



# RAILROAD RESEARCH BULLETIN



**Spring 1978**  
**Volume 5 Number 1**

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August 1977 and January 1978

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**Federal Railroad Administration**

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The Transportation Research Board is an agency of the National Research Council, which serves the National Academy of Sciences and the National Academy of Engineering. The Board's purpose is to stimulate research concerning the nature and performance of transportation systems, to disseminate information that the research produces, and to encourage the application of appropriate research findings. The Board's program is carried out by more than 150 committees and task forces composed of more than 1800 administrators, engineers, social scientists, and educators who serve without compensation. The program is supported by state transportation and highway departments, the major administrations of the U.S. Department of Transportation, the Association of American Railroads, and other organizations interested in the development of transportation.

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# Foreword

This *Bulletin*, containing 1045 abstracts of journal articles, research reports, computer programs, and magnetic tape data sets and 531 summaries of ongoing research activities, covers material accessioned by the Railroad Research Information Service between August 1977 and January 1978.

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

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

The RRIS Cumulative Subject Index 1973-1975 is available from the Railroad Research Information Service along with most of the editions of the *Railroad Research Bulletin*. Some RRIS publications are available from the National Technical Information Service at somewhat higher prices. In addition to acquisition and selection, RRIS work includes the classification, indexing, storage, retrieval, and dissemination of abstracts and summaries.

## RRIS FILE SEARCHES

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

The fee schedule for RRIS title searches reflects the primary support for the service from the Federal Railroad Administration and the nonprofit nature of all National Research Council information services. The charge for computer retrieval from the RRIS file is \$50 per request plus

\$0.25 per citation after screening by RRIS. A written authorization or purchase order is required before the retrieval is made.

## USING THE RAILROAD RESEARCH BULLETIN

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

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

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

If you can identify your interest by subject, turn to the Subject Term Index. Each term in this index is followed by the document record number, which consists of the two-digit subject area number and the six-digit TRIS accession number that identifies the individual document under that subject area. An A after subject area numbers indicates that the item is a summary of ongoing research. The items are arranged in order of ascending accession numbers within each subject area.

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

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

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



# Availability of Documents

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

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

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|---|---|--|
| <p><b>AAR</b><br/>Association of American Railroads<br/>1920 L Street, N.W.<br/>Washington, D.C. 20036</p> <p><b>AAR</b><br/>For technical reports identified by a report number such as R-253:<br/>Association of American Railroads<br/>Technical Center<br/>3140 South Federal Street<br/>Chicago, Illinois 60616</p> <p><b>AIAA</b><br/>American Institute of Aeronautics and Astronautics<br/>Technical Information Service<br/>750 Third Avenue<br/>New York, New York 10017</p> <p><b>AREA</b><br/>American Railway Engineering Association<br/>59 East Van Buren Street<br/>Chicago, Illinois 60605</p> <p><b>ASCE</b><br/>American Society of Civil Engineers<br/>345 East Forty-seventh Street<br/>New York, New York 10017</p> <p><b>ASME</b><br/>American Society of Mechanical Engineers<br/>345 East Forty-seventh Street<br/>New York, New York 10017</p> <p><b>CIGGT</b><br/>Canadian Institute of Guided Ground Transport<br/>Queen's University<br/>Kingston, Ontario K7L 3N6<br/>Canada</p> <p><b>DOT</b><br/>U.S. Department of Transportation<br/>Nassif Building<br/>400 Seventh Street, S.W.<br/>Washington, D.C. 20590</p> <p><b>ECMT</b><br/>All documents available through OECD (see below)</p> <p><b>ESL</b><br/>Engineering Societies Library<br/>345 East Forty-seventh Street<br/>New York, New York 10017</p> <p><b>FRA</b><br/>Federal Railroad Administration<br/>Transpoint Building<br/>2100 Second Street, S.W.<br/>Washington, D.C. 20590</p> | <p><b>GPO</b><br/>Superintendent of Documents<br/>U.S. Government Printing Office<br/>Washington, D.C. 20402</p> <p><b>IEEE</b><br/>Institute of Electrical and Electronics Engineers<br/>345 East Forty-seventh Street<br/>New York, New York 10017</p> <p><b>IPC</b><br/>IPC (America), Inc.<br/>205 East Forty-second Street<br/>New York, New York 10017</p> <p><b>IT</b><br/>Transport Publishing House<br/>Basmannyi Tupik 6A<br/>Moscow B-174, USSR</p> <p><b>MPS</b><br/>USSR Ministry of Railways<br/>Novo-Basmannaya, ul.2<br/>Moscow B-174, USSR</p> <p><b>NAE/NAS/NRC</b><br/>National Academy of Sciences<br/>Publication Sales<br/>2101 Constitution Avenue, N.W.<br/>Washington, D.C. 20418</p> <p><b>NTIS</b><br/>National Technical Information Service<br/>5285 Port Royal Road<br/>Springfield, Virginia 22161</p> <p><b>OECD</b><br/>OECD Publications Center<br/>Room 1207<br/>1750 Pennsylvania Avenue, N.W.<br/>Washington, D.C. 20006</p> <p><b>ORE</b><br/>See UIC/ORE below.</p> <p><b>OST</b><br/>Office of the Secretary<br/>U.S. Department of Transportation<br/>400 Seventh Street, S.W.<br/>Washington, D.C. 20590</p> <p><b>RPI</b><br/>Railway Progress Institute<br/>801 North Fairfax Street<br/>Alexandria, Virginia 22314</p> <p><b>RTAC</b><br/>Roads and Transportation Association of Canada<br/>875 Carling Avenue<br/>Ottawa, Ontario K1S 5A4<br/>Canada</p> <p><b>SAE</b><br/>Society of Automotive Engineers<br/>400 Commonwealth Drive<br/>Warrendale, Pennsylvania 15096</p> | <p><b>SNAME</b><br/>Society of Naval Architects and Marine Engineers<br/>74 Trinity Place<br/>New York, New York 10006</p> <p><b>TRB</b><br/>Transportation Research Board<br/>Publications Office<br/>2101 Constitution Avenue, N.W.<br/>Washington, D.C. 20418</p> <p><b>TRRL</b><br/>Transport and Road Research Laboratory<br/>Crowthorne, Berkshire RG11 6AU<br/>England</p> <p><b>TSC</b><br/>Transportation Systems Center<br/>55 Broadway<br/>Cambridge, Massachusetts 02142</p> <p><b>TsNIITEI</b><br/>Central Scientific Research Institute of Information and Technical and Economic Research<br/>Raushskaia Nab 4<br/>Moscow 113035, USSR</p> <p><b>UIC</b><br/>International Union of Railways, BD<br/>14-16 Rue Jean-Rey<br/>75015 Paris<br/>France</p> <p><b>UIC/ORE</b><br/>For technical reports identified by a report number such as B125/RP3/E (note restrictions below):<br/>International Union of Railways<br/>Office for Research and Experiments<br/>Oudenoord 60<br/>Utrecht, Netherlands</p> <p><b>UITP</b><br/>International Union of Public Transport<br/>Avenue de l'Uruguay 19<br/>B-1050, Brussels<br/>Belgium</p> <p><b>UMI</b><br/>University Microfilms International<br/>300 North Zeeb Road<br/>Ann Arbor, Michigan 48106</p> <p><b>UMTA</b><br/>Urban Mass Transportation Administration<br/>400 Seventh Street, S.W.<br/>Washington, D.C. 20590</p> |
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412 McLaughlin Hall  
Berkeley, CA 94720  
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# Abbreviations

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



# Examples of Abstracts and Summaries

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

sections. The document record number appears at the top of each abstract. Abstracts within each subject area are listed in ascending order of the accession numbers, although these usually will not be consecutive. Examples of research report abstract and of a journal article abstract of both U.S. and non-U.S. journal articles appear below and on the next page.

## Abstract of a research report

Document record number	
TRIS accession number	
Subject area code	02 128640
Title	<b>TEST TRAIN PROGRAM SIXTH PROGRESS REPORT</b>
Research report abstract	This report describes the progress of the Rail Research Program involving operation of the FRA test cars and the performance of other rail research efforts during the period 1 July 1973 to 30 June 1974. Highlights of the work reported include operation of the FRA test cars to perform track surveys and other rail research activities; test car upgrading; expansion of the Rail Research Program; and data management and data analysis tasks which have been undertaken to benefit railroad technology. The Rail Research Program primarily involves the operation and instrumentation of the FRA test cars. This research program is designed to provide high-speed measurement of railroad track characteristics, development of comprehensive track measurement techniques, development of special testing instrumentation, and data evaluation through analysis and electronic processing. Sponsorship was from FRA, DOT.
Supplementary notes	
Authors, publication data, document data	Peterson, C Kaufman, WM Yang, TL Corbin, JC ENSCO, Incorporated, (DOT-FR-74-19) Prog Rpt. FRA- ORD&D-75-25, June 1974, 124 pp, 36 Fig.
Activity data	Contract DOT-FR-20032
Source of abstract	ACKNOWLEDGMENT: FRA
Availability	PURCHASE FROM: NTIS Repr. PC, Microfiche PB-247084/AS, DOTL NTIS
NTIS accession number	
Washington, D.C., availability with RP, JC, or call number	

## Abstract of a U.S. journal article

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TRIS accession number	
Subject area code	02 131315
Title	<b>INVESTIGATION INTO CAUSES OF RAIL CORRUGATIONS</b>
Journal article abstract	Heavy traffic density and high-capacity cars increased wear and abrasion on curves which CP Rail countered with lubricators that cut flange abrasion but produced rail corrugation with a wavelength of 8 to 28 inches on the low rail. Plastic flow or rail head metal combined with surface fatigue are predominately responsible for rail corrugation. Recommendations for overcoming the problem includes improved wheel rail contact geometry through elimination of wide gauge, elimination of false flanges on wheels, reduction of railhead curvature and modification of the AAR wheel profile; cutting of lateral frictional force by use of self-steering trucks; changes in rail metallurgy to increase resistance to surface fatigue and plastic flow, reduction of dynamic loadings and improved flange lubrication techniques.
Author, publication data, document data	Kalousek, J Klein, R <i>AREA Bulletin</i> Vol. 77 Bulletin, Jan. 1976, pp 429-48, 15 Fig., 2 Tab., 7 Ref.
Source of abstract	ACKNOWLEDGMENT: AREA Bulletin
Availability	PURCHASE FROM: ESL Repr. PC, Microfilm
Washington, D.C., availability with RP, JC, or call number	DOTL JC

## Abstract of a non-U.S. journal article

Document record number  
TRIS accession number  
Subject area code → **09 141649**

Translated title → **EXPERIMENTAL ANALYSIS OF THE DYNAMIC BEHAVIOR OF A MECHANICAL STRUCTURE. CONCEPT OF MECHANICAL IMPEDANCE** [Analyse experimentale du comportement dynamique d'une structure mecanique. Concept d'impedance mecanique]

Title in original language → The experimental method of analysis called "mechanical impedance" (the concept of mechanical impedance is of the same nature as that of electrical impedance) is used to study the dynamic behavior of the structure of the material. It reveals the vibration pattern in any given area of a component. The SNCF Testing Division uses this method to analyse stress patterns in components, to limit the amplitude of certain vibrations, or to monitor the condition of a metallic structure during operation. The applications of this method are shown by means of examples. [French]

Journal article abstract →

Language of full-text article →

Author, publication data, document data → Butteaud, B *Revue Generale des Chemins de Fer* May 1976, pp 304-323, 40 Fig., 3 App.

Source of abstract → ACKNOWLEDGMENT: UIC

Availability → ORDER FROM: ESL

Washington, D.C., availability with RP, JC, or call number → DOTL JC

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

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

## Summary of ongoing research

Document record number  
TRIS accession number  
RRIS subject area number → **02 058303**

Project title → **FREIGHT CAR TRUCK DESIGN OPTIMIZATION**

Project summary → The Truck Design Optimization Project (TDOP) is a multiyear project intended to evaluate performance characteristics of existing railroad freight car trucks; determine through cost-benefit analysis the feasibility of improving truck performance by mechanical modification of existing type trucks or through introduction of new truck designs that respect carbody/-suspension system interfaces or are otherwise compatible with existing freight train systems; provide performance and testing specifications for use in the development of freight car suspension systems, and study concepts of integrated carbody support systems and advanced designs in anticipation of future railroad requirements.

Agency performing the work → PERFORMING AGENCY: Southern Pacific Transportation Company

Project investigators → INVESTIGATOR: Byrne, R (Tel 415-362-1212X-22547)

Project sponsors → SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

Contract monitor → RESPONSIBLE INDIVIDUAL: Fay, GR (Tel 202-426-0855)

Project data → Contract DOT-FR-40023  
STATUS: Active NOTICE DATE: Feb. 1976 START DATE: June 1974 COMPLETION DATE: Dec. 1978 TOTAL FUNDS: \$2,000,000

Source of this summary → ACKNOWLEDGMENT: FRA

# Abstracts of Reports and Journal Articles

## 00 Right-of-Way

00 053234

### INVESTIGATION OF BRIDGE DECKS WITH CONCRETE-ENCASED GIRDERS. STATICALLY DETERMINATE DECK TESTS UNDER DYNAMIC AND STATIC LOADS.

A twin-span bridge deck comprising concrete-encased steel sections and forming two continuous spans each of 19 m length was constructed on test floor No. 2 of the Structure Testing Centre of the CEBTP at Saint Remy les Chevreuse. This structure had been designed according to the calculation rules in force on the SNCF in 1973. The tests to which it had already been submitted (fatigue testing under service load to two million cycles, then statically tested) and its description are dealt with in Reports No. 5 and No. 7. However, brief mention should be made here of the fact that it concerns a bridge deck comprising 4 HEA 800 sections in AE 24 steel encased in concrete and corresponding to 2/3 of the cross-section of a real deck. This continuous deck of 2 x 29 m, after having undergone initial tests, was severed at its middle, and the present report describes the tests carried out on the two spans rendered "statically determinate" in this way.

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

International Union of Railways D 123/RP 8/E, Oct. 1976, 35 pp, 59 Fig., 11 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 053241

### STATIC TESTS ON EXPERIMENTAL DECK MODELS BY HOLOGRAPHY

This report describes the comparative testing by the holographic interferometry method of two deck models of micro-concrete, the one being a monolithic slab and the other being formed of six girders assembled by transverse pre-stressing. These tests have enabled the part played by the load/transverse pre-stressing ratio to be revealed as well as the areas of influence of the transverse prestressing. The coefficient of friction is 0.4 for the model. Is it the same for real concrete? In practice, three or four cross-ties must give almost as good a load distribution as continuous clamping, as can be shown by the theory of diaphragms. What is the value of proving an approximately 45% spread of pre-stress? If mating surfaces are good, or the irregularities are grouted, or filled with fairly stiff material, no reason exists to suppose a different distribution of pre-stress than in a homogeneous construction.

Restrictions on the use of this document are contained in the explanatory material. Prepared by the ORE Specialists Committee D123. Original text in French. Also published in English and German.

International Union of Railways DT 61 (D 123)E, Apr. 1977, 18 pp, 17 Fig., 2 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 053250

### FATIGUE PHENOMENA IN WELDED CONNECTIONS OF BRIDGES AND CRANES. FATIGUE TESTS ON SMALL I-BEAMS 360 MM X 230 MM

The report describes fatigue tests on four welded steel I-beams, under both constant amplitude and spectrum loading. The beams were shop welded, and incorporated attachments which gave rise to stress concentrations.

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

International Union of Railways D 130/RP 3, Oct. 1976, 57 pp, 99 Fig., 13 Tab., 2 Ref., 9 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 053251

### STATISTICAL DISTRIBUTION OF AXLE LOADS AND STRESSES IN RAILWAY BRIDGES. BENDING MOMENT SPECTRA AND PREDICTED LIVES OF RAILWAY BRIDGES

The report presents bending moment spectra at mid-span points for simple beams and predicted lives of railway bridges for 10 spans from 2 to 50 m. The bridges are subjected to various typical trains of 7 European railway administrations, the trains run at different speeds. For the fatigue life of bridges, the moment histories are analysed by the rainflow counting method and Palmgren-Miner cumulative damage theory is used.

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

International Union of Railways D 128/RP 5, Oct. 1976, 43 pp, 24 Fig., 78 Tab., 10 Ref., 4 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 053253

### INVESTIGATION OF BRIDGE DECKS WITH CONCRETE ENCASED GIRDERS. DYNAMIC TESTS ON EXPERIMENTAL DECKS DII AND DIII

The present report deals with the dynamic and static testing of two bridge deck models of 3.60 m span. The first part "A" concerns deck D II, like experimental deck S V previously tested statically (see report No. 3) and composed of a slab of rich-mix concrete provided at the underside with three steel flats and welded connectors. The second part "B" refers to deck D III, like experimental deck S VI previously tested statically (see report No. 4) and formed of five prefabricated concrete girders with steel flat at the underside and connectors, these girders being assembled by transverse pre-stressing.

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

International Union of Railways D 123/RP 9, Apr. 1977, 33 pp, 24 Fig., 12 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

00 150474

### COMBINED UTILITY/TRANSPORTATION TUNNEL SYSTEMS-ECONOMIC, TECHNICAL AND INSTITUTIONAL FEASIBILITY

Although utility tunnels are common in Europe and Asia, United States use is largely confined to institutions where all utilities are under single ownership. Cut-and-cover transportation projects appear to display nearly ideal conditions for the use of utility tunnels. This project evaluated the economic, technical and institutional feasibility of incorporating utility tunnels into cut-and-cover transportation tunnel projects. Direct construction costs for the utility tunnel and conventional utility treatment options were projected and found to be comparable. In addition, significant reductions in urban disruption result when the construction of the utility tunnel and transportation tunnel is properly integrated. The combined

tunnel system is the recommended option. The treatment of each utility, the structure of the tunnel operating entity and recommendations for implementation are included.

Prepared in cooperation with American Public Works Association, Chicago, Ill.

Huck, PJ Iyengar, MN Makeig, KS Chipps, J  
IIT Research Institute, American Public Works Association,  
Transportation Systems Center Final Rpt. DOT-TSC-OST-75-50, July 1976, 242 pp

Contract DOT-TSC-794

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-262067/2ST, DOTL NTIS

#### 00 150947

#### SCANNED ACOUSTICAL HOLOGRAPHY FOR GEOLOGICAL PREDICTION IN ADVANCE OF RAPID UNDERGROUND EXCAVATION. PHASE II

A large circular scanner, five feet in diameter, was activated in January 1976. The system employs microcomputers for determining the reference wave phase angles in real-time. Holograms were made and reconstructed in less than ten minutes. The quality of the hologram is excellent and the laser reconstructions (reconstructed images) are of good quality showing good resolution and good image definition. A variety of "roughness" features were modeled on a variety of objects immersed in a large water tank. These features simulate properties that will be encountered when actual geologic conditions are examined. Also developed were a variety of new image enhancement techniques essential for the success of the effort when real-world situations were encountered. Plans for an actual field demonstration of the system in rock are proceeding. A variety of new prototype designs for data gathering, data storage, data processing and display techniques were also completed. The authors predict that implementation of a large tunnel boring machine with an acoustic holography system will be highly successful.

See also PB-245 147.

Price, TO Fitzpatrick, GL Brennan, JM  
Holosonics Incorporated, National Science Foundation Intrm Rpt.  
NSF/RA-760297, May 1976, 59 pp

Contract NSF-APR75-16376

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-260768/7ST, DOTL NTIS

#### 00 150972

#### BRIDGES: CONSTRUCTION AND CONSTRUCTION MATERIALS. VOLUME 2. JANUARY, 1976-NOVEMBER, 1976 (CITATIONS FROM THE ENGINEERING INDEX DATA BASE)

Bridge design, construction, construction materials, and the structural/mechanical properties are investigated in these reports gathered in a worldwide literature survey. Bridge decks, piers, approaches, and foundations are among the salient features reviewed. (Contains 87 reports)

See also NTIS/PS-76/1051, and NTIS/PS-76/1052.

Habercom, GE, Jr  
National Technical Information Service Intrm Rpt. Dec. 1976, 94 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-76/1054/6ST, DOTL NTIS

#### 00 150974

#### BRIDGES: CONSTRUCTION AND CONSTRUCTION MATERIALS. VOLUME 2. DECEMBER, 1975-NOVEMBER, 1976 (CITATIONS FROM THE NTIS DATA BASE)

Bridge design, construction, construction materials, and the structural/mechanical properties are investigated in these Government-sponsored research reports. Bridge decks, approaches, piers, and foundations are among the salient features reviewed. (This updated bibliography contains 105 abstracts, all of which are new entries to the previous edition.)

Supersedes NTIS/PS-75/888, and NTIS/PS-75/076. See also NTIS/PS-76/1053, and NTIS/PS-76/1054.

Habercom, GE, Jr  
National Technical Information Service Intrm Rpt. Dec. 1976, 110 pp

ACKNOWLEDGMENT: NTIS  
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NTIS/PS-76/1052/1ST, DOTL NTIS

#### 00 150975

#### BRIDGE CONSTRUCTION AND CONSTRUCTION MATERIALS. VOLUME 1. 1964-NOVEMBER, 1975 (CITATIONS FROM THE NTIS DATA BASE)

Bridge design, construction, construction materials, and the structural/mechanical properties are investigated in these Government-sponsored research reports. Bridge decks, approaches, piers, and foundations are among the salient features reviewed. (This updated bibliography contains 223 abstracts, none of which are new entries to the previous edition.)

See also NTIS/PS-76/1053, and NTIS/PS-76/1054.

Habercom, GE, Jr  
National Technical Information Service Intrm Rpt. Dec. 1976, 228 pp

ACKNOWLEDGMENT: NTIS  
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NTIS/PS-76/1051/2ST, DOTL NTIS

#### 00 151216

#### AESTHETIC AND ENVIRONMENTAL CONSIDERATIONS IN THE DESIGN OF ELEVATED TRANSPORTATION STRUCTURES

This report addresses issues related to assessing or anticipating visual impacts of elevated transportation structures upon urban settings. Two alternative approaches are outlined for assessing negative impacts of elevated structures upon different settings. The compatibility matrix approach cross-references characteristics of an existing or proposed structure with features of a particular setting to identify conflicts. The case study approach graphically portrays each setting with and without the existing or proposed structure in place to illustrate comparative changes (impacts). Nine hypothetical case studies are presented as examples. Various considerations of ways to improve existing elevated transportation structures are offered, including general restoration noise control and lighting. Considerations are also offered for ways to improve the conditions of elevated train stations and pedestrian skyways. Recommendations for planning new elevated structures are presented.

Prepared in cooperation with Illinois Univ. at Urbana-Champaign. Dept. of Industrial Engineering.

Silver, ML Bell, LS  
Illinois University, Chicago, Illinois University, Urbana, Department of Transportation Final Rpt. DOT/TST-76/16, June 1975, 134 pp

Contract DOT-OS-30092

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263158/8ST, DOTL NTIS

#### 00 151219

#### FIELD MEASUREMENTS OF THE VIBRATION PROPERTIES OF ELEVATED RAPID TRANSIT STRUCTURES

Vibrations induced into rail rapid transit structures may be radiated from the structure as airborne noise that disturbs the rider and the wayside community or as ground-borne vibrations which propagate into the foundations of wayside structures setting walls, floors, and common household items into annoying vibration. This report describes the results of field measurements on existing steel elevated structures presented to aid transit operators and engineers concerned with design, performance, repair, and evaluation of steel elevated rapid transit structures. These measurements showed that the peak acceleration levels are generated in decreasing order of magnitude on the rail, on the top and bottom girder flanges, on the girder web, on cross-bracing, on the column, and at the footing base. In addition, peak acceleration levels of 70 g are little attenuated as they are transmitted from the rail through the structure, and peak acceleration levels significantly increase for increasing train speeds.

Venema, T Silver, ML  
Illinois University, Chicago, Department of Transportation Intrm Rpt.  
DOT/TST-75/43, Dec. 1974, 83 pp

Contract DOT-OS-30092

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263220/6ST, DOTL NTIS

00 154901

**OVERLAY OF LARGE, PLACED QUARRYSTONE AND BOULDERS TO INCREASE RIPRAP STABILITY**

This report describes the wave tank tests and field performance of a single layer of large armor stone used as a protective overlay on underdesigned riprap. The resistance of the overlay to wave attack was determined by small-scale model and prototype-scale wave tank tests at CERC. A stone overlay concept was successfully used to repair a damaged riprap revetment on Oahe Reservoir, South Dakota (App. A). Design information and an example problem (App. B) are presented to demonstrate application of the overlay concept to both revetment repair and original construction. (Author)

McCartney, BL Ahrens, JP  
Army Coastal Engineering Research Center Tech. Pap. CERC-TP-76-19, Dec. 1976, 37 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-A036896/9ST, DOTL NTIS

00 155093

**A TECHNICAL AND ECONOMIC EVALUATION OF WATER JET ASSISTED TUNNEL BORING**

A full size mechanical mole outfitted with a high pressure water jet system was used to bore a section of tunnel in granite. Data collected in the laboratory and in the field are included in the report. Section 2 presents the equations pertaining to the hydraulic system. Section 3 details the relationships describing the hydraulic cutting of rock. Section 4 discusses the laboratory work done to evaluate the interaction between mechanical and water jet cutting systems. Section 5 presents a discussion of the field boring results obtained at Skykomish. In Section 6 a technical and economic evaluation of a hypothetical 20 foot diameter jet assisted machine boring Skykomish granite is presented. Finally, Section 7 contains the recommendations of work needed for the practical implementation of jet assisted tunnel boring.

See also PB-254 616.

Hustrulid, W  
Utah University, National Science Foundation NSF/RA-760174, July 1976, 160 pp

Grant NSF-APR74-21784-A04

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264625/5ST, DOTL NTIS

00 158940

**STRUCTURAL TESTS OF CAST-IN-PLACE TUNNEL LINERS**

Two tests of circular 10-ft. diameter models of cast-in-place tunnel liners are described. One test specimen was unreinforced and the other was conventionally reinforced with 0.44 percent circumferential deformed bars in the inner and the outer faces. Loading simulated vertical active ground loads and lateral passive resistance as the liner deformed. All external forces were distributed over an 8-in. (203 mm) circumferential distance at 30 deg. intervals. The purpose of the tests was to study the structural response, including nonlinear moment redistribution and failure, of a liner with loading and restraint conditions similar to those encountered in the ground. Results of these two tests are compared with results of similar tests on steel-fiber-reinforced specimens. Comparison of the results provide an indication of the influence of reinforcement and passive force stiffness on behavior and strength. Linear analyses are used to study the influence of more realistic distribution of external forces and shear stress between the liner and medium.

Paul, SL Sinnamon, GK Ferrera-Boza, R  
Illinois University, Urbana, Office of the Secretary of Transportation  
Final Rpt. DOT/TST/76T-18, UILU-ENG-76-2027, Aug. 1976, 115 pp, 14 Ref.

Contract DOT-FR-30022

ACKNOWLEDGMENT: NTIS  
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PB-267302/8ST, DOTL NTIS

00 158942

**THE GROUND MOVEMENTS RELATED TO BRACED EXCAVATION AND THEIR INFLUENCE ON ADJACENT BUILDINGS**

This report summarizes the settlement and lateral displacement measurements associated with urban excavation projects in the dense sands and interbedded stiff clay of Washington, D.C. and the soft clay of Chicago. The ground movements caused by excavation in each area are discussed in light of the soil profile and construction techniques. The relationship between soil displacement and the damage caused to adjacent buildings is examined. Criteria for the onset of architectural damage are recommended for brick-bearing wall and frame structures subject to excavation movements. Brick-bearing wall structures are described, with special emphasis on the construction details related to building stability. Various modes of instability caused by differential ground movements are examined for brick-bearing wall structures. Case histories of building damage caused by adjacent excavation are presented.

O'Rourke, TD Cording, EJ Boscardin, M  
Illinois University, Urbana, Office of the Secretary of Transportation,  
Federal Railroad Administration Final Rpt. DOT/TST-76T-23, UILU-ENG-76-2023, Aug. 1976, 135 pp

Contract DOT-FR-30022

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-267311/9ST, DOTL NTIS

00 158943

**DURABILITY AND PHYSICAL PROPERTIES OF STEEL FIBER REINFORCED CONCRETE**

The durability and physical properties of steel fiber reinforced concretes proportioned for pumpability criteria for tunnel liners are reported. The mix parameters include fiber contents of 0.9, 1.2 and 1.5 volume percent, maximum aggregate sizes of 3/8, 1/2, 3/4 and 1 in. (10, 13, 20 and 25 mm), and use of water reducers. Tests were performed at 28 d with type 1 cement concrete and between 1-1/2 h and 90 d with regulated-set cement concrete. Regulated-set cement concrete is found to lose nearly twice the strength as type 1 cement concrete for exposure to 660 F (350 C). Corrosion of steel fiber reinforcement is observed in cracked concrete with no apparent lower bound on crack size. The magnitude of the shrinkage of portland cement concretes proportioned for pumpability is related to the high paste contents required to fill the voids in the aggregate fiber array. An estimate of shrinkage can be made if the proportions of the mix and the curing are known.

Halvorsen, GT Kesler, CE Robinson, AR Stout, JA  
Illinois University, Urbana, Department of Transportation, Federal  
Railroad Administration Final Rpt. DOT/TST-76T-21, UILU-ENG-76-2013, Aug. 1976, 75 pp

Contract DOT-FR-30022

ACKNOWLEDGMENT: NTIS  
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PB-267318/4ST, DOTL NTIS

00 158944

**DESIGN OF FIBER REINFORCED CONCRETE FOR PUMPING**

This study was undertaken to develop a positive design procedure for pumpable fibrous reinforced concrete mixes and to provide information on this method for application in tunnel liners. The addition of fiber reinforcement to any combination of fine and coarse aggregates increases the void content of the mix. The incompressible paste content of the mix must exceed the void content so that segregation failure will not occur during pumping. Because of the inherent high void content and harshness of a fiber reinforced concrete mix compared to a plain concrete mix the gradation of the sand is more critical and the steps necessary to design a pumpable mix more detailed. The steps include selection of the aggregates, ratio of fine to coarse aggregate, volume of paste, quantity of water and the cement content. Mixes with four different coarse aggregate maximum sizes, two water reducing admixtures and one phase thickening admixture were studied. These mixes were evaluated in a laboratory testing apparatus designed to model actual pumping conditions.

Ounanian, DW Kesler, CE  
Illinois University, Urbana, Department of Transportation, Federal  
Railroad Administration Final Rpt. DOT/TST-76T-17, UILU-ENG-76-2010, Aug. 1976, 53 pp

Contract DOT-FR-30022  
 ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-267319/2ST, DOTL NTIS

00 158945

#### CONCRETE REINFORCED WITH PLAIN AND DEFORMED STEEL FIBERS

The work is a result of the investigation of steel fiber reinforced concrete as a material for slipformed tunnel liners, and interest in designing the best concrete for this purpose. With the development of commercial deformed fibers, it became apparent that a comparison of the behavior of concretes reinforced with various types of steel fibers would be useful in evaluation of these new materials. These comparisons may be of specific interest in selecting mixes and equipment for concrete tunnel liners, and of general interest with respect to development of fibrous reinforcement with different anchorage characteristics.

Halvorsen, GT  
 Illinois University, Urbana, Department of Transportation, Federal  
 Railroad Administration Final Rpt. DOT/TST-76T-20, UILU-  
 ENG-76-2011, Aug. 1976, 73 pp

Contract DOT-FR-30022

ACKNOWLEDGMENT: NTIS  
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PB-267320/0ST, DOTL NTIS

00 158948

#### SHOTCRETE: LARGE SCALE TESTING OF THIN LINERS WITH A FLAT ARCH GEOMETRY

This report presents the results of model tests on thin shotcrete layers similar to those potentially used as initial tunnel support in flat roofed tunnels. The structural behavior and maximum carrying capacity of these layers were determined in this testing program. The large-scale test facility used in previous work was modified to simulate a flat roofed tunnel. Preliminary tests, using thin mortar layers, were conducted in order to assess the performance of the test device and to evaluate the principal variables controlling the capacity of a thin lining. Results obtained from these tests were used in the planning and evaluation of the shotcrete test program. Three principal modes of failure were observed: diagonal tension in the shotcrete, separation of the layer from the wall, and thrust-moment interaction in the separated portion of the layer. The failure mode was governed mainly by the thickness and boundary conditions of the layer, as well as the adhesive characteristics along the shotcrete wall contact. Other parameters, such as the strength of the shotcrete also affected the maximum carrying capacity of the layers. A conceptual model has been developed to be used as a theoretical framework in the analysis of these and future tests results. Recommendations for future studies of thin shotcrete linings are also given in this report.

Fernandez-Delgado, G Mahar, J Cording, EJ Parker, H  
 Illinois University, Urbana, Department of Transportation, Federal  
 Railroad Administration Final Rpt. DOT/TST-76T-19, UILU-  
 ENG-76-2029, Aug. 1976, 182 pp

Contract DOT-FR-30022

ACKNOWLEDGMENT: NTIS  
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PB-267355/6ST, DOTL NTIS

00 158949

#### DISPLACEMENTS AROUND TUNNELS IN SOILS

This report summarizes one year of research on ground movements around tunnels in soil. Data from available case histories of tunnels constructed in sands and gravels, stiff clays, and soft clays is combined with the results of field observations and a model study to describe sources and volumes of ground lost around tunnels, the relationship between volume of ground lost and volume of surface settlement, and the shape of the surface settlement trough. Horizontal strains occurring with the surface settlement trough are described, and their implications for building damage are discussed. The volume of surface settlement is affected not only by the volume of lost ground, but also by the volume of expansion or compression in the soil around a tunnel. The surface settlement trough can be approximated by relationships presented by Peck (1969), except in cases where the settlements are very small (elastic) or very large (greater than 0.5 percent of the tunnel

depth). In these cases, the settlement trough may be wider or narrower, respectively, than estimated. The results of field and analytical studies of interference effects between settlement troughs for multiple tunnels are presented. The results of a field observation program of settlement measurements on the Washington, D.C. Metro Section F2a tunnels are presented. A third section of the report is a progress report on a model study in which ground movements around a model tunnel in sand were measured using photogrammetric procedures and displacement gages.

Cording, EJ Hansmire, WH MacPherson, HH Lenzini,  
 PA Vonderohe, AP  
 Illinois University, Urbana, Department of Transportation, Federal  
 Railroad Administration Final Rpt. DOT/TST-76T-22, Aug. 1976, 208  
 pp

Contract DOT-FR-30022

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-267356/4ST, DOTL NTIS

00 159043

#### ROCK, FROZEN SOIL AND ICE BREAKAGE BY HIGH-FREQUENCY ELECTROMAGNETIC RADIATION: A REVIEW

In the past decade, various workers have investigated the use of high-frequency electromagnetic radiation for breaking and excavating rock and frozen ground. This report reviews the high-frequency dielectric properties of these materials, the physics of heating, and the existing literature on these subjects. The high-frequency dielectric properties of rocks and soils, and the absorption of energy by these materials, are mainly determined by their liquid water contents. Computer modeling was used to calculate absorption energy as a function of distance behind irradiated faces of earth materials. The resulting computations showed that most energy is absorbed in the first few centimeters of frozen ground and weak soils. However, in hard rocks of low water content, electromagnetic waves penetrate more deeply, and significant amounts of energy are also absorbed tens of centimeters behind the irradiated faces. Test results showed that electromagnetic rock breakage is feasible only for excavations in hard rock; test results from the use of electromagnetic radiation for excavating tunnels in weak rocks and frozen ground are not promising. (Author)

Hoekstra, P  
 Cold Regions Research and Engineering Laboratory, (4A762719AT42)  
 CRREL-76-36, Oct. 1976, 21 pp

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

AD-A039178/9ST, DOTL NTIS

00 159755

#### STUDIES AND SOLUTIONS FOR THE CONSTRUCTION OF A TUNNEL SECTION IN TERRAIN OF CONSIDERABLE HYDROSTATIC PRESSURE [Studi e soluzioni per la costruzione di una tratta di galleria in terreni particolarmente spingenti con pressioni di tipo idrostatico]

This article describes and illustrates the surveying, excavating and lining of a 1 km stretch of tunnel at Santomarco on the Paola-Cosenze railway line, Italy. The tunnel was drilled through clayey-marl rock formation and extreme hydrostatic pressure was encountered, due to thrust from the mountain. Separate sections in the article deal with: the geology of the mountain area; geomechanical considerations; laboratory and in situ tests; evaluation of the pressures acting on the lining; definition of the geomechanical parameters affecting static design and the forecasting of the loads acting on the lining; and the construction method adopted, consisting of closed shield drilling, the placing of prefabricated reinforced concrete lining shells, and the injection of a strengthening ring of concrete. /TRRL/ [Italian]

Verrengia, A *Gironale del Genio Civile* Analytic Vol. 114 No. 1011, Oct. 1976, pp 363-409, 46 Fig., 2 Tab., 9 Phot.

ACKNOWLEDGMENT: TRRL (IRRD 225841)  
 ORDER FROM: Ministero dei Lavori Pubblici Consiglio Superiore, Via  
 Nomentana 2, Rome, Italy



00 162999

**PERFORMANCE OF A THIN METAL RETAINING WALL WITH MULTIPLE ANCHORAGE**

The construction and performance of a new type of retaining structure is described. The wall, at the head of a steep canyon, was built by anchoring a thin metal face to the backfill area with multiple metal tiestraps anchored to a continuous deadman. The forces in the tiestraps, the distribution of these forces, the distribution of stresses in the soil and backfill, and the deformation of the wall and within the backfill were measured with appropriate strain and fluid settlement gauges and pressure cells. Subject to the limitations imposed by the facts that the instrumentation and the results produced from the pressure cell observations showed considerable variability, the following conclusions are drawn: (a) conventional earth-pressure analysis gives reasonable forces for tiestrap wall design, but consideration in future designs should be given to the effects of sloping surcharges; (b) stresses in the backfill near the wall face are less than those indicated by conventional earth-pressure analysis; (c) a tieback wall deforms in the active sense in spite of the presence of the tiestraps. The potential failure surface within the backfill can be predicted with reasonable accuracy using Coulomb earth-pressure analysis, but the actual surface may define a smaller active zone; (d) the outward wall movements were not unreasonably large, but were of sufficient magnitude to reduce the total force necessary to stabilize the backfill at the active value; (e) the vertical movements in the backfill exceed those accounted for by lateral wall movement and were weather-related; and (f) the wall was still moving at the end of the rainy season, but at a rate significantly smaller than before. Further movements appear to be likely, but tolerable. /Author/

This article appeared in Transportation Research Record No. 616, Soil Mechanics: Rutting in Asphalt Pavements, Embankment on Varved Clays, and Foundations.

Schroeder, WL (Oregon State University); Schwarzhoff, JC (Forest Service); Hansen, LA (Stanford University) *Transportation Research Record* No. 616, 1976, pp 56-61, 12 Fig., 9 Ref.

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DOTL JC

00 163003

**ANALYZING FIELD DATA FOR RAPID SETTLEMENTS (ABRIDGEMENT)**

The square root of adjusted time method is one that uses the rate of settlement after the fill is complete, when only consolidation settlement is occurring, to separate the rapid from the consolidation settlement during filling. The rate of settlement is determined from settlement platform observations. The square root of time is a curve-fitting technique for analyzing data from the one-dimensional consolidation test and has been shown to be valid for other boundary conditions. To analyze for rapid settlements by this method, the observed settlements after the entire load is in place are plotted against the square root of adjusted time. The validity of this technique was verified by comparing the rapid settlement results from it with the results from using an analysis involving percent consolidation. The study concluded that this simple method gives good results for most drainage conditions. However, in clays whose coefficient of consolidation varies significantly, piezometer data will also be needed. A discussion which follows the paper comments that the methods described here are useful when good settlement and excess pore-pressure data are available on a project having a compressible stratum such as varved clay. However, the boring and test data and experience from various other projects indicate that it is probable that settlement of the loose strata above the varved clay at the location studied, may have influenced the rapid settlement results.

This article appeared in Transportation Research Record No. 616, Soil Mechanics: Rutting in Asphalt Pavements, Embankment on Varved Clays, and Foundations.

Long, RP Healy, KA (Connecticut University, Storrs); Keene, P *Transportation Research Record* No. 616, 1976, pp 74-77, 4 Fig., 2 Tab., 5 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

00 163054

**BRIDGE BEARINGS**

This is a state-of-the-art report on procedures for design, fabrication, construction, and maintenance of bridge bearings. Performance records for

currently used expansion devices are reviewed. The sliding device includes lubricants between surfaces, lead sheets between plates, self lubricated bronze plates, and polytetrafluoroethylene (TFE) sliding on stainless steel. Rolling devices, such as roller nests, larger rollers, single rollers, segmental rockers, and pinned rockers are examined. Linkage devices are used between girder where no movement is to be transmitted. Elastomeric bearing pads are quite successful, they have no moving parts to freeze, nothing to corrode, and have little or no maintenance requirements. Routine maintenance of bridge bearings should be directed towards keeping the bearings clean and free of water, salt, and debris. Recommendations include designing a bridge with a few movable bearings as possible; bearings should be designed to require a minimum of maintenance; provisions should be made so that the bridge may be jacked up and the bearings adjusted or replaced; material quality is important in elastomeric bearings; inspection of bridge bearings should be included as part of the regular bridge inspection program.

Sponsored by the American Association of State Highway and Transportation Officials in cooperation with the Federal Highway Administration.

*NCHRP Synthesis of Highway Practice* No. 41, 1977, 62 pp, 48 Fig., 8 Tab., 3 App.

ORDER FROM: TRB Publications Off

00 163228

**HANDBOOK FOR RAILROAD TRACK STABILIZATION USING LIME SLURRY PRESSURE INJECTION**

This handbook includes chapters dealing with the technology of line injection, surface and subsurface soil exploration and laboratory testing, environmental considerations and safety precautions. In addition, there are appendices which provides state-of-the-art specifications for lime slurry injection and laboratory soil testing procedures. A lime slurry section gives a complete description of the present state-of-the-art of Lime Slurry Pressure Injection (LSPI). This handbook hopefully will provide the railroad industry with existing information and guidance in the selection and use of the LSPI method of roadbed stabilization.

Prepared in cooperation with the Federal Railroad Administration, and the Transportation Systems Center and with the aid of the Railroad Industry.

Blacklock, JR Lawson, CH

Graduate Institute of Technology, Federal Railroad Administration  
Handbook FRA/ORD-77-30, June 1977, 92 pp

Contract DOT-OS-40107

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-272721/AS, DOTL NTIS

00 163243

**STABILIZING TRACK THROUGH STATION PLATFORMS, OTHER GROUND STRUCTURES**

To ensure track stability, the top 20 inches of ballast should be kept as dry as possible, keeping the groundwater table low and shedding as much surface water as possible. For these reasons, where no drainage ditch is possible at the foot of the subgrade shoulder, as at station platforms and level crossings, measures must be taken to compensate for interference in the drainage system.

Ahlf, RE *Railway Track and Structures* Vol. 73 No. 4, Apr. 1977, pp 20-23, 1 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

00 163287

**RAPID CONSTRUCTION OF HIGH EMBANKMENT ON SOFT SUBSURFACE**

The compressible clay layers were strengthened with sand compaction piles of 5 X 10 to the 4th power m in total length, and the main body of the embankment was protected with side fills about 10 m wide against base failure. The instrumentation on the site is shown from the data of which possible harmful displacement of the embankment under construction was prevented, some residual settlements after completion were estimated, and the basic data concerning the track maintenance after opening were obtained.

Watanabe, S *Railway Technical Research Inst Quarterly Reports* Vol. 17 No. 4, 1976, p 188

ACKNOWLEDGMENT: EI

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

DOTL JC

00 163396

#### CONCRETE BRIDGE-TUNNEL HAS NO DECK

Highway fill was placed over post-tensioned precast concrete arch sections placed over an operational railroad track. This method of construction proved cost effective and avoided any interference with railroad traffic. This design also permitted the engineer to carry the typical roadway section over the bridge thus avoiding the undesirable side effects of typical bridge decks.

deNapoli, P (Hayden, Harding and Buchanan Incorporated) *ASCE Civil Engineering* Vol. 47 No. 4, Apr. 1977, pp 75-77

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 163401

#### FIELD EXPERIMENTATION WITH CHEMICAL ALLEVIATION OF FROST DAMAGE

The paper reports on field tests utilizing several different chemical additives to reduce frost heaving in railroad subballast soils. The experience gained as to type of additive, method of application, and effectiveness is described. Since the railroad problem must employ a type of treatment which does not interrupt rail service during installation, only injection procedures or surface treatment followed by natural leaching leading to intrusion of the additive have been studied.

Proceedings of the Second Conference on Soil-Water Problems in Cold Regions held in Edmonton, Canada on September 1-2, 1976.

Sheeran, DE (McGill University, Canada); Dalton, CJ Yong, RN American Geophysics Union Proceeding 1976, pp 173-185

ACKNOWLEDGMENT: EI

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00 163408

#### SEGMENTAL LINER FOR SOFT GROUND TUNNELS

Concrete is presented as a low-cost material for use as a sole tunnel liner material in future mass transit tunnel projects. Existing mass transit tunnels throughout the world which have used concrete liners are presented. A systems summary is given which outlines numerous factors that must be considered for implementation of concrete as a sole tunnel liner material. Various concretes and liner sealant systems are presented as well as past and current research efforts directed toward greater use of concrete in future transit tunnel projects. Many aspects for consideration in a sealant system test verification program are also presented.

Tartaglione, LC (Lowell University) *ASCE Journal of the Construction Division* Vol. 103 No. 2, June 1977, pp 227-243, 21 Ref.

ACKNOWLEDGMENT: EI

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00 163718

#### THE NEW RAIL BRIDGE OVER THE SOUTH ELBE IN HAMBURG AS AN EXAMPLE OF A LATTICE GIRDER BRIDGE [Die neue Eisenbahnbrücke über die Suederelbe in Hamburg als Beispiel einer Fachwerkmittelträgerbrücke]

No Abstract. [German]

Stier, W *Stahlbau* Vol. 46 No. 1-3, 1977, 28 pp, 5 Tab., 35 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

00 163724

#### FLOOD AND ITS REMEDIES IN SEIKAN TUNNEL

A flood occurred in the work tunnel and water flow reached a rate of 14 cubic meters per minute at a point 16.89 km from the mouth of the tunnel in an area of sand tuff and silt rock. The author describes the remedial measures taken, i.e., pumping, basalt injections and detouring of the fracture zone.

Maeda, M *Permanent Way* Vol. 17 No. 65, Jan. 1977, pp 24-35, 1 Fig., 2 Tab., 9 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Japan Railway Civil Engineering Association, 1-18-7 Higashiueno, Taito-ku, Tokyo 110, Japan

DOTL JC

00 163725

#### TECHNICAL PROBLEMS OF RAILWAY ON THE HONSHU-SHIKOKU BRIDGE

A general description of rail and road links between the two islands, followed by a study of bridge spans and train make-up and wind velocity. Examined are types of bridges (girder bridges, arch and suspension bridges) with a level for a double-track line and a level for a six-lane roadway, along with vibrational stability of the bridge, track and catenary, and train operation across the bridge.

Okamura, H *Permanent Way* Vol. 17 No. 65, Jan. 1977, pp 1-23, 2 Fig., 8 Tab., 16 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Japan Railway Civil Engineering Association, Kyodo Bldg, 18-7 Hagashi-Uyeno 2-chome, Daito-ku, 1-18-7 Higashiueno, Taito-ku

DOTL JC

00 163746

#### BREAKING STRENGTH OF WELDED IRON SECTIONS TAKEN FROM BRIDGES BUILT IN THE 19TH CENTURY

[Festigkeitsverhalten von "Schweisseisen" aus Brueckenbauwerken des 19. Jahrhunderts]

No Abstract. [German]

Steinhardt, O *Eisenbahntechnische Rundschau* Vol. 26 No. 6, June 1977, pp 383-384, 2 Fig., 1 Phot., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

DOTL JC

00 163757

#### PRESTRESSED CONCRETE THROUGH-GIRDER BRIDGES AND HIGH STRENGTH CONCRETE BRIDGES FOR RAILWAYS

Long span bridges and special type ones on the Tokaido Shinkansen which was completed in 1964 were mostly built of steel. But the noise by high-speed trains running on bridges with no ballast in track exceeds 100db (a) near the structures, thereby creating a serious social problem. Thus new bridges to be constructed hereafter were decided to be built of concrete as far as possible. This paper discusses the use of prestressed & high-strength concrete in railway bridges, problems in design and also the mix proportion in high-strength concrete. /TRRL/

Proceedings of the Symposium on Prestressed Concrete.

Ishiguro, Y Miyasaka, Y

Concrete Institute of Australia Analytic 1976, 10 pp, 6 Fig., 2 Tab., 2 Phot.

ACKNOWLEDGMENT: TRRL (IRRD-227233), Australian Road Research Board

ORDER FROM: Concrete Institute of Australia, 147 Walker Street, North Sydney, New South Wales, Australia

00 163776

#### DOES YOUR EMBANKMENT DIRT HAVE A SOILS PROBLEM?

The problems associated with subsurface embankment soils and the role these soils play in the overall stability of the railroad embankment are discussed. Various remedial steps which may be implemented to solve unstable embankment conditions are described. Graphical data is given on dewatering embankments and on repairing and stabilizing slides.

Proceedings, 76th AREA Technical Conference, Chicago, Illinois, March 29-31, 1977.

Perdue, GW (Rone Engineers, Incorporated) *AREA Bulletin* Conf Paper Vol. 78 No. 663, June 1977, pp 556-572, Figs., 1 App.

ORDER FROM: ESL

DOTL JC

00 163780

**AN INTRODUCTION TO MOVEABLE-BRIDGE OPERATING MACHINERY INSPECTION PROCEDURES**

The operation inspection of the operating machinery for lift, swing and bascule bridges is described.

Presented at the Association's 81st Annual Convention, in Chicago, Illinois, September 13-15, 1976.

Cragg, PE (Earle Gear and Machine Company) *American Railway Bridge & Building Assoc, Proc Conf Paper* 1976, pp 86-93

ORDER FROM: American Railway Bridge & Building Association, 18154 Harwood Avenue, Homewood, Illinois, 60430

00 163801

**STATE OF EARTH STRUCTURES BETWEEN OKAYAMA AND HAKATA OF SAN-YO SHINKANSEN**

The soil engineering problems of the San-yo extension of the Shinkansen are discussed. From its opening, the earthworks on this line were systematically studied with settlement and stability carefully checked. While high-speed trains use the line, in-service settlement of the embankments proved to be small. Embankments which had been reinforced and stabilized with netting proved to be sufficiently compacted. Also described are the residual settlement of embankments on soft subsurface and the prevention of mudpumping in cuts.

Watanabe, S Ito, T Iwasaki, K *Railway Technical Research Inst Quarterly Reports* Vol. 18 No. 2, June 1977, pp 62-65, 6 Fig.

ACKNOWLEDGMENT: Japanese National Railways

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

DOTL JC

00 163802

**TEST RESULTS OF VARIOUS TYPES OF BALLAST-MAT AND CHARACTERISTICS OF A45 BALLAST MAT**

To give more elasticity to track structures on elevated structures or in tunnels, the ballast mat was developed and has been widely used by JNR. This report discusses the evolution of the mat, inspection and test of early types and the general characteristics seen necessary for such installations.

Sato, Y Usami, T *Railway Technical Research Inst Quarterly Reports* Vol. 18 No. 2, June 1977, pp 66-69, 3 Fig., 4 Ref.

ACKNOWLEDGMENT: Japanese National Railways

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

DOTL JC

00 163871

**ROCK PROPERTY TESTING FOR THE ASSESSMENT OF TUNNELLING MACHINE PERFORMANCE**

As part of a research project designed to develop criteria for the prediction of cutting performance of rock tunnelling equipment, tests were developed to identify rock properties which influence its cutting properties. Rock hardness indentation measuring tests were performed using an NCB cone indenter. A range of hardness measurements covering a number of common sedimentary rock types is shown against varying cutting and wear rates. Rebound hardness scleroscope measurements are similarly shown to be an important factor in the wear rate of drag-pick tools. A further aspect of the cutting properties of rock is the extent to which micro-bedding planes act as planes of weakness. A relative measure of the intensity of these planes can be obtained from wave velocity measurements. It is concluded that the tests show how rock properties can be applied to give an understanding of rock behaviour when being excavated. /TRRL/

McFeat-Smith, I *Tunnels and Tunnelling Analytic* Vol. 9 No. 2, Mar. 1977, pp 29-33, 5 Fig., 4 Tab., 6 Phot., 9 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 226933)

ORDER FROM: ESL

DOTL JC

00 163874

**CONSTRUCTION OF THE CUAJONE TUNNELS, PERU**

The construction is discussed of five rock tunnels in a 27 km long tunnel system in Peru. The cross-section of the tunnels inside the clearance line was 38 sq M to accommodate a single line of standard gauge railway track.

Although geological studies predicted competent granodiorite with almost no support or rockbolting requirements, the application of shotcrete over almost the total length of the tunnels was required to prevent loosening of the rock joints. Another corrective action found necessary was to change the tunnel section and the shape of the steel sets from an "inverted U" to a "horse-shoe" section with curved walls to resist ground pressure. The article also considers the choice of drilling equipment, and ground support systems with particular emphasis on shotcrete application and control. The effect of changing geological conditions on equipment used and contractors' claims are considered. /TRRL/

Peyfuss, KF (International Engineering, Incorporated) *Tunnels and Tunnelling Analytic* Vol. 9 No. 1, Jan. 1977, pp 31-35, 3 Fig., 2 Phot.

ACKNOWLEDGMENT: TRRL (IRRD 226931)

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DOTL JC

00 164145

**FUNCTIONAL PAVEMENT DESIGN FOR CONTAINER TERMINALS**

The selection of pavement type for the severe operating conditions of container handling areas is largely dictated by functional requirements. An evaluation is made of the intense point loading under stacked containers, the spillage of fuel and lubricants, the high tire contact pressures and the settlement potential of the foundation. Many pavement types, special and conventional, are examined to suit these requirements. Typical structural designs of the various pavement types are compared on a total cost basis, inclusive of maintenance costs, for the full range of container design loading. Fuel spillage and the point loading favour concrete, special surface dressings and tar for the surfacing in preference to asphalt. Large settlement situations favour precast concrete blocks and plates that can be re-levelled, or stage construction for bituminous pavements. The upper range of wheel loads favours concrete pavements and the lower range, flexible pavements. /TRRL/

Proceedings of the 8th Conference.

Paterson, WDO *Australian Road Research Board Conference Proc Analytic* Vol. 8 1976, pp 22-29, 4 Fig., 6 Tab., 6 Phot., 2 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 226255)

ORDER FROM: Australian Road Research Board, 500 Burwood Road, Vermont South, Victoria 3133, Australia

00 164173

**CONSTRUCTION OF THE SCHMIDTSTEDTER PRESTRESSED CONCRETE RAILWAY BRIDGE BY TRANSVERSE MOVEMENT**

This paper deals with the planning and construction of the Schmidtstedter bridge in Erfurt. This bridge, an underbridge with two openings of each 16M clear width and 4.75M clear height was to be erected with the least possible interference in the rail and shunting traffic of Erfurt central station. The supporting structure of the bridge, consisting of abutments, centre piers, superstructure, sealing, protective concrete layer and gravel bed, was constructed on a prefabrication site and then moved to the area of operation. The structure body with dimensions of 41.00 x 66.70 x 4.66 M weighed 14000t. Jacking was carried out on pte runners via a runway, with four synchronized hydraulic jacks. Foundations were brought in underneath the railroad bed by a mining system. Details are presented relating to the construction of the bridge, the site conditions, foundation installation, movement path, slides, structural body, jacking equipment and method, and the construction stages. /TRRL/

Symposium Proceedings.

Hoptner, M (Kammer der Technik)

Concrete Institute of Australia *Analytic* 1976, 10 pp, 1 Fig., 12 Phot., 4 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 227232)

ORDER FROM: Concrete Institute of Australia, 147 Walker Street, North Sydney, New South Wales, Australia

00 164244

**THE PRINCIPLES AND APPLICATIONS OF GROUTING**

Soils are injected with grouts, the choice of which depends on the nature of the medium to be injected (fissured rock or sand and gravels) and the results desired: imperviousness, consolidation, cavity filling, the jacking-up of buildings. Grouts may be unstable, stable, liquids or foams, and are characterized by their decantation, setting time, viscosity and rigidity. They

produce their effect either by impregnation or by "claquage". For the injection of unstable grouts, the final injection pressures must be limited to a high value, whilst for stable or liquid grouts it is the quantity injected that must be fixed in advance. The applications envisaged relate to: (1) the treatment of tunnels; (2) cavity filling, and (3) the jacking up of buildings. Over-strict specifications lead to disappointing results because of the heterogeneity of soils. Controls must relate to results and not to methods. /TRRL/

Cambeft, H *Quarterly Journal of Engineering Geology* Analytic Vol. 10 No. 2, 1977, pp 57-95, 30 Fig., 7 Phot., 10 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 227528)

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

00 164427

**EXCAVATION THROUGH 10-M OVERBURDEN: TUNNELING METHOD FOR NOGUCHI TUNNEL, SANYO SHINKANSEN LINE, JAPAN**

Details are given of the methods adopted for the construction of the tunnel for the railway line in Japan. Because of the unsatisfactory geological and topographical conditions, coupled with the need to avoid interruption of surface facilities—notably a major highway and a newly constructed drive-in—special techniques were adopted. A description of these methods is given: the bottom half was driven with two pilot tunnels and the upper half was consolidated with grouting in advance. After consolidation, a modified Lance-Bernold technique was employed.

Honma, T (Japanese National Railways); Saito, T Horinouchi, T Institution of Mining and Metallurgy Conf Paper 1976, pp 17-25

ACKNOWLEDGMENT: EI

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00 164442

**SPECIAL PROBLEMS FEATURE EPOXY REPAIRS ON SOO LINE BRIDGE**

Condition of the four concrete piers in the deck-truss bridge across the Flambeau River in Wisconsin included structural cracks which were apparent and voids left by timber piles that had rotted away, which were not apparent at the beginning. The problems solved by the contractor in rehabilitating this 70-year-old bridge are described.

*Railway Track and Structures* Vol. 73 No. 9, Sept. 1977, pp 50-53, 1 Fig., 6 Phot.

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00 164456

**TUNNEL CONSTRUCTION: STATE OF THE ART AND RESEARCH NEEDS**

Contents: Drilling and Blasting, J.D. Jacobs; Structural Supports, S. Taradash; Machine Tunneling, J.D. Jacobs; Materials Handling, P.E. Sperry; Tunneling in Bad Ground, N.A. Nadel; Shield-Driven Tunnels With or Without Compressed Air, R.S. Mayo; Long-Hole Drilling in Advance of Tunnel Penetration, V.L. Stevens; Contractual Relations in Tunnel Construction, L.D. Wilbur; Tunnel Safety, P.R. McOllough; Exotic Methods, W.C. Maurer; Sunken Tubes, R.B. Stevenson; Tunnel Guidance, G. Colson; Predrainage Methods for Tunnel Dewatering, R. G. Lenz; Pressure Grouting of Tunnels, E.D. Graf; Instrumentation in Tunnels, E.J. Cording; Cut-and-Cover Tunneling, H.R. Tiedemann; Use of Underground Space, E.L. Armstrong.

*Transportation Research Board Special Report* No. 171, 1976, 32 pp, Photos.

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**LARGE-SCALE EXCAVATIONS USING EXPLOSIVES, AND EARTHWORKS ON THE BAM (BAIKAL-AMOUR) TRUNK LINE [Vazny] etap burovzryvnyh i zemljanyh rabot na BAME]**  
No Abstract. [Russian]

Mihev, ND *Transportnoye Stroitel'stvo* No. 8, Aug. 1977, pp 3-6, 3 Phot., 1 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

00 165062

**METHOD OF REPAIRING WATER DRAINAGE PIPES UNDER RAILWAY EMBANKMENTS [Sooruzenie trub scitovym sposobom]**

An explanation of a method for repairing water drainage pipes under railway embankments without interrupting traffic, but with traffic slowing down to 40 km/h during the work. Description of this method and its advantages. [Russian]

Podcekaev, VA *Put'i Putevoye Khozyaistvo* No. 6/7, 1977, 5 pp, 1 Tab., 1 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

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

00 165066

**PNEUMATIC EQUIPMENT USED FOR REPAIRING TUNNEL LININGS [Silovoe pnevmaticheskoe torovoe ustrojstvo dlja vozvedeniya sbornyh obdelok tonnelej]**

No Abstract. [Russian]

Kurancev, MI *Transportnoye Stroitel'stvo* No. 7, July 1977, pp 14-15, 3 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

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

00 165074

**REPORT ON RESEARCH OF ACCIDENT CONTROL SYSTEM**

Detection of incipient natural calamities that can interfere with train operation is a goal of Japanese National Railways. This involves the detection of rain, snow, earthquakes and high winds. It also includes landslide detection, means for monitoring the integrity of bridges, and methods of transmitting and interpreting readings from all such systems.

*Permanent Way* Vol. 19 No. 1/2, No. 70-71, Aug. 1977, pp 1-36, Figs., Tabs.

ORDER FROM: Japan Railway Civil Engineering Association, 1-18-7 Higashiueno, Taito-ku, Tokyo 110, Japan

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00 165167

**CALCULATION, MODEL TESTING AND IN-SITU MEASUREMENTS OF TUNNELS IN SOFT SOIL [Berechnungen, Modellversuche und in-situ Messungen bei einem Bergmaennischen Vortrieb in Tonigem Untergrund]**

An assessment is made of the advantages offered by the new Austrian tunneling method which was first applied in construction of the Frankfurt subway tunnels. A comparison is made of results obtained by calculations for soil pressures and settlement rates and results obtained on models and in tunnels. [German]

Mueller-Salzburg, L Sauer, G Chambosse, G *Bauingenieur* Vol. 52 No. 1, Jan. 1977, pp 1-8, 11 Ref.

ACKNOWLEDGMENT: EI

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00 165174

**REGIRDING OF MAHANADI BRIDGE, SOUTH-EASTERN RAILWAY**

The author describes a novel method adopted for regirding the Mahanadi Bridge with 64 spans of 30.48 m each, near Cattack on the South-Eastern Railway. The conventional method of regirding using stagings or an enveloping girder would have been laborious, expensive and time consuming. The problems were overcome by careful planning, making the best use of the available space and resources, and taking some calculated risks. Detailed calculations were made to ensure safety of the structure and the cranes.

Mukherjee, PK (South-East Railway, India) *Institution of Eng (India) Journal, Civ Eng Div* Vol. 57 Jan. 1977, pp 193-204, 1 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 165233

**SPIRAL DRILL-AND-BLAST CONCEPT MAY SPEED UP TUNNELING ADVANCE RATE**

Principles and self-shielding nature of concept are explained, and prototype of spiral blast machine is described. Operational experience and test results of shield performance are evaluated.

Peterson, CR (Rapidex, Incorporated); Fisk, AT Brooks, RE Olson, JJ *Mining Engineering* Vol. 29 No. 6, June 1977, pp 29-32, 7 Ref.

ACKNOWLEDGMENT: EI

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00 165244

**RETAINING WALLS AND SUPERVISION SYSTEM FOR A 16.0 M DEEP EXCAVATION [Sicherungs-und Ueberwachungsmassnahmen in Einer 16 m Tiefen Baugrube]**

The walls of a 16 m deep excavation situated in an urban area with unfavorable soil conditions, are retained partially by anchored slurry trench walls and partially by anchored sheet piles which were placed into a trench. The trench behind the sheet pile walls was refilled with filter gravel. The anchor forces and deformation of the walls, the soil and the adjacent buildings were measured. Provisions are described, which were necessary to reduce the deformation. [German]

Sixth Eur Conf on Soil Mech and Found Engineering, Vienna, Austria, March 22-24, 1976.

Henauer, R Otta, L

International Society of Soil Mech and Found Eng Proceeding V1 1 Pap 1/2-8, 1976, pp 149-156

ACKNOWLEDGMENT: EI

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00 165245

**CUT AND COVER TRENCHES USING THE PANOSOL PROCESS [Tranchees couvertes en parois prefabriquees]**

A description of the different phases of construction of a covered trench using precast or cast in-situ diaphragm walls is presented. The resulting advantages of a precast wall over a cast in-situ wall during the execution and long term stages are discussed. Certain special problems related to the Panosol process are considered: the shape of the joints, their watertightness, and the placing of panels with cut-off levels well below the working platform. [French]

Sixth Eur Conf on Soil Mech and Found Eng, Vienna, Austria, March 22-24, 1976.

Namy, D Fenoux, GY

International Society of Soil Mech and Found Eng Proceeding V1 1 Pap 1/2-13, 1976, pp 183-188, 8 Ref.

ACKNOWLEDGMENT: EI

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00 165247

**SOIL STRUCTURE INTERACTION FOR A TUNNEL PARTLY FOUNDED ON SLURRY WALLS**

The properties of the soil layers involved in the problem are illustrated by the results of the static penetration test and by some results of laboratory tests. Also the geological age is given. The tunnel consists of two openings separated by a central support resting on a slab. The tunnel road is located 24 m underneath the original soil level, and the slurry walls are ended 8 m underneath the level of the road.

Sixth Eur Conf on Soil Mech and Found Eng, Vienna, Austria, March 22-24, 1976.

De Beer, E (Ghent University, Belgium); Wallays, M Bonvoisin, J Pirlet, G

International Society of Soil Mech and Found Eng Proceeding V1 1 Pap II/2, 1976, pp 281-290, 3 Ref.

ACKNOWLEDGMENT: EI

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00 165248

**STRUCTURAL ACCIDENTS AND THEIR CAUSES**

The paper presents reviews of the histories of four large metal bridges which failed either during construction or shortly after being brought into service.

From this material the authors conclude that the accidents had certain causes in common and that their histories hold lessons for present day engineering practice.

Sibly, PG (University College, London); Walker, AC *Institution of Civil Engineers, Proceedings* Vol. 62 May 1977, pp 191-208, 24 Ref.

ACKNOWLEDGMENT: EI

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DOTL JC

00 165697

**SOME DEVELOPMENTS IN SEGMENTAL TUNNEL LININGS DESIGNED IN THE UNITED KINGDOM**

Standard all-purpose concrete and cast-iron tunnel linings are discussed with the modifications necessary to suit them for specific purposes and particular types of ground conditions. As well as being designed for ease of fabrication and erection, tunnel lining ring segments also serve as external support for surrounding ground and internal support for roads, railways and services. Although attempts are made to optimise the use of surrounding ground and tunnel lining for mutual support, stresses incurred in handling and construction also must be considered in lining design. In suitable ground conditions the expanded lining has become accepted practice in which a large number of small segments are used to avoid the need for reinforcement. /TRRL/

Lyons, AC (Halcrow and Partners) *Underground Space Analytic* Vol. 1 No. 3, 1977, pp 173-83, 20 Fig., 10 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 228108)

ORDER FROM: Pergamon Press, Incorporated, Headington Hill Hall, Oxford OX3 0BW, England

00 165763

**INSURANCE FOR URBAN TRANSPORTATION CONSTRUCTION**

This report investigates insurance programs for urban transportation construction, including subways, and establishes guidelines by which an authority owner can choose the insurance program which best serves the needs dictated by the conditions and factors of the specific job. An optimal insurance program combines lowest costs, highest standards, and most effective administration. There are many possible tradeoffs, thus, the decision is complex. An analysis of insurance programs is presented; e.g., Coordinated and conventional, withholding policies, deductibles, liability, Completed Operations Coverage and other possible coverage combinations. Various forms of insurance are discussed, as are programs for general construction safety. Innovative variations of Coordinated Insurance Programs are explored. The results are decision-making guidelines for owners for managing risk in urban transportation construction.

Barrett, JE

Cresheim Company, Incorporated, (DOT-TSC-UMTA-77-23) Final Rpt. UMTA-MA-06-0025-7713, June 1977, 116 pp

Contract DOT-TSC-1159

ACKNOWLEDGMENT: UMTA

ORDER FROM: NTIS

PB 272-108/2ST, DOTL NTIS

00 166259

**RAPID EXCAVATION OF ROCK WITH SMALL CHARGES OF HIGH EXPLOSIVES**

The purpose of this investigation was to determine the feasibility of designing and testing the elements of a small-charge blasting system that will eliminate, or reduce to acceptable levels, most of the undesirable features of current underground drill and blast systems, that is, (1) air blast, (2) ground vibrations, (3) flying fragments, (4) overbreak and fracture of surrounding rock, and (5) the cyclic nature of drill and blast operations. The experimentation was conducted in tunnels in granite, and the results indicated that the basic technical concepts of the project were achieved. The next step is to design, construct, and test a prototype machine.

Clark, GB Rollins, RR

Missouri University, Rolla, Bureau of Mines Final Rpt. Bu-Mines-OFR-98-77, Nov. 1976, 121 pp

Contract H0252052

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-267295/4ST, DOTL NTIS

00 166262

**UNDERGROUND MINE TESTS OF REAM**

Ream is a unique method of rock breaking using high energy projectile impact. This report describes the most recent in a series of tests demonstrating mining applications for the ream method. In an underground limestone mine at Greer, W. Va., ream was used to drive a short tunnel and drill a large diameter borehole. Along with breakage data from these tests, the goal of the program was to examine environmental problems which might result from the use of cannons underground. A total of 103 shots was used to advance a 14-1/2-foot high by 10-foot-wide face a distance of 5-1/2 feet. It is estimated that the 9.3-pound-concrete projectiles launched at 5,000 feet per second will break an average of 0.78 tons of limestone or 67 percent of the 1.125 tons of granodiorite broken in previous tests. The 9-inch-diameter borehole was drilled horizontally by repeated axial impact for 7 feet, 2-1/2 inches by 21 shots giving an average of 4.12 inches per shot. Scaling this result to compressible impact energy yields an estimated 5.8 inches per shot for a 12.8-inch diameter hole compared with 8 inches per shot for a 16-inch-diameter hole in granodiorite.

Lundquist, R

Physics International Company, Bureau of Mines Final Rpt. Bu-Mines-OFR-91-77, Nov. 1976, 46 pp

Contract H0252011

ACKNOWLEDGMENT: NTIS

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PB-267340/8ST, DOTL NTIS

00 167063

**GUIDELINES FOR IMPROVED RAPID TRANSIT TUNNELING SAFETY AND ENVIRONMENTAL IMPACT. VOLUME I. SAFETY**

Two of the major objectives of the Urban Mass Transportation Administration Tunneling Program are to lower subway construction costs and reduce construction hazards and damage to the environment. This study consists of a two-volume report and aims to develop guidelines for improved rapid transit tunneling safety and environmental impact, that is, this effort is directed toward underground construction applicable to modern transit subway systems in urban areas. Examination of construction safety regulations, tunnel construction accident data, and features of underground construction leading to unsafe work show that a systems approach to safety is required. Ten guidelines were drafted to supplement current construction safety regulations (OSHA 29CFR1926). Recommendations for further study and evaluation were made to complete the systems safety approach.

See also Volume 2, PB-271 048.

Bledsoe, JD Chase, AP

Mathews (A.A.), Incorporated, Transportation Systems Center, Urban Mass Transportation Administration Final Rpt. DOT-TSC-UM-TA-77-2-I, Jan. 1977, 117 pp

Contract DOT-TSC-802-1

ACKNOWLEDGMENT: NTIS

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PB-271047/3ST, DOTL NTIS

00 167064

**GUIDELINES FOR IMPROVED RAPID TRANSIT TUNNELING SAFETY AND ENVIRONMENTAL IMPACT. VOLUME II. ENVIRONMENTAL IMPACT**

Two of the major objectives of the Urban Mass Transportation Administration Tunneling Program are to lower subway construction costs and reduce construction hazards and damage to the environment. This study consists of a two-volume report and aims to develop guidelines for improved rapid transit tunneling safety and environmental impact, that is, this effort is directed toward underground construction applicable to modern transit subway systems in urban areas. Investigation of subway construction jobs shows that at least two principles underlie treatment of environmental problems. First, planning and design should consider both short-term and permanent damage to environment, and second, a need for better communication of contractor's planned activities and public concerns so that disruptions can be minimized. Guidelines were developed along these principles and are grouped into the following categories: general, community relations, and specific environmental control techniques.

See also Volume 1, PB-271 047.

Lemer, AC Cheng, CY

Mathews (A.A.), Incorporated, Voorhees (Alan M) and Associates, Incorporated, Transportation Systems Center, Urban Mass Transportation Administration Final Rpt. DOT-TSC-UMTA-77-2-II, Jan. 1977, 138 pp

Contract DOT-TSC-802-2

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-271048/1ST, DOTL NTIS

00 167286

**MUCK UTILIZATION PLANNING. URBAN TRANSPORTATION TUNNELING: A HANDBOOK OF RATIONAL PRACTICES FOR PLANNERS AND DESIGNERS**

This handbook alerts transportation system planners and designers to planning methods which can lead to more efficient use of earth and rock materials produced during excavation for transportation tunnels and large excavations. The earth and rock materials produced from tunnel operations are commonly described by the miner's term, 'tunnel muck'. Tunnel muck has been traditionally treated as a waste product of the construction process. This handbook documents the results of a study of alternative uses for tunnel muck including use of muck as backfill materials within the transit project. The suggested procedures are consistent with construction methods and project management procedures.

Liu, TK Gifford, DG Dugan, JP

Haley and Aldrich, Incorporated, Transportation Systems Center, Urban Mass Transportation Administration Handbook DOT-TSC-UM-TA-77-22, May 1977, 64 pp

Contract DOT-TSC-836

ACKNOWLEDGMENT: NTIS, UMTA

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PB-272139/7ST

00 167309

**STAND-UP TIME OF TUNNELS IN SQUEEZING GROUND. PART II. A GENERAL CONSTITUTIVE RELATIONSHIP FOR SOFT SOILS**

The effect of tunnel size, advance rate, and depth of cover on the stand-up time of tunnels in squeezing ground was investigated through a series of 12 physical model tests. The stand-up time, defined as the time elapsed before instability develops, was found to be characterized by increasing deformations and deformation rates rather than a catastrophic collapse of the tunnel. Test results showed a 25% increase in stand-up time was realized by halving the size of the opening (from 5.0 m dia. to 2.4 m dia. when scaled to prototype dimensions) or by decreasing the advance rate by a factor of four (from 1.3 m/hr to 0.3 m/hr for the 5.0 m dia. tunnel). Depth of cover was described in terms of the ratio of confining pressure to material strength. Decreasing the depth (or increasing material strength) by 10% also increased stand-up time by 25%. In order to establish a predictive capability, a constitutive theory describing the time dependent behavior of soft clays has been developed. By generalizing existing empirical rules developed for fixed boundary conditions and then unifying these empirical rules with a tensor framework, a multi-axial constitutive equation describing the stress-strain-time behavior of normally loaded soft clays was formulated.

Kavazanjian, E Mitchell, JK

California University, Berkeley, Department of Transportation Final Rpt. DOT/TST-77/60, June 1977, 36 pp

Contract DOT-OS-50108

ACKNOWLEDGMENT: NTIS

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PB-272472/2ST

00 167321

**STAND-UP TIME OF TUNNELS IN SQUEEZING GROUND. PART I. A PHYSICAL MODEL STUDY**

The effect of tunnel size, advance rate, and depth of cover on the stand-up time of tunnels in squeezing ground was investigated through a series of 12 physical model tests. The stand-up time, defined as the time elapsed before instability develops, was found to be characterized by increasing deformations and deformation rates rather than a catastrophic collapse of the tunnel. Test results showed a 25% increase in stand-up time was realized by halving the size of the opening (from 5.0 m dia. to 2.4 m dia. when scaled to



prototype dimensions) or by decreasing the advance rate by a factor of four (from 1.3 m/hr to 0.3 m/hr for the 5.0 m dia. tunnel). Depth of cover was described in terms of the ratio of confining pressure to material strength. Decreasing the depth (or increasing material strength) by 10% also increased stand-up time by 25%. In order to establish a predictive capability, a constitutive theory describing the time dependent behavior of soft clays has been developed.

Myer, LR Brekke, TL Korbin, GE Kavazanjian, E Mitchell, JK  
California University, Berkeley, Department of Transportation Final Rpt.  
DOT-TST-77/59, June 1977, 208 pp

Contract DOT-OS-50108

ACKNOWLEDGMENT: NTIS  
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PB-272516/6ST

00 167371

**DEVELOPMENT OF DESIGN PROCEDURES FOR STABILIZED SOIL SUPPORT SYSTEMS FOR SOFT GROUND TUNNELING. VOLUME I. A REPORT ON THE PRACTICE OF CHEMICAL STABILIZATION AROUND SOFT GROUND TUNNELS IN ENGLAND, FRANCE AND GERMANY**

This is the first volume of a series of three reports which will describe the results of a research project on the development of a design procedure for soil stabilization systems for support of the ground around shallow tunnels. This volume presents documentation on existing stabilization technology as practiced in England, France and Germany. The specific purposes of the visit were: observe large scale tunnel grouting operations, define differences in grouting operations in various countries, document the reasons why chemical grouting is used, develop general guidelines about costs of grouting operations, examine types of specifications and quality control measures used, and discuss ongoing research of behavior of chemically stabilized soils. Further, research into chemical grouting is underway at several institutes in Europe but not in the United States, and it was felt that valuable experience could be gained by discussions with European researchers.

Clough, GW

Polytechnic Institute of New York, Department of Transportation Final Rpt. DOT/OS-77/58, June 1977, 115 pp

Contract DOT-OS-50123

ACKNOWLEDGMENT: NTIS  
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PB-272771/7ST

00 167384

**RECOMMENDED PROCEDURES FOR SETTLEMENT OF UNDERGROUND CONSTRUCTION DISPUTES**

The Subcommittee on Contracting Practices appointed a Task Group on Arbitration to review methods other than court litigation currently used for settlement of disputes in the U.S., particularly in the construction industry, and to recommend specific procedures for the resolution of disputes and an organizational arrangement under which such procedures could be administered effectively. This report presents the procedures developed by the Task Group on Arbitration.

Sponsored in part by Urban Mass Transportation Administration, Washington, D.C., Federal Highway Administration, Washington, D.C., Department of Transportation, Washington, D.C. See also report dated Nov 74, PB-236 973.

US National Committees/Tunnelling Technology, National Science Foundation, Urban Mass Transportation Administration, Federal Highway Administration, Department of Transportation Final Rpt. NVC/AE/TT-77/1, Nov. 1977, 31 pp

Contract NSF-C310-277-000

ACKNOWLEDGMENT: NTIS  
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PB-272964/8ST

00 167510

**BUILDING A TRUNK ROUTE FOR HEAVY FREIGHT AND PASSENGERS**

Polish State Railways is constructing a new trunk line, a 223-km double-track artery linking the nation's major coalfield and industrial area with Warsaw and eventually with the Baltic ports. It has been planned to

accommodate heavy freight movements as well as passenger trains running at 200 km/h. Standard concrete components were designed in various dimensions to fit almost all the structures required--culverts and bridges. The line is being electrified.

Basiewicz, T (Warsaw Railway Centre) *Railway Gazette International* Vol. 133 No. 10, Oct. 1977, pp 373-375, Photos.

ACKNOWLEDGMENT: Railway Gazette International  
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DOTL JC

00 167511

**NZR'S KAIMAI TUNNEL NEARS COMPLETION ON MAJOR CUT-OFF**

A new cutoff on the North Island of New Zealand involves a tunnel 8.85 km long constructed through a mountain ridge generally volcanic in origin. The Kaimai tunnel has been constructed through difficult geological conditions by a combination of bored and manual methods. Substantial water inflow made it necessary to provide a large central invert drain which precluded use of conventional ballasted track. The tunnel is being equipped with the first paved concrete trackbed in New Zealand.

Berry, JS (New Zealand Railways) *Railway Gazette International* Vol. 133 No. 10, Oct. 1977, p 384, 2 Fig., Photos.

ACKNOWLEDGMENT: Railway Gazette International  
ORDER FROM: ESL

DOTL JC

00 167523

**THE TUNNELLING SYSTEM FOR THE BRITISH SECTION OF THE CHANNEL TUNNEL. PHASE II WORKS**

A 260 M length of the British end of the service tunnel for the channel tunnel was driven over a period of two and a half months early in 1975. The operation of the tunnelling machine was observed as it advanced through the lower chalk and is described in terms of its principal operations, namely cutting, steering, spoil removal and lining. In addition to the normal operation of tunnelling, exploratory probe holes were drilled ahead of the tunnel face. The aim of this study was to assess the suitability of the tunnelling system for the specific task of tunnelling in chalk and to establish which of its operations most constrained the rate of tunnelling. Detailed analyses are given of the cutting performance and the simultaneous construction of the segmented tunnel lining and results are presented graphically to illustrate the variations in progress rates achieved. The quality of the chalk was measured at intervals using the technique of face-indexing and samples from the face and spoil were analyzed. These tests indicated the near-homogeneous nature of the chalk marl throughout the drive. The tunnelling machine is shown to be capable of excavating and lining at a rate of 2.4 m/h on average. Probing ahead, even with optimum drilling rates, represents 16 percent of the total construction time effectively reducing the tunnelling rate to 2.0 m/h on average. The study identified the critical operations and indicated that quite simple modifications could well increase overall tunnelling rates to about 3 m/h; and even further improvement appears possible.

Morgan, JM Barratt, DA Tilley, DM

Transport and Road Research Laboratory, (0305-1293) Monograph TRRL Report 734, 1977, 76 pp, 22 Fig., 8 Tab., 21 Phot., 13 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-228155)  
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00 167529

**KAIMAI TUNNEL, NEW ZEALAND--A CASE HISTORY**

The 9-km single-track rail tunnel is being driven through difficult and variable volcanic formations, and a description is given of the tunneling conditions, the equipment and techniques used to overcome changing circumstances. The west portal is situated in saturated alluvial deposits and a short length of tunnel through this formation was supported with multiple-stage timbering. The tunnel then passes through 5 km of andesite, which ranges from hard jointed rock to soft weathered material and associated tuffs and breccias. The formation is extensively faulted and contains zones of swelling montmorillonite clays; for much of its length temperatures of 35-40 degree C are encountered. Excavation is by full-face methods with the use of explosives, where possible, with variations of heading and bench techniques in bad ground. The high underground temperatures have been rendered tolerable by the installation of refrigeration

equipment with a total capacity of 200 tonnes. The remainder of the tunnel passes through massive pyroclastic flows, material ranging from moderately hard blocky rock to weak tuffs and breccias. This section of the tunnel is being driven successfully by use of a 6.4-m diameter Jarva boring machine.

Tunnelling, Proceedings of an Intl Symp, London, England, March 1-5, 1976. Also available from Institution of Mining and Metallurgy.

Bennion, JD (Ministry of Works and Development, New Zealand)  
Institution of Mining and Metallurgy Proceeding 1976, pp 371-380

ACKNOWLEDGMENT: EI  
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#### 00 167530

##### IN-SITU GROUND AND LINING STUDIES FOR THE CHANNEL TUNNEL PROJECT

The Channel tunnel project would have involved more than 150 km of lined tunnels, intended to carry high-speed trains 50 km between portals. The trial tunnels planned in phase II to demonstrate the viability of the project offered an opportunity to compare the lining design assumptions with the actual behaviour of the ground and to measure the response of linings erected in the identical circumstances expected for the final works. The objectives and development of these in-situ studies are described and placed in the context of other studies carried out in the United Kingdom and in France. A length of instrumented concrete linings was installed in conjunction with the ground instrumentation. Vibrating wire strain gauges, hoop load cells and photoelastic optical stress plugs were incorporated and provision was also made for the accurate measurement of deformation of the rings. Further sets of instrumented linings, concrete and cast iron, are described.

Tunnelling, Proceedings of an Intl Symp, London, England, March 1-5, 1976. Also available from the Institution of Mining and Metallurgy.

Curtis, DJ (Mott, Hay and Anderson); Lake, LM Lawton,  
WT Crook, DE  
Institution of Mining and Metallurgy Proceeding 1976, pp 231-242

ACKNOWLEDGMENT: EI  
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#### 00 167531

##### MILAN METRO: EXPERIENCE IN TUNNEL CONSTRUCTION ON THE PORTA GARIBALDI-PIAZZA CADORNA SECTION

A description is given of work on the sections, the most difficult yet encountered. The problems associated with this section, both surface and underground, are noted, and methods of construction are presented, details being given of the tunnels, both single and double-tracked, soil treatment and excavation procedures.

Tunnelling, Proceedings of an Intl Symp, London, England, March 1-5, 1976. Also available from the Institution of Mining and Metallurgy.

Botti, E (Metropolitan Milanese)  
Institution of Mining and Metallurgy Proceeding 1976, pp 153-164

ACKNOWLEDGMENT: EI  
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#### 00 167532

##### TUNNELLING '76

The Proceedings contains 34 papers presented at the Symposium, as well as discussions and authors' replies. Tunnels, tunneling case histories and tunneling machines of all types are covered in the papers, including highway tunnels, railway tunnels, water tunnels, submarine tunnels, mining tunnels, controlled blasting techniques, bentonite shields, ground support systems, linings, instrumentation, percussive rock drills, cutting performance factors, soft ground and hard rock tunneling and machines, structural design and analysis. Individual papers are indexed separately.

Tunnelling, Proceedings of an Intl Symp, London, England, March 1-5, 1976. Also available from the Institution of Mining and Metallurgy.

Jones, MJ  
Institution of Mining and Metallurgy Proceeding 1976, 455 pp

ACKNOWLEDGMENT: EI  
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#### 00 167534

##### CALCULATION OF TUNNEL CASING IN FORM OF MATRIX TAKING INTO ACCOUNT THE FORCES OF FRICTION, ELASTIC RESISTANCE OF ROCK AND THE PLACE OF THEIR APPLICATION [Uchet sil treniya, uprugikh soprotivlenii porody i mesto ikh prilozhenii pri raschete tunnel'nykh obdelok v matrichnoi forme]

A new method is proposed for calculating the annular tunnel casing, by taking into account both normal and tangential stresses of passive earth pressure in contact with rocks. In the nodes of the diagram two supports are placed in the direction conditioned by the normal and tangent to the perimeter of cross-section of the casing. The eccentricity of the application of tangent forces is taken into consideration. [Russian]

Published in French and English as well as Russian.

Daushvili, A (Gruz SSR Polytechnic Institute) *Studia Geotechnica* Vol. 7 No. 1-2, 1976, pp 9-16

ACKNOWLEDGMENT: EI  
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#### 00 167535

##### SNOW PRESSURE ON RIGID OBSTACLES

A continuum mechanical formulation of snow pressure is given. The snow pressure against retaining structures on slopes is considered in two separate parts: (1) the static component due to the regression of transverse expansion as discussed by Haefeli, and (2) the dynamic component due to the interruption of the creep (internal deformation) and glide (slip of the entire snow cover over the ground). Snow-pressure calculations made using the nonlinear viscous constitutive equations given by D.M. McClung are given for the plane strain-rate problem of a rigid barrier on a snow-covered slope. These calculations are compared with the previous formulation of snow pressure given by Haefeli for the expected range of boundary conditions for the structure and for the snow-earth interface. The results show that the original formulation by Haefeli gives a dynamic component of similar magnitude to the present calculations. Substantial differences are apparent when the up-slope distances for interruption of the creep and glide processes are compared.

McClung, D (Washington University, Seattle) *Norwegian Geotechnical Institute Publication* No. 116, 1977, 9 pp, 8 Ref.

ACKNOWLEDGMENT: EI  
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#### 00 167548

##### LOCAL SCOUR AROUND BRIDGE PIER IN TIDAL CURRENT

A strong tidal current whose direction reverses periodically causes a complex local scour around a bridge pier and this scour has a bad influence on the stability of the bridge. This local scour is caused by an unbalance between the input and output sediment transport rates around the pier. In this paper some basic features of a local scour around a rectangular pier in a tidal current are investigated experimentally and, using these data, further analyses on the similarity between a model and its prototype are made.

Nakagawa, H (Kyoto University, Japan); Suzuki, K *Coastal Engineering of Japan* Vol. 19 Dec. 1976, 4 Ref.

ACKNOWLEDGMENT: EI  
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#### 00 167549

##### SUBWAY TUNNELS IN AREAS OF MINING SUBSIDENCE IN THE RUHR DISTRICT, GERMANY

Because the city of Gelsenkirchen is undergoing subsidence movements due to coal mining, special problems arise in the design and erection of the tunnel for the underground system of the municipal railway. The principal results of the design rules derived from extensive preliminary studies are discussed. The subsidence movements are causing compression and straining of the ground in which the tunnel is embedded. These actions of the soil have to be translated into idealized design displacements for engineering purposes. If the tunnel structure follows these deformations without restraints, no stresses (or, at least, only minor stresses) will occur. The conditions to which the tunnel structure should comply are cited. The design principles proposed are those of a tunnel lining that is almost completely flexible in the direction of the tunnel axis and stiff transversely to the axis. The theory of plasticity is applied to calculate the strains and stresses due to subsidence movements. Thus, the material chosen for the tunnel lining should provide sufficient

capacity to yield without coming close to rupture. General rules for the design principle are given for tunnels constructed either by cut-and-cover or by covered driving.

Tunnelling, Proceedings of an Intl Symp, London, England, March 1-5, 1976. Also available from the Institution of Mining and Metallurgy.

Duddeck, H (Technical University of Braunschweig, West Germany); Hollmann, F Kotulla, B Meissner, H Westhaus, KH Zerna, W Ahrens, H  
Institution of Mining and Metallurgy 1976, pp 381-390

ACKNOWLEDGMENT: EI  
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00 167603

#### DESIGN OF ELEVATED GUIDEWAY STRUCTURES FOR LIGHT RAIL TRANSIT. ABRIDGMENT

This paper outlines a rationale for designing an elevated guideway for urban rail transit, and applies this to a design of a double-track guideway for a proposed light rail transit (LRT) line. Three factors that affect the rationale for designing elevated guideway structures for LRT include performance requirements that specify guideway function; constraints that limit the choices available to the designer; and, design considerations that tell the designer how to choose among options, all of which satisfy the performance requirements and constraints. A design study is included which develops a suitable guideway configuration and examines in some detail a typical four-span structure. The following design aspects are discussed: Vehicle specifications; guideway cross sections; structural design; construction options; and, costs. The authors conclude that the rationale presented for the design of elevated guideway structures for LRT is neither a specification nor a code, but should form the basis for either. It identifies performance requirements that must be met for the structure, constraints that limit the designer's range of choice in meeting the performance requirements, and design considerations that provide the basis for making design choices.

From TRB Record 627, Rail Transit.

Billing, JR Grouni, HN (Ontario Ministry of Transportation & Communic, Can); Vuchic, VR (Pennsylvania University, Philadelphia)  
*Transportation Research Record* No. 627, 1977, pp 17-21, 3 Fig., 1 Ref.

ORDER FROM: TRB Publications Off

00 167839

#### SLOPE STABILITY OF CERTAIN SELECTED COLLUVIAL SOILS

The objective of this study is to characterize natural clayey colluvial soils that occur in eastern Oklahoma. Three study sites were selected in areas of known landslides. Piezometers and permeability bore holes were placed in the soils in undisturbed areas adjacent to landslides. Undisturbed samples were taken for laboratory analysis. Rainfall at the sites were monitored continuously. Horizontal drains were installed to determine flow rates of subsurface water within the soils. A stability assessment of the soils is presented to demonstrate the degree of landslide hazard in these areas.  
/Author/

Sponsored by and performed in cooperation with Federal Highway Administration.

Hayes, CJ  
Oklahoma Department of Transportation, (71-05-1 Item No. 129) Final Rpt. FHWA-OK-77-6, June 1977, 70 pp, 11 Fig., 29 Tab., 47 Ref., 2 App.

Contract HP&R

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00 167847

#### HYDRAULIC TRANSPORTATION AND SOLIDS SEPARATION OF EXCAVATED MATERIALS IN TUNNELS

Hydraulic transportation of tunnel muck can be safe and economical; however, it is not in wide use except in Twin Cities area of Minnesota. There, it was developed along with hydraulic cutting for tunneling in the weak St. Peter sandstone. This combination has produced some of the lowest cost urban civil works tunnels in the United States. Most of the system used in the St. Peter sandstone could be used in soils and various soft rocks of other areas. It is the objective of this research project to increase the use of hydraulic transportation for tunnel muck by documenting the system which is now in use and by developing solids-water separation methods which will make the system compatible with the urban environment. Systems for

solids-water separation have been designed based on tests at the laboratory scale. Three basic systems are proposed: discharge into public waters, disposal into sanitary sewers or re-use in the tunneling operation. These systems would add about thirty dollars per lineal foot of tunnel (8 ft ID) for a total cost of about \$630. The system for re-use of the water will be tested in the field at full scale. /Author/

Sponsored by DOT, Office of the Secretary. See also report dated Jul 75, PB-254 096.

Miller, SM Nelson, CR Christensen, GL Yardley, DH  
Minnesota University, Minneapolis, Department of Transportation Final Rpt. DOT-TST-77-75, Jan. 1977, 199 pp, Figs., Tabs., Refs., 6 App.

Contract DOT-OS-40087

ACKNOWLEDGMENT: NTIS  
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PB-273274/1ST, DOTL NTIS

00 167963

#### AERIAL PHOTOGRAMMETRY IN USE AT THE DB [Die Luftbildmessung bei der Deutschen Bundesbahn] No Abstract. [German]

Koethe, K *Eisenbahntechnische Rundschau* Vol. 26 No. 7/8, July 1977, pp 473-483, 2 Fig., 8 Phot., 5 Ref.

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

DOTL JC

00 167965

#### NEW STITCHES SEW UP EROSION CONTROL

The paper describes how man-made fabrics are finding new uses in drainage ditches, on roadway slopes and in waterway channels to prevent erosion.

*American City and County* Vol. 92 No. 5, May 1977, pp 73-74

ACKNOWLEDGMENT: EI  
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00 167968

#### HOW POST-TENSIONING STABILIZES THE PIERS OF AN ANCIENT BRIDGE

The paper reports how a post-tensioning system has been used successfully to increase the stability of two piers of the 74-year-old Alexandra Bridge spanning the Ottawa River opposite the Parliament Buildings. Due to the porous concrete of piers 2 and 3 below water level a casing was needed to prevent the sides of the anchor bolts' holes from collapsing during drilling.

Hancock, N *Engineering and Contract Record* Vol. 90 No. 2, Feb. 1977, pp 48-49

ACKNOWLEDGMENT: EI  
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00 167969

#### GROUND-LINING PRESSURE DISTRIBUTION AND LINING DISTORTION

This article describes the design, construction, and calibration of a hybrid electro-hydraulic type of earth pressure cell and the subsequent use of these cells for the measurement of radial ground pressures acting on concrete segmental tunnel linings at two locations in mixed clayey ground in northeast England. Also described is an accompanying program of lining distortion measurement. The tunnels studied were 3.20 m diam at depths of 11.77 m and 12.39 m to the crown. Terminal ground-lining interaction pressures were found to be almost uniformly distributed about the tunnel cross-section, these recorded pressures being one-half the theoretical maximum overburden pressure. These ultimate pressures were achieved after a period of only 7-8 days following lining erection and grouting-up. Lining distortion measurements support these observations.

Attewell, PB El-Naga, NM *Ground Engineering* Vol. 10 No. 3, Apr. 1977, pp 28-35, Refs.

ACKNOWLEDGMENT: EI  
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00 167970

**BASICS OF CHEMICAL VEGETATION CONTROL**

Comprehensive review of types of herbicides and their applications is presented. Some fundamentals on growth, and equipment and chemicals useful in controlling of weed are discussed.

*Public Works* Vol. 108 No. 4, Apr. 1977, pp 92-93

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

00 167973

**BIBLIOGRAPHY AND DATA ON CABLE-STAYED BRIDGES**

In recent years, American bridge engineers have been increasingly interested in the design and construction of the cable stayed bridge. Undoubtedly, this type of bridge will have a significant impact on future bridge construction. Recognizing the fact that many engineers are not familiar with its design and construction, a comprehensive reference list of literature and engineering data on the cable stayed bridge has been compiled. The bibliography has been classified into eight categories: (1)Development, (2)Description, (3)Theory, (4)Analysis and Design, (5)Stability, (6)Cables, (7)Construction, and (8)Miscellaneous. The engineering data illustrated schematically the bridge layouts and tower configuration of more than 60 bridges of this type throughout the world.

Yiu, CS (Pavlo Engineering Company) *ASCE Journal of the Structural Division* Vol. 103 No. 10, Oct, 1977, pp 1971-04

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 167974

**UNIQUE DRAINAGE SOLVES ICING IN RAILWAY TUNNEL**

Solution to a severe icing problem in a tunnel section during relocation of 13 km of rail line necessitated by the Mica dam project in British Columbia is described. The method used to drain away seepage water in the tunnel resulted in the clearing of the blocked line, cut costs and saved valuable time in the relocation operation.

Kennedy, J *Engineering and Contract Record* Vol. 90 No. 7, July 1977, pp 46-47

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 167975

**STAGING SPAN REPLACEMENT FOR OLD BRIDGE SAVES \$5 MILLION**

The paper reports how, instead of building a new bridge to carry heavier coal trains across the Missouri River near Rulo, Neb., the prefabricated steel spans were slid onto new and modified piers that supported an existing 90-year-old bridge. The rehabilitated structure will be 1,863-ft-long with eight plate girder side spans and two through truss spans in the center. It will be 186 ft shorter than the existing 2,049-ft bridge because the east embankment will be extended.

*Engineering News-Record* Vol. 198 No. 25, June 1977, p 58

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 167979

**STEEL RAILROAD VIADUCT CURVED IN PLANE [Stalowy wiadukt kolejowy zakrzywiony w planie]**

The structure and assemblage of steel viaduct curved in plane is described. Continuous, eight span beam with different spans is accepted as a statical scheme of the bridge. Total length of the viaduct is 160 m. Two girders with ribbed steel decking, form the cross section. [Polish]

Czudek, H (Politech Warszawska, Poland); Pietraszek, T Zobel, H *Inżynieria i Budownictwo* Vol. 34 No. 4, Apr. 1977, pp 121-124, 2 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 168005

**EVALUATION OF FUNCTION OF PASSIVE LOAD FOR TUNNEL LINING**

A method to analyze the concrete lining of tunnels taking passive loads into consideration is proposed. The basic assumptions used are given as follows:

the structural system of the tunnel lining is an arch under the plain strain condition supported elastically at the ends and passive loads acting on the lining are induced in proportion to displacement of the lining toward the surrounding rock over void between the lining and the rock. Using a mathematical model, many numerical results are obtained for various loading patterns, heights of the rock mass, thickness of the lining and the voids.

Chou, T (Shinshu University, Japan) *Soils and Foundation* Vol. 17 No. 1, Mar. 1977, pp 13-21, 2 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 168006

**DRIVE SHIELDS IN TUNNELING [Der Vortriebsschild im Tunnelbau]**

Application of shields in soft soils to protect personnel against bursts and flooding is discussed. Calculations and measurements of two types of shields are explained and illustrated. Transportation from plant to site and performance characteristics are described. [German]

Anheuser, L *Stahlbau* Vol. 46 No. 5, May 1977, pp 133-137

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 168093

**MELBOURNE'S TROUBLED TUNNELLER GRINDS TO A HALT**

The problems encountered in tunnelling Melbourne's underground railway are described. Drill and blast methods were prohibited to minimize ground disturbance under the tall buildings and steel ring beams had to be inserted at 1 m intervals just behind the face. Also shotcreting of the tunnel sides within 1 m of the face was required within one hour of exposure. The tunnelling machine covered nearly 40 m/week until it hit hard rock when numerous problems arose culminating in the failure of the main bearing. This failure meant that the machine had to be completely rebuilt with a new 12 spoked head and the triple-disc cutters replaced by more efficient single discs. Front support is provided by a sliding shoe, and steering jacks on the shoe help to prevent the head dropping. Bearing design was changed, and the cutter head speed reduced from 5.2 rev/min to 3 rev/min. Gearboxes and variable speed motors have been replaced with high-torque low-speed motors. Mucking out is now by rail instead of conveyor. The new hard-rock machine can work at up to 73 m/week.

Ferguson, H *New Civil Engineer Analytic* No. 256, Aug. 1977, p 16, 1 Phot.

ACKNOWLEDGMENT: TRRL (IRRD-229040)

ORDER FROM: Institution of Civil Engineers, 91-93 Farringdon Road, London EC1M 3LE, England

00 168096

**DEFORMATION AND STRESS MEASUREMENTS ON A SLURRY TRENCH WALL OF THE VIENNESE TUNNEL STRUCTURES [Deformations-und Spannungsmessungen an Schlitzwänden von Wiener Tunnelbauwerken]**

This work is concerned with the determination of the actual earth pressures which occur during the building of a stiff slurry trench wall. At two building sites, stresses and deformations of retaining walls had their stiffnesses measured and evaluated. First, a description is presented of the selected methods of measurement, measuring instruments and the measurements themselves, as well as an illustration of the foundation conditions, the soil mechanics investigations and their evaluation. The following are evaluated: the stress measurements on the steel stiffeners of the walls, optical deformation measurements of the slurry trench walls, stress measurements of the reinforcement and the measurements of the inclination of the external retaining walls. These are then expressed numerically by means of compensating polynomials and are numerically differentiated. Thus the cross sectional forces and the loadings of the system studied are obtained. The result of this work has been a summary of the knowledge obtained of the magnitude and distribution of earth pressures acting on slurry trench walls and the relationship with the foundation soil coefficients. [German]

Rott, W

Technical University of Graz, Austria Monograph Mar. 1976, 96 pp, Figs., Tabs., Photos., Refs.

ACKNOWLEDGMENT: TRRL (IRRD-304686), Federal Institute of Road Research, West Germany  
ORDER FROM: Technical University of Graz, Austria, Rechbauerstrasse 12, Graz, Austria

00 168113

## ALUMINIUM TUNNEL LININGS [Aluminium-Innenverkleidung bei Tunnelbauten]

A description of Alucobond lining, a composite material made of aluminium and polyethylene sheeting used in tunnels on main highway No. 32. [German]

*Tiefbau* Vol. 19 No. 5, 1977, pp 392-405, 5 Phot.

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

00 168648

## TUNNEL CONSTRUCTION (CITATIONS FROM THE NTIS DATA BASE)

Unique tunneling methods, cost studies, tunnel support innovations, tunneling machines, and soil and rock properties encountered are investigated in these Government-sponsored research reports. Vehicular, water, sewage, and mine tunnels are reviewed. Finite element analysis is used extensively for investigation of soil and rock mechanics. (This updated bibliography contains 327 abstracts, 82 of which are new entries to the previous edition.)

Supersedes NTIS/PS-76/0647, NTIS/PS-75/550, NTIS/PS-74/096 and COM-73-11390. See also NTIS/PS-76/0648, NTIS/PS-76/0649, NTIS/PS-76/0650 and NTIS/PS-77/0788.

Habercom, GE, Jr  
National Technical Information Service Sept. 1977, 332 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-77/0787/OST

00 168665

## EARTHQUAKE ENGINEERING: BUILDINGS, BRIDGES, DAMS, AND RELATED STRUCTURES. VOLUME 2. 1974-SEPTEMBER 1977 (A BIBLIOGRAPHY WITH ABSTRACTS) [Rept. for 1974-Sep 77]

Seismic phenomena relative to buildings, bridges, dams, and other structures are investigated. Damage assessment is made and design inadequacies are revealed. Suggestions for structural improvements for dynamic response are presented. Abstracts on site selection and earthquake-proofing for atomic power plants are included. (This updated bibliography contains 365 abstracts, 125 of which are new entries to the previous edition.)

Supersedes NTIS/PS-76/0772, NTIS/PS-75/633, and COM-74-11141. See also Volume 1, 1964-Dec 73, NTIS/PS-75/632.

Habercom, GE, Jr  
National Technical Information Service Oct. 1977, 370 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-77/0862/1ST

00 168818

## MECHANICAL TUNNEL BORING PREDICTION AND MACHINE DESIGN

A comprehensive theoretical analysis of the interaction of a disc roller cutter with hard, brittle rocks was undertaken. Predictor equations were modified to consider the effect of cutter wear. Testing was undertaken both with sharp and artificially dulled disc cutters. Results indicated that penetration, spacing, and edge angle are highly significant variables affecting cutter performance. To simulate, the multiple cutter patterns found in the field were undertaken to experimentally study the effects of different modes of cutting. Theoretical force values calculated by using the developed predictor equations were found to agree with laboratory observations. The scaling of the small and large-scale cutting results appeared to be possible. The field boring data from an experimental tunnel boring site was used to check the validity of the predictor equations for field boreability predictions. A computer program designed to predict field boring performance was written.

Ozdemir, L Miller, R Wang, FD  
Colorado School of Mines, National Science Foundation Ann Rpt. NSF-RA-770199, 1977, 332 pp

Grant NSF-APR73-07776-A03

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-271978/9ST

00 168888

## DEVELOPMENT OF DESIGN PROCEDURES FOR STABILIZED SOIL SUPPORT SYSTEMS FOR SOFT GROUND TUNNELING. VOLUME II. PRELIMINARY RESULTS

This report describes the experimental and analytical work carried out at Stanford University during the first year of a research effort devoted to the development of a rational design methodology for grouted tunnels. The long range objective of this work is to provide a designer with a simple tool which can be used to select the size, strength and stiffness of a grouted soil zone around a tunnel which will economically and effectively limit surface deformations caused by tunneling. The first year effort has been devoted to developing laboratory procedures to study load-deformation response of chemically stabilized soils, performing laboratory tests of typical stabilized soils and evaluating the observed behavior, performing load tests on soil samples grouted under field conditions, developing a finite element code which can reasonably model the effects of tunnel construction in grouted soil zones, and documenting existing field case histories and applying the new finite element code to study some of the actual tunneling cases.

See also PB-272 771. Sponsored by DOT, Office of the Secretary

Clough, GW Tan, DY Kuck, WM Koenzen, P  
Stanford University, Department of Transportation Final Rpt. DOT/TST-77/74, Aug. 1977, 176 pp, 59 Fig., 21 Tab., 22 Ref.

Contract DOT-OS-50123

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-273064/6ST, DOTL NTIS

00 168930

## PREFABRICATED STRUCTURAL MEMBERS FOR CUT-AND-COVER TUNNELS. VOLUME 1. DESIGN CONCEPTS

This report explores the possibility of improving cut-and-cover tunnel construction in urban areas by the use of prefabricated structural members. Various shapes and materials are examined and methods of incorporating these shapes are described. Types of loadings required and design methods are shown. The study concludes that the use of prefabricated members, particularly precast concrete members, is feasible and offers opportunities for significantly reducing surface disruption time. It shows construction methods for the use of precast wall members placed in fluid (slurry) trenches, and precast, prestressed members. This report is the first of two volumes. Volume 2, FHWA-RD-76-114, 'Three Case Studies,' summarizes designs and cost considerations applicable to three actual tunnel sites.

See also Volume 2, PB-273 531.

Martin, LD Gill, SA Scott, NL  
Consulting Engineers Group, Incorporated, Federal Highway Administration, (HPR) Final Rpt. FHWA/RD-76-113, 4149-Vol-1, Mar. 1977, 190 pp

Contract DOT-FH-11-8594

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-273530/6ST

00 168931

## PREFABRICATED STRUCTURAL MEMBERS FOR CUT-AND-COVER TUNNELS. VOLUME 2. THREE CASE STUDIES

This report is the second of two volumes. The design concepts for the use of prefabricated structural members on cut-and-cover tunnels developed in Volume 1 (PB-273 530) are tested on three sites where transportation tunnels are being considered. The sites represent a diversity of site conditions, grades and tunnel depths. The site studies confirm the feasibility of many of the concepts proposed in Volume 1. Cost savings in the order of 7 to 13 percent of the structural costs are indicated. Construction time will usually be saved, and a dramatic difference in surface disruption is shown in Case Study 1, the only site studied where such disruption was an important factor. The use of prefabricated members for tunnel approaches and other depressed roadways is investigated in Case Study 2.

See also Volume 1, PB-273 530.

Martin, LD Kowall, KR  
Consulting Engineers Group, Incorporated, Federal Highway  
Administration, (HPR) Final Rpt. FHWA/RD-76-114, 4149-Vol-2,  
May 1977, 174 pp

Contract DOT-FH-11-8594

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-273531/4ST

00 169962

# **SYNTHETIC BUILDING MATERIALS OPEN NEW POSSIBILITIES IN TUNNEL CONSTRUCTION**

[Kunststoffverbundbau erschliesst neue moeglichkeiten im Tunnelbau]

Instead of having concrete reinforced with a layer of meshwork, synthetic resins are used to preserve rock layers: pins and reinforcements are made of synthetic resin. The tunnel lining is made of glass-fibre reinforced epoxy resin. Official tests were carried out on these materials in Stuttgart and in Vienna. They have been patented in Europe and in the western world. [German]

Brandstaetter, R *Strassen und Tiefbau* Vol. 31 No. 7, 1977, pp 16-19

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

00 169963

# **NEW KNOWLEDGE IN THE FIELD OF FATIGUE, AND ITS APPLICATION IN BRIDGE BUILDING [Neue Erkenntnisse auf dem Gebiet der Ermuedung und deren Beruecksichtigung bei der Bemessung von Eisenbahnbruecken]**

According to the results of comprehensive fatigue tests, fatigue resistance can be indicated for a given period by using only stress cycles and details of constructional lay-out (Delta-Sigma concept). [German]

Hirt, MA *Bauingenieur* Vol. 52 No. 7, 1977, pp 255-262, 10 Phot., 24 Ref.

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

00 169967

# **ROLE OF POLYMERIC LINING FOR REINFORCED CONCRETE STRUCTURES FOR TRANSPORT APPLICATIONS [Rol'polimernyyh pokrytiy dlja zelezobetonnyh konstrukcij transportnogo stroitel'stva]**

No Abstract. [Russian]

Krasovskaja, TA *Transportnoye Stroitel'stvo* No. 9, 1977, pp 50-52, 1 Fig., 1 Tab., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Mezhdunarodnaya Kniga, Smolenskaya sennaya pl 32/34, Moscow G-200, USSR

00 169970

# **CONSTRUCTION OF THE SEIKAN UNDERSEA TUNNEL**

This tunnel is 53.85 km long and has an undersea portion measuring 23.3 km. It consists of a double main tunnel, a pilot tunnel and a service tunnel, and its deepest portion is 240 m below sea level.

Mochida, Y *Japanese Railway Engineering* Vol. 17 No. 2, 1977, pp 4-7, 4 Tab., 5 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Japan Railway Engineers' Association, 2-5-18 Otemachi, Chyoda-ku, Tokyo, Japan

DOTL JC

00 169980

# **USE OF CALIBRATED SAND AS INTERMEDIATE LAYER BETWEEN BALLAST AND TRACK BED [Gleichfoermige Sande als Schuttschichtmaterial im Eisenbahn-Unterbau]**

The authors gives the specifications for the types of sand involved, describes their use on the Springfuhl-Eichgestell line section, and gives the results of performance-inspections carried out in November 1975 and May 1976. [German]

Rott, H Skiendziel, H *DET Eisenbahntechnik* Vol. 25 No. 8, Aug. 1977, pp 320-322, 1 Fig., 2 Tab., 2 Phot., 2 Ref.

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

00 169982

# **MECHANICAL BORING OR DRILL AND BLAST TUNNELLING**

Proceedings include 15 technical papers that provide detailed information relating to all aspects of tunneling on both sides of the Atlantic. The reports give a comparison of the two techniques with respect to contracting, excavation and pre-investigation rock mechanics, present and future equipment, and a detailed comparative cost analysis. They also bring out differences in the conditions and techniques between the United States and Sweden.

Natl Swed Build Res Doc n D3: 1977 1st US-Swed Underground Workshop, Stockholm, December 5-10, 1976.

Persson, PA Schmidt, RL

Swedish Detonic Research Foundation Proceeding Res Doc No D3, 1977, 277 pp

ACKNOWLEDGMENT: EI

ORDER FROM: Swedish Detonic Research Foundation, Stockholm, Sweden

00 170016

# **ANALYSIS OF SNOW AVALANCHE TERRAIN**

A multiple regression analysis has been performed of the average annual number of avalanches and terrain factors. Observations were made at 36 paths at Rogers Pass, British Columbia, over a period of 9 years. The average slope inclination measured from the starting point to the beginning of the run-out zone and exposure to wind proved to be the most significant variables. Slope angle at the starting point, variations over the track, and roughness of the ground surface were of secondary significance and their influence varied strongly from site to site. The analysis confirmed that avalanches need either a steep slope or a snow drift to start and a minimum inclination of track to maintain their motion.

Schraerer, PA (National Research Council of Canada) *Canadian Geotechnical Journal* Vol. 14 No. 3, Aug. 1977, pp 281-287

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

00 170017

# **NEW APPROACH IN FATIGUE MEASUREMENT OF RAILROAD BRIDGES [Neue Erkenntnisse auf dem Gebiet der Ermuedung und Deren Beruecksichtigung bei der Bemessung von Eisenbahnbruecken]**

New concepts in analysis of cracks and stresses in railroad bridges are briefly defined. Analysis of measured data on non-propagating cracks is given, based on fracture mechanics basis. [German]

Hirt, MA (Lausanne Technische Hochschule, Switzerland) *Bauingenieur* Vol. 52 No. 7, July 1977, pp 255-262, 24 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

00 170085

# **THE TUNNEL COST MODEL, A METHOD FOR CALCULATING BUILDING COSTS AND THE TIME NEEDED TO BUILD TUNNELS THROUGH ROCK [Das tunnelkostenmodell. Ein verfahren zur berechnung der baukosten und bauzeit von tunneln in fels]**

Unlike the methods and cost model for tunnels developed by the MIT, it is now possible to integrate unknown geological factors and a dispersal of boring work both rationally and in detail in calculations. The zones of cost and time dispersal which are thus created can be used to make a better assessment of risks and for determining which building methods are not suitable for adapting to unknown factors. [German]

Einstein, HH *Schweizerische Bauzeitung* Vol. 92 No. 42, 1977, pp 741-751, 5 Tab., 19 Phot., 11 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Verlags der Akademischen Technischen Vereine, Postfach 630, 8021 Zurich, Switzerland

00 170089

# **REINFORCED SUBGRADE**

Geological conditions in Japan result in about 700 km of the Japanese National Railways being rated as having "poor subgrade." To reduce maintenance on these segments, JNR has adopted a method of reinforcement consisting of a top layer of precisely sized slag and a bottom layer of sized crushed stone with asphalt emulsion spread over the subgrade to



protect and cure the slag until it solidifies. Complete drainage of rainwater is provided during construction; subgrade materials are compacted to more than 95% of maximum dry density.

Ino, T (Japanese National Railways) *Japanese Railway Engineering* Vol. 17 No. 1, 1977, pp 22-23, 6 Fig., 1 Tab.

ACKNOWLEDGMENT: Japanese Railway Engineering  
ORDER FROM: Japan Railway Engineers' Association, 2-5-18 Otemachi, Chiyoda-ku, Tokyo, Japan

DOTL JC

00 170108

## MEASUREMENT OF BALLAST LAYER VIBRATIONS UNDER THE LOAD OF PASSING TRAINS [Izmerenie vibracij ballastnogo sloga zeleznodorozhnogo puti pod poezdami]

Results of a study of maintenance equipment IS-1269 which measures the vibrations of the ballast bed. [Russian]

Anan'ev, NI *Vestnik VNIIZT* No. 6, 1977, pp 38-41, 4 Fig., 1 Tab., 5 Ref.

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

00 170419

## ICG TAILORS VEGETATION CONTROL TO FIT THE LOCATION, THE PROBLEM

The 9,000 route miles of the Illinois Central Gulf are subjected to systematic vegetation control programs. Areas of division are brush, main line, and yards and bridges. Heavy dependence is placed on contract applicators to keep abreast of new application techniques, products and equipment.

*Railway Track and Structures* Vol. 73 No. 12, Dec. 1977, pp 26-27, 2 Phot.

ORDER FROM: ESL

DOTL JC

00 170456

## UNDERPASSES PENETRATE A MAZE OF OBSTACLES

The paper reports how two underpasses surrounded by busy railroads were constructed by shoring them up with a series of tiebacks to head off future

problems. Deep, sharply angled holes were made for tiebacks and concrete piles, and a massive bulkhead system was used to support the shoofly during excavation and construction of bridges alongside the tracks.

Smith, L (McGraw Hill World News) *Construction Methods and Equipment* Vol. 59 No. 9, Sept. 1977, pp 70-72

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

00 170458

## FORMS ROLL OVER STREETCAR TRACKS TO CAST STATION IN HILL

The construction of a new station in the side of a hill in San Francisco by using massive arched traveling forms that roll over existing tracks to cast the station's vaulted walls and ceiling is described. The station, 51 ft wide and 26 ft high, is elliptical in cross section and lies on a vertical curve with a 2% grade. The 212-ft-long underground section will be topped by a 150 x 125-ft building, also underground.

*Engineering News-Record* Vol. 199 No. 15, Oct. 1977, pp 22-23

ACKNOWLEDGMENT: EI  
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DOTL JC

00 170586

## EARTHWORKS IN MODERN RAILWAY AND ROAD CONSTRUCTION--4. FOUNDATIONS OF EMBANKMENTS. PROBLEMS OF STABILITY [Le opere in terra nelle moderne costruzioni ferroviarie e stradali--4. La fondazione dei rilevati. Problemi di stabilita]

After briefly calling to mind the reactions of the foundation terrain under the load of an embankment, the article illustrates the modalities of study of equilibrium by means of a critical examination, both of the various factors which influence the phenomenon and of the calculation procedures. [Italian]

Orlandi, D *Ingegneria Ferroviaria* Vol. 32 No. 5, May 1977, pp 359-369

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

01 053225

**THEORETICAL TRANSFER FUNCTIONS OF SOME MAINTENANCE MACHINES**

This document deals with the calculation of theoretical transfer functions of maintenance machines based on the data provided by the manufacturers. Both lining and levelling have been considered. The results have been represented by plots attached in the appendix.

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

Esveld, C (Netherlands Railways)

International Union of Railways DT 29/E, Apr. 1976, 52 pp, Figs., 2 Tab., 2 Ref., 1 App.

ACKNOWLEDGMENT: UIC

ORDER FROM: UIC

DOTL RP

01 053235

**UNCONVENTIONAL TRACKS. SLAB TRACK TESTS AT VELIM**

The report describes tests at Velim of two types of in situ slab track, broad sleeper track, and conventional laid in a 450 M radius curve without cant and a straight track laid using prefabricated slabs. All withstood the planned fifty million tonne traffic loading and were subsequently subjected to further loading up to two hundred million tonne.

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

International Union of Railways D87/RP 16/E, Oct. 1976, 23 pp, 35 Fig., 32 Tab.

ACKNOWLEDGMENT: UIC

ORDER FROM: UIC

DOTL RP

01 158547

**ECONOMIC FEASIBILITY OF PROCESS FOR HIGH-YIELD LAMINATED STRUCTURAL PRODUCTS**

Recovery of lumber-type products from sawlogs can be substantially greater than that by conventional sawing processes if veneer-product production methods are used. Economic analysis based on a hypothetical continuous-process veneer-product facility derives production costs of acceptable levels for producing high-strength and specialty lumber-type products. Continuous laminating presses suitable for the facility evaluated are not yet commercially available but can be replaced with batch laminating presses for producing short-length products such as crossarms and railroad crossties. Methods may be developed to reduce glue costs. Increasing log prices will also increase the economic advantage of high-yield laminating processes. (Author)

Harpole, GB Aubry, LW

Forest Products Laboratory Res. Rpt. FSRP-FPL-285, 1977, 25 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

AD-A039923/9ST, DOTL NTIS

01 162953

**GENERAL ELECTRIC AND TRACK INSPECTION CARS FOR SHINKANSEN**

Description is given of the inspection work carried out by this train: 23 tasks concerning track, 10 tasks concerning the power circuit and the catenary, 6 tasks concerning signalling, 6 tasks concerning telecommunications. The train operates once a week at a speed of 210 km/h and carries out additional inspections at various times.

Suzuki, H *Rail International* Vol. 8 No. 4, Apr. 1977, pp 185-192, 2 Fig., 4 Tab., 3 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

01 162968

**SPECIAL PROCESSES WITH THE THERMIT WELDING TECHNIQUE [Sonderverfahren der THERMIT-Schweisstechnik]**

The Thermit welding technique can be used for a number of special purposes in addition to the well-known process for welding rail joints. Thermit contact surfaces provide reliable electrical connections between current

return cables and the rail; they can be used for re-surfacing rails and eliminating defects on the head of the rail. A new field of application is in annealing processes where the rail is subjected to heat treatment while in place on the track. [German]

Jacoby, N *Eisenbahningenieur* Vol. 28 No. 3, Mar. 1977, pp 91-99, 5 Fig., 11 Phot., 10 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 162969

**VEHICLES. TRACK PANELS. STRESS ON THE BALLAST [Fahrzeug. Gleisrost. Schotterbeanspruchung]**

It is possible to retard track panel sagging and cut down on maintenance costs by reducing the amount of pressure on the ballast. In addition to adapting axle loads and the wheel base, another factor can be that of the way sleepers are arranged for a given rail profile. Consideration must also be given to the torsion and lifting movement of the sleeper, as well as to the difference between the rigidity of the ballast and that of the sub-soil. [German]

Eisenmann, J *Eisenbahningenieur* Vol. 28 No. 3, Mar. 1977, pp 83-90, 10 Fig., 9 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 162970

**STUDY OF THE RESULTS OF LABORATORY TESTS ON TROPICAL WOODS SUITABLE FOR USE AS RAIL SLEEPERS**

[Etude de l'aptitude des essences tropicales a l'emploi en traverses de chemin de fer a partir de resultats d'essais en laboratoire.]

No Abstract. [French]

Deon, G *Bois et Forêts des Tropiques* No. 167, May 1976, pp 55-70, 9 Tab., 9 Phot., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Centre Technique Forestier Tropical, 45 bis, Avenue de la Belle Gabrielle, 94 Nogent sur Marne, France

01 162971

**SWITCHES FOR HIGH-SPEED RAIL TRAFFIC [Weichen fuer Schienen-Schnellverkehr]**

Switches for high speed traffic are designed substantially differently from usual switches, particularly where the frogs and switch points are concerned. The author describes general solutions and then examines the development of switches for high speed lines on the DB and their special constructional features. He also discusses the subject of installing new switches and maintenance. [German]

Morgenschweis, O *Eisenbahningenieur* Vol. 28 No. 3, Mar. 1977, pp 101-107, 7 Fig., 2 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 163221

**EFFECTS OF RUBBER-PAD UNDER CONCRETE TIE ON PULVERIZATION OF BALLAST, VIBRATION AND NOISE**

To decrease the pulverizing and mud pumping of ballast, and to control vibration and noise, a rubber pad has been developed for installation under concrete ties. The vibration and lateral resistance of the ballast, vibration of the entire track structure, and the noise near the track were measured in test and mainline tracks. The durability of the pad under the tie was also investigated.

Katoh, Y Kakegawa, H *Railway Technical Research Inst Quarterly Reports* Vol. 18 No. 1, Mar. 1977, pp 10-14, 9 Fig., 1 Tab.

ACKNOWLEDGMENT: Japanese National Railways

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

DOTL JC

01 163222

**DEVELOPMENT OF PACKING HMP FOR TRACK LEVELLING**

To permit adjustment of rail vertically on concrete slab or more conventional track, a newly developed Hot-Melt-Packing (HMP) has been developed. Intended to be used atop rubber tie pads, this packing completes the filling of the clearance under the rail, maintains resistance against rail movement and improves the stability of the rubber pad. The displacement and deterioration of rubber tie pads were also investigated.

Shimizu, K Yoshida, H *Railway Technical Research Inst Quarterly Reports* Vol. 18 No. 1, Mar. 1977, pp 15-19, 6 Fig., 1 Tab., 1 Ref.

ACKNOWLEDGMENT: Japanese National Railways

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

DOTL JC

01 163236

**LINING AND LEVELLING OF TRANSITION CURVES ON THE "DIRETTISSIMA" [I raccordi plano-altimetrici per le curve delle linee direttissime]**

No Abstract. [Italian]

Jaforte, B *Ingegneria Ferroviaria* No. 11, Nov. 1976, pp 12-22, 3 Fig., 13 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

01 163249

**EFFECT OF THE INFRASTRUCTURE REACTION MODULUS ON THE INTERNAL STRESSES IN THE INBK-7 SLEEPER**

[Wpłyn współczynnika podatności podłoża na sily wewnętrzne w podkładzie kolejowym INBK-7]

The authors carry out a static analysis of the sleeper on a flexible Winkler foundation with various values for the foundation reaction modulus. The analysis shows that the variation in the value of modulus C to the extent of 0.5-69 kg/cubic cm changes the bending moment and transversal stresses very slightly. [Polish]

Syczewski, M *Przegląd Kolejowy Drogowy* Vol. 24 No. 3, Mar. 1977, pp 78-81, 2 Fig., 2 Tab., 11 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 163263

**RAILROAD WOOD TIE DESIGN AND BEHAVIOR**

The theory of an elastic beam on an elastic or spring foundation is reviewed and its implications to straight rail track examined as an introduction to tie design. Published data on railroad track performance are reassessed with emphasis on the design of the wood tie. Contradictions and inaccuracies which result in errors and questionable practices in present North American recommended design procedures are found. Improvements in design methodology are outlined which are consistent and dimensionally correct. For the new heavier jumbo freight cars present practice is shown to be marginal and fatigue failures are predicted to increase. It is concluded that the optimum length of ties to prevent centerbinding on standard gauge is theoretically 8-4 ft ignoring the tie plate and 9 ft with a 12-in. tie plate on competent ballast support. Further improvements should be made by increasing tie width and maintaining or lowering the ratio of spacing to tie breadth.

Raymond, GP (Queen's University, Canada) *ASCE Journal of Transportation Engineering* Vol. 103 No. 4, July 1977, pp 521-538, 8 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

01 163265

**TECHNICAL TOPICS: A ROLLING LOAD FATIGUE MACHINE**

A machine is described which simulates railroad wheel/rail rolling contact problems. The machine was specifically designed to investigate the initiation and growth of transverse defects. Two rail samples can be simultaneously tested with wheel/rail contact forces up to 200 kN at speeds up to 4 Hz.

Cottam, WJ (Melbourne Research Laboratory, Australia) *BHP Technical Bulletin* Vol. 20 No. 2, Nov. 1976, pp 38-39

ACKNOWLEDGMENT: EI

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01 163302

**PLANAR AND ALTIMETRIC LAYOUT OF TRACK APPROACHES TO CURVES ON FAST LINES [I raccordi plano-altimetrici per le curve delle linee direttissime]**

In order to replace the approach tracks with a constant banking on the existing lines by sinusoidal tracks, which are certainly better, it would be necessary to modify long sections of track. Therefore, a new type of approach track is proposed. They would consist of three sections, of which two end sections would be transitions and the central one would have constant banking. The possibility of superimposition with regard to the cubic parabola is all the higher, the longer is the intermediate section. The proposed approach track arrangement is analyzed in order to permit its application on high-speed lines to be built in the future. [Italian]

Jaforte, B *Ingegneria Ferroviaria* Vol. 31 No. 11, Nov. 1976, pp 12-22

ACKNOWLEDGMENT: EI

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DOTL JC

01 163717

**RESIDUAL AND STRAIGHTENING STRESSES IN NEW ROLLED STEEL RAILS [Eigen-und Richtspannungen in walzernen Schienen]**

When a new rail is laid in the track, it should be realized that, as a rule, the permanent bearing capacity of the material of which the rail is made is more or less influenced by residual stresses due to temperature. The results of measurements show that residual stresses in new rails after rolling occur mainly during straightening and not during cooling. The extent to which these stresses exist and how they are distributed in the length of rail depend on the curve of the rail before straightening, the elongation limit of the material and the rail profile. [German]

Asbeck, HO Heyder, M *Eisenbahntechnische Rundschau* Vol. 26 No. 4, Apr. 1977, pp 217-222, 6 Fig., 1 Tab., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

DOTL JC

01 163732

**BEHAVIOR OF RAIL HEAD METAL WHEN SUBJECTED TO FATIGUE [Le comportement a la fatigue du metal du champignon des rails]**

Complete calculation of the cycles of stresses produced in the rail head by a wheel going over it is a way of establishing the influence of the various running parameters on the behavior of the rail head metal when subjected to fatigue. Such calculations were carried out by using a recently developed fatigue criterion valid for complex cycles. It is thus possible to attack the problem of establishing nonempirically the permissible load in relation to wheel diameter. [French]

Prasil, B *Informations Techniques-SNCF-Direct de l'Equip* No. 16, Dec. 1976, pp 11-23, 8 Fig., 3 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

01 163739

**EFFECT OF THE WHITE COATING ON RAILS ON THE STABILITY OF WELDED TRACK [A sinek fehér festesének hatása a hezagnelkuli vaganyok allekonysagara]**

The author describes the new method proposed by the Brno Institute of Technology. The rails are covered with a white plastic mixture, except for the running tread and the lower rail area. This is meant to reduce rail over-heating. [Hungarian]

Unyi, B *Vasut* Vol. 27 No. 3, Mar. 1977, pp 24-25, 2 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Vasuti Tudományos Kutató Intézet, Múzeum 11, Budapest 8, Hungary

01 163748

**ENDURANCE TESTS WITH WOODEN SLEEPERS [Badanie trivalosci podkladow drewnianych]**

The article presents methods used for endurance-testing wooden sleepers and the results obtained, agents responsible for the deterioration of the sleepers, analysis of the problem of sleeper replacement in the general context of track renewal, and monitoring of the reliability of wooden sleepers. [Polish]

Fijalek, M *Przegląd Kolejowy Drogowy* Vol. 24 No. 5, May 1977, pp 144-148, 8 Fig., 10 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: *Przegląd Kolejowy Drogowy*, Wydawnictwa Komunikacji i Łączności, Warsaw 12, Poland

01 163777

**RESEARCH ON RAIL METALLURGY**

Heavier loads and higher speeds make it necessary for rails and associated components to be able to withstand higher wheel loads. This will require new rail materials, rather than the redesigning of rails. The paper discusses the current state of metallurgical development of rail steels and makes recommendations on some fields of research worthy of study. Optimization of rail life requires also that all components of the track structure be investigated simultaneously.

Proceedings, 76th AREA Technical Conference, Chicago, Illinois, March 29-31, 1977.

Marich, S (Broken Hill Proprietary Company Limited) *AREA Bulletin* Conf Paper Vol. 78 No. 663, June 1977, pp 594-610, 4 Fig., 6 Tab., 17 Ref.

ORDER FROM: ESL

DOTL JC

01 163778

**EFFECT OF HEAVY CARS ON RAIL**

The basis for Union Pacific's decision that 125-ton cars on four-axes have exceeded the wheel loads which track can sustain is illustrated. The rail head steel is stressed beyond its elastic limit by such cars and plastic flow ensues. The author says that rail life decreases exponentially as wheel loads are raised.

Proceedings, 76th AREA Technical Conference, Chicago, Illinois, March 29-31, 1977.

Sunnygard, JR (Union Pacific Railroad) *AREA Bulletin* Conf Paper Vol. 78 No. 663, June 1977, pp 611-635, 23 Fig., 8 Ref.

ORDER FROM: ESL

DOTL JC

01 163779

**RE-DECKING UP'S JOSO BRIDGE**

The 3900-ft structure across the Snake River had its open-deck ties replaced after 33 years of service by a track panel process which is described. There was a cost saving as compared with replacing ties singly.

Presented at the Association's 81st Annual Convention, in Chicago, Illinois, September 13-15, 1976.

McDonald, GW (Union Pacific Railroad) *American Railway Bridge & Building Assoc, Proc* Conf Paper 1976, pp 31-35, 5 Phot.

ORDER FROM: American Railway Bridge & Building Association, 18154 Harwood Avenue, Homewood, Illinois, 60430

01 163782

**SANTA FE ADOPTS FLUX-CORED WIRE FOR RAIL-END BUILD-UP**

To achieve better welds for building up battered and chipped rail ends, a gang using electric arc welding with flux-cored wire with semi-automatic feed works in jointed track territory. The process results in lower cost and requires less welder training than the oxy-acetylene welding formerly used.

*Railway Track and Structures* Vol. 73 No. 7, July 1977, pp 22-24, 7 Phot.

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DOTL JC

01 163783

**RECYCLING THE WOOD CROSSTIE: RESEARCHERS DEVELOP AND TEST LAMINATED PARTICLE TIE**

With the prospect that up to 30 million replacement ties will be installed annually over the next few years, the potential of recycling rather than disposing of the scrap ties is being investigated. The Forest Products Laboratory of the U.S. Department of Agriculture and University of Wisconsin have been investigating methods for reducing discarded cross ties to smaller pieces of wood, ultimately to discrete particles, and then for bonding the particles into boards and finally to laminate the boards to form reconstituted ties. Engineering tests are described.

This article is a joint effort of a group of engineers and technologists at the U.S. Forest Products Laboratory, Forest Service, U.S. Department of Agriculture, which is maintained at Madison, Wis., in cooperation with the University of Wisconsin.

Heebink, BG Superfeskys, MJ Geimer, RL Chern, J *Railway Track and Structures* Vol. 73 No. 7, July 1977, pp 26-30, 3 Fig., 4 Tab.

ORDER FROM: ESL

DOTL JC

01 163791

**THE REAL WORLD OF TRACK AS RELATED TO SAFETY**

The attitude and training of inspectors and track supervisors, along with the track conditions which they must detect and correct are discussed. The experience of the author's railroad is described.

Presented at the 13th Annual Railroad Engineering Conference, Pueblo, Colorado, October 12-13, 1976, and included in the Conference Proceedings, "Railroading Challenges in America's Third Century--Improved Reliability and Safety," sponsored by the FRA's Office of Research and Development, U.S. DOT.

Peterson, LA Gatton, CL (Louisville and Nashville Railroad Company)

Federal Railroad Administration Conf Paper FRA/ORD-77/13, July 1977, pp 47-51, 16 Fig.

ACKNOWLEDGMENT: FRA

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DOTL NTIS

01 163792

**THE PRESENT AND FUTURE IN RAIL FLAW DETECTION**

Automation of the process of detecting rail flaws so this may be done more rapidly and accurately has progressed to the stage of preliminary design. In automating rail inspection, signal processing and data processing hardware, along with the system's hardware technology, are already available, offering the greatest promise for accommodating the high data rates of the multiple sensor system.

Presented at the 13th Annual Railroad Engineering Conference, Pueblo, Colorado, October 12-13, 1976, and included in the Conference Proceedings, "Railroading Challenges in America's Third Century--Improved Reliability and Safety," sponsored by the FRA's Office of Research and Development, U.S. DOT.

Kaske, AD Phipps, PL (Sperry Univac Defense Systems)

Federal Railroad Administration Conf Paper FRA/ORD-77/13, July 1977, pp 52-59, 6 Fig., 10 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

DOTL NTIS

01 163793

**TRACK INSPECTION APPROACHES FOR SAFETY AND MAINTENANCE PLANNING**

For several years the Bessemer & Lake Erie has taken part in a study of track geometry and track degradation. The objectives are development of quantitative ratings of track quality and utilization of such data for long-range track maintenance planning. A special car has been instrumented for the railroad's own regular use in measuring wheel-rail forces and the FRA's track geometry measurement car is used periodically for added data collection. The railroad is working toward a system which may be used as a full-time maintenance planning tool.

Presented at the 13th Annual Railroad Engineering Conference, Pueblo, Colorado, October 12-13, 1976, and included in the Conference Proceedings, "Railroading Challenges in America's Third Century--Improved Reliability and Safety," sponsored by the FRA's Office of Research and Development,

U.S. DOT.

Price, BH (Bessemer and Lake Erie Railroad)  
Federal Railroad Administration Conf Paper FRA/ORD-77/13, July  
1977, pp 60-69, 26 Fig.

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

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01 163876

**STUDY OF THE DEFORMABILITY OF THE  
BALLAST-PLATFORM SYSTEM ON A RAILWAY TRACK  
UNDER VERTICAL LOAD ACTION** [Estudio de la deformabilidad  
del sistema balasto-blatatorma en una via ferrea bajo la accion de cargas  
verticales]

The research described in this article is centered on the study and analysis of the factors defining the vertical rigidity of the ground-ballast-platform assembly of a railway track, firstly from the theoretical point of view and secondly from a practical one, using experiments carried out on specific Spanish railway lines subjected to a daily operational traffic load. The starting point for the research has been the theory of the floating beam currently used in calculating vertical stresses on the track in conjunction with the theories of elastic systems and interesting results have been deduced. By using methods such as that of finite elements, results have been obtained which would not have been possible using elastic theories. After a bibliographical review, a critical analysis of the current state of the art is given, as well as a study of the parameters on which the rigidity of the track depends, field experiments, ballast-platform assembly behaviour, laboratory tests carried out, general interpretation of the experimental research work done and the effects of the different ballast characteristics. /TRRL/ [Spanish]

Lopez, A

Higher Technical Schl of Road, Canal & Port Engrs Thesis May 1976,  
324 pp, Figs., Tabs., 3 Phot., 99 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 226663), Ministry of Public Works,  
Spain

ORDER FROM: Higher Technical Schl of Road, Canal & Port Engrs, Ciudad  
Universitaria S/N, Madrid 3, Spain

01 164417

**FLASH BUTT WELDING OF HEAVY DUTY  
RAILS--LABORATORY SIMULATION AND ON SITE  
EXPERIENCE**

The technique has been used to assess the weldability of new rail steels, processed on laboratory scale, in terms of the amount of martensite which forms in the heat affected zone of welds and the maximum hardness values in this zone. Use of the data has been made in modifying the standard flash butt welding procedure to produce metallurgically satisfactory welds.

Presented at the IIW Public Session and Metals Technology Conference,  
in Sydney, Australia, August 21-28, 1976.

Marich, S

International Institute of Welding Conf Paper ASession 4, Paper 4, 1976,  
7 pp, 6 Ref.

ACKNOWLEDGMENT: EI  
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01 164420

**ACCELEROMETER DEVICE FOR CONTINUOUS  
MEASUREMENT OF UNDULATING RAIL WEAR** [Marezzimetro:  
dispositivo accelerometrico per la misura continua dell'usura ondulatoria  
delle rotaie]

The Test and Technological Research Service of the Municipal Transport Undertaking of Milan has produced a simple device for the continuous measurement of corrugation: it is based on the dynamic working of an accelerometer which follows the profile of the corrugation and records its depth graphically, with an error of a few hundredths of a millimeter. The device proceeds at a speed of 10 km/hr. To conciliate the requirements of the accelerometer and the related electronic instrument with the dynamic characteristics of the rail feeler, recourse had to be made to a modern piece of equipment for the reproduction of the vibrations in the laboratory. The device is, however, still in the experimental phase. [Italian]

Campolongo, G (Milan Municipal Transport Authority, Italy) *Ingegneria  
Ferroviana* Vol. 32 No. 3, Mar. 1977, pp 194-199

ACKNOWLEDGMENT: EI  
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DOTL JC

01 164425

**UP GRINDS RAIL TO SPEED WORK-HARDENING**

The report describes how service life of rails at the Union Pacific is extended by grinding off spalled metal after the rail has been in the track two or three years.

*Railway Track and Structures* Vol. 73 No. 2, Feb. 1977, p 53

ACKNOWLEDGMENT: EI  
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DOTL JC

01 164430

**MAINLINE RERAILING PRINCIPLES**

Installing new rail is an expensive operation and the choice of rail weight has an obvious influence on the costs. This paper presents a methodology which will assist the decision maker to choose the rail weight with the lowest life costs. The methodology is illustrated by a case study utilising data covering NSW mainline operations.

Gentle, NF *Transport Economic and Operational Analysis* No. 2, Nov.  
1976, pp 16-38, 3 Fig., 3 Tab., 1 App.

ACKNOWLEDGMENT: Transport Economic and Operational Analysis  
ORDER FROM: Transport Economics and Operational Analysis, Australian  
Government Publishing Service, Canberra, Australia

DOTL JC

01 164431

**FRENCH CONCRETE SLEEPER DESIGN DEVELOPMENT**

With adoption of welded rail and elastic rail fasteners, French National Railways found it necessary to improve the concrete cross tie. Although the twin-block type has been most widely used and has advantages including lateral stability, light weight, absence of center cracking, and low cost, it does have limited bearing area and tendency to gauge widening. SNCF again began investigation of the monoblock design. Studies have included redesign of the twin-block design with greater strength and bearing area, along with improved bonding of the tie bar. The monoblock design is of particular interest for lines where they will replace wood ties out of face.

Prud'homme, A (French National Railways) *Railway Engineer* Vol. 2 No.  
4, Aug. 1977, pp 21-24, 5 Fig., 1 Tab.

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01 164439

**GRADE CROSSING RENEWAL NOW MAJOR OPERATION ON  
B & M**

Federal funding, initiated under the Federal-Aid Highway Act of 1973 is being used in the territory of the Boston and Maine Railroad for programmed rebuilding of grade crossings. The procedures and equipment are described. Work involves clearing of the site to the subgrade, installation of a stabilization fabric and use of a prefabricated track panel.

*Railway Track and Structures* Vol. 73 No. 9, Sept. 1977, pp 24-27, 8 Phot.

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01 164440

**CONRAIL IN THREE-YEAR PROGRAM TO MECHANIZE BASIC  
FORCES**

Conrail, having mechanized its track surfacing and rail and tie renewals, is now engaged in a three-year, \$24 million program for mechanization of the basic operations not covered by the highly organized production gangs. The basis operations are either divisional or under a track supervisor.

*Railway Track and Structures* Vol. 73 No. 9, Sept. 1977, pp 28-30, 4 Phot.

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01 164441

**WEEDS ON DM&IR ARE TOUGH AND TROUBLESOME ... BUT HERBICIDES, SPOT SPRAYING GET THE JOB DONE**

The vegetation control program of the Duluth, Missabe & Iron Range is described. While six different chemicals were formerly used, the Minnesota line now finds that two give satisfactory results. Contractor works during the short growing season.

*Railway Track and Structures* Vol. 73 No. 9, Sept. 1977, pp 40-41, 3 Phot.

ORDER FROM: ESL

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01 164451

**WHY DOT OPTED FOR CONCRETE TIES IN THE NORTHEAST CORRIDOR**

Applying life cycle costing to options for track rehabilitation in the Northeast Corridor, the Department of Transportation has elected to use concrete cross ties for rebuilding 400 track miles of the line. Per-mile costs developed for three options--conventional renewal, total renewal with preplated wood ties and elastic fasteners, and total renewal with concrete ties with elastic fasteners--demonstrated the advantage of the concrete tie to DOT's satisfaction.

*Railway Age* Vol. 178 No. 17, Sept. 1977, pp 32-34, 1 Tab., 1 Phot.

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01 164454

**THE CONCRETE TIE ... NEW LIFE FOR A FALTERING CAUSE**

The concrete tie has not won widespread acceptance from track engineers, but various North American properties have tested or adopted such ties. In a series of five articles, various aspects of the current situation are discussed: Concrete ties on CN: The scenario behind the decision; Concrete ties for MARTA ballasted track; This concrete-tie test features conventional rail anchors (Santa Fe); Concrete-tie test criteria: What type of loading? How important are cracks?; and Interspersing concrete ties with wood ties: A look at Seaboard experiment 10 years later.

*Railway Track and Structures* Vol. 73 No. 8, Aug. 1977, pp 23-36, 3 Fig., 1 Tab., 15 Phot.

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01 165044

**STATISTICAL AND MEASUREMENT TECHNIQUES THAT CAN BE USED FOR STUDYING TRACK GEOMETRY AND LABORATORY EXAMINATIONS [Mess- und rechentechnische Möglichkeiten zur Untersuchung der geometrischen Lage des Gleises und deren labormaessige Erprobung]**

Working from the principle that tracks form a random system, the author describes his basic ideas and gives the underlying formulae for his statistical analysis: stationary phenomena, representative sampling, probability density, power density spectrum, correlation and self-correlation functions. He goes on to describe how information obtained from track examination is recorded, adapted and processed at the DB and how statistics are drawn up in respect to the state of the track. [German]

Petermann, H Seewald, GG *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 24 No. 2, 1977, pp 339-358, 8 Fig., 3 Phot., 19 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Hochschule fuer Verkehrswesen Friedrich List, Friedrich List Platz 1, Dresden 801, East Germany

01 165048

**EXTENSION OF TRANSITION CURVES WITH MINIMUM TRANSVERSAL DISPLACEMENT [Verlängern von Uebergangsbogen mit kleinsten Seitenverschiebungen]**

Higher speed limits on lines usually necessitate modifications in the layout of transition curves. The author puts forward 4 solutions to this problem, also expressed as equations, and discusses their respective advantages. [German]

Schramm, G *Eisenbahningenieur* Vol. 28 No. 7/8, July 1977, pp 293-299, 3 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 165049

**SECOND RESEARCH PHASE ON THE BEHAVIOUR OF THE RICLA-CALATORAO SLAB-TRACK TEST SECTION [Segunda fase de la investigacion sobre el comportamiento del tramo de ensayo de via en placa Ricla-Calatorao]**

No Abstract. [French]

Oliveros, F Celades, L *Revista AIT* No. 15, Apr. 1977, pp 9-31, 20 Fig., 8 Tab., 4 Phot., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 165052

**SPECIAL ISSUE: TRACK, INFRASTRUCTURE AND HIGH SPEEDS [Sonderpublikation Oberbau-Infrastruktur und Schnellfahrt]**

Series of 10 articles dealing with the following subjects: Ideas of Austrian Railways concerning tracks and equipment of the network, High-speed tracks, American points of view concerning track maintenance, Track stabilization following maintenance, Steel for rails and turnouts on heavy traffic lines, Unification of equipment for the UIC master plan for European Railways, Sleepers and track strength, Possibilities of obtaining precise geometric data for track alignment using mechanical equipment, New types of track, especially in tunnels, Presentation of the SUZ (rapid track renewal train). [German]

*Verkehrsannalen* 1976, 235 pp, 6 Tab., 106 Phot., 49 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Verkehrsannalen, Gauermannsgasse 4, Vienna 1010, Austria

01 165060

**FASTENING DEVICES FOR CONTINUOUS WELDED RAILS ON REINFORCED CONCRETE SLEEPERS, AND THEIR MAINTENANCE [Osobennosti remonta i soderzaniya besstykovogo puti s zelezobetonnyimi spalami]**

The October Railway was one of the first to use reinforced concrete sleepers from 1956, and continuous welded rails from 1958. The article describes the particular features of stresses and residual deformation, and the execution of the construction work and routine maintenance of the track. [Russian]

Mel'kov, GV *Put'i Putevoye Khozyaistvo* No. 7, 1977, pp 11-15, 3 Fig., 3 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 165063

**RAIL FATIGUE PHENOMENA [Ermuedungserscheinungen bei Eisenbahnschienen]**

Mechanical, dimensional and chemical characteristics of the DR's Russian-made S 49 and R 65 rails, and description, according to the Russian documentation referred to in the text, of wear phenomena in these rails: oval flaw, flaking and cracking.

Arnhold, G Moras, E *Signal und Schiene* Vol. 21 No. 7, July 1977, pp 225-227, 1 Fig., 2 Tab., 10 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 165070

**RECONSTRUCTION PLAN ON THE SHINKANSEN TRACK**

In 1975 after being subjected to 250 million tons of traffic at speeds to 200 km/h, the decision was made to rehabilitate the track of the original New Tokaido Line between Tokyo and Osaka. The growing incidence of defects in rails and welds, degradation of ballast and absence of proper maintenance bases came in for attention. The scheduling and forces necessary for various phases of these programs are described. The problems which have been encountered to date and possible solutions are discussed.

Ohsaki, T (Japanese National Railways) *Permanent Way* Vol. 18 No. 3, No. 68, Apr. 1977, pp 1-13, 11 Fig., 1 Phot.

ORDER FROM: Japan Railway Civil Engineering Association, 1-18-7 Higa-shiueno, Taito-ku, Tokyo 110, Japan

DOTL JC

01 165071

**REPLACEMENT OF TURNOUTS ON THE SHINKANSEN TRACK (TOKAIDO)**

As part of the rehabilitation of the New Tokaido Line, all 123 turnouts are to be replaced by 1981 with units incorporating the heavier rails being installed throughout the route. The line is shut down entirely during periods of slack traffic for these changeouts. The procedures and equipment used to achieve the scheduled replacements are described.

Tanaka, H Otsuka, C Hori, R Kamezawa, K (Japanese National Railways) *Permanent Way* Vol. 18 No. 3, No. 68, Apr. 1977, pp 14-30, 23 Fig., 4 Tab., 5 Phot.

ORDER FROM: Japan Railway Civil Engineering Association, 1-18-7 Higashiueno, Taito-ku, Tokyo 110, Japan

DOTL JC

01 165072

**HIGH FREQUENCY TRACK VIBRATIONS AND CHARACTERISTICS OF VARIOUS TRACKS**

This report analyzes the noises related to vibration of the track structure and of supporting structures such as bridges and tunnels resulting from discontinuities of the wheel/rail interface. By comparing theoretical studies with field measurements, the effective mass and effective support spring constant for forced vibrations produced by wheel/rail interactions are established. This approach to dynamic analysis for various track structures could lead to development of means for isolating vibrations and controlling noise.

Sato, Y *Permanent Way* Vol. 18 No. 4, No. 69, June 1977, pp 1-8, 5 Fig., 1 Tab.

ORDER FROM: Japan Railway Civil Engineering Association, 1-18-7 Higashiueno, Taito-ku, Tokyo 110, Japan

DOTL JC

01 167111

**ANALYSIS OF KANSAS TEST TRACK BEAM RESPONSE**

In the fall of 1975 post-mortem static and dynamic tests were conducted on a reinforced twin concrete beam section of the Kansas Test Track (KTT) near El Dorado, Kansas. These tests were part of an extensive program undertaken by the Federal Railroad Administration to gain insight into the mechanisms of the rapid deterioration of that test facility. The data from the static and dynamic tests were used to validate a dynamic track structure model of the KTT beam sections. This report presents a summary of the validation process and the subsequent use of the model as an analytical tool for parameter studies. These studies assist in the investigation of the nature of the KTT beam performance, give insight into the behavior of beam and slab track structures, and provide the technical background for evaluation of future non-conventional track structure designs.

Anderes, JR

Mitre Corporation, Federal Railroad Administration Final Rpt. MTR-7502, FRA/ORD-77/31, June 1977, 85 pp

Contract DOT-FR-54090

ACKNOWLEDGMENT: NTIS

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PB-271412/9ST, DOTL NTIS

01 167278

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

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

Johns, TG Davies, KB

Battelle Columbus Laboratories, Transportation Systems Center, Federal Railroad Administration, Intrm Rpt. DOT-TSC-FRA-76-23, BATT-G-6266-0101, Nov. 1976, 136 pp

Contract DOT-TSC-1038

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-272054/8ST, DOTL NTIS

01 167280

**FATIGUE CRACK PROPAGATION IN RAIL STEELS**

In order to establish safe inspection periods of railroad rails, information on fatigue crack growth rates is required. These data should come from a sufficiently large sample of rails presently in service. The reported research consisted of the generation and analysis of fatigue crack growth data of 66 rail samples taken from existing track all over the United States. Additional information concerns mechanical properties, chemical composition, microstructure, and fractographic features. A statistical analysis was performed to evaluate possible correlations with fatigue crack growth properties and microstructural parameters. Weak correlations were found with carbon, manganese and oxygen content, and with the fraction of pearlite. A subsequent phase of this research program is discussed.

Feddersen, GE Buchheit, RD Broek, D

Battelle Columbus Laboratories, Transportation Systems Center, Federal Railroad Administration, Intrm Rpt. DOT-TSC-FRA-77-3, June 1977, 108 pp

Contract DOT-TSC-1076

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-272062/1ST, DOTL NTIS

01 167282

**METHODS FOR JOINING OF RAILS: SURVEY REPORT**

The performance of track structures depends greatly on the integrity of the connections between rail sections. Because the majority of service and detected rail failures occur at joints, particularly conventional bolted joints, this survey was conducted to review existing practices, examine potential joining methods, and identify promising new methods and modifications of joining methods that can provide improved rail performance and lower fabrication cost. Methods for joining rails in the field as well as in plants by both metallurgical methods (welding and brazing processes) and nonmetallurgical methods (mechanical fastening and adhesive bonding) are reviewed. Joining procedures, inspection methods, laboratory and in-track performance, failure modes, adaptability to shop and field fabrication, personnel skills required, and costs are discussed. Joining methods that warrant additional development are identified and developmental efforts are outlined.

Hauser, D

Battelle Columbus Laboratories, Transportation Systems Center, Federal Railroad Administration, Department of Defense Final Rpt. DOT-TSC-FRA-77-7, July 1977, 164 pp

Contract DSA900-74-C-0616

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-272066/2ST

✓ 01 167339

**NORTHEAST CORRIDOR HIGH SPEED RAIL PASSENGER SERVICE IMPROVEMENT PROJECT. TASK 22: PROGRAM PLAN FOR TRACK DEVELOPMENT AND DEMONSTRATION**

Problems of design, construction, and procurement for concrete tie track systems, turnout slab foundations, high-speed turnouts, movable frogs, and mitre rails are identified. Design details of the state of the art for and contemporary experience with concrete tie track systems, turnout slabs, high-speed turnouts, and movable points or wing rail frogs are reviewed. High-speed turnouts, frogs, and mitre rail design and recommendations for application to the Northeast Corridor program are designated. Five different concrete ties and three fastener components are identified and quantified. Installation procedures and schedules for the proposed New Brunswick-Trenton stretch are presented. Concrete tie application to and program objectives for the FAST track at Transportation Test Center, Pueblo, Colorado are also described. Turnout slab design details are established and details of an application to FAST are stated.



See also report dated Jul 76, PB-262 236.  
 Howell, RP Kendall, RA Holowaty, MC Wesley, R  
 De Leuw Cather/STV, Federal Railroad Administration Final Rpt.  
 FRA/NECPO-76/08, 2656-50, July 1976, 155 pp

Contract DOT-FR-66006

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-272602/4ST

#### 01 167341

##### U.S.-U.S.S.R. RAIL INSPECTION INFORMATION EXCHANGE

This trip report describes the results and conclusions of the U.S. delegation resulting from the U.S.-U.S.S.R. Rail Inspection Information exchange tour of the Soviet Union, August 24 through September 1, 1975. This information exchange was conducted under protocol agreements developed in 1974 between the Ministry of Railroads of the U.S.S.R. and the Federal Railroad Administration of the U.S. Department of Transportation. The objective of this information exchange was to achieve a technical description of Soviet rail inspection technology and practice and to learn of recent R&D efforts for nondestructive inspection (NDI) of rail. The pertinent areas included: contemporary rail NDI systems, planning and scheduling of rail inspection, inspection of track components other than rail, methods for measurement of rail stresses, and recent R&D efforts in rail NDI. This report is divided into five sections: itinerary, description of devices and techniques, applicability of Soviet technology to U.S. rail NDI, effectiveness of the information exchange, and recommendations for future exchanges.

Becker, FL  
 Battelle Memorial Institute/Pacific Northwest Labs, Transportation  
 Systems Center, Federal Railroad Administration Final Rpt.  
 DOT-TSC-FRA-77-6, FRA/ORD/77-35, June 1977, 90 pp

Contract DOT-TSC-979

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-272612/3ST

#### ✓ 01 167348

##### NORTHEAST CORRIDOR IMPROVEMENT PROJECT TASK 202: CONCRETE TIE COST AND PERFORMANCE FOR TRACK STRUCTURES

As a result of a survey of the Northeast Corridor, it was determined that 1,100 miles of track require upgrading to meet the trip-time goals set forth in the Railroad Revitalization and Regulatory Reform Act of 1976. As a part of the determination of the best way to meet these requirements, two types of ties and three methods of reconditioning track were evaluated. A comparative analysis was performed on the three methods of reconditioning track: component replacement of wood-tie track with traditional spike fasteners, complete rebuilding of track with preplated wood ties and elastic fasteners, and complete rebuilding of track with concrete ties and elastic fasteners. Differences in the methods were analyzed with regard to productivity rates, cost, and performance.

De Leuw, Cather-Parsons and Associates, Federal Railroad Administration Final Rpt. FRA/NECPO-77/2, F202-37, Oct. 1977, 57 pp

Contract DOT-FR-76048

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-272745/1ST

#### 01 167377

##### RAIL INSPECTION SYSTEMS ANALYSIS AND TECHNOLOGY SURVEY

The study was undertaken to identify existing rail inspection system capabilities and methods which might be used to improve these capabilities. Task I was a study to quantify existing inspection parameters and Task II was a cost effectiveness study to utilize the results of Task I in defining the total costs incurred in inspecting and replacing rail and in defining the most cost effective inspection system. Some of the major findings from these studies were that the practices of stopping for hand check and to mark flaws and of manually processing all data were the major factors presently limiting inspection speeds. It was concluded that use of automatic data processing and elimination of the stops would allow speeds to be increased to about 25 mph (40 kmph) and inspection costs would be reduced by about a factor of

2. It was also concluded that with extensive transducer and carriage development, speeds up to 50 mph (80 kmph) were feasible and would further reduce inspection costs from 0 up to a maximum of about 30 percent depending upon usage. A recommendation was made to develop an inspection vehicle with an ultimate speed capability of 50 mph (80 kmph) or higher.

Kaiser, WD Byers, RH Ensminger, D Meacham, HC Flora, JH  
 Battelle Columbus Laboratories, Federal Railroad Administration,  
 Transportation Systems Center Final Rpt. DOT-TSC-FRA-77-13,  
 FRA/ORD-77/39, Sept. 1977, 229 pp

Contract DOT-TSC-979

ACKNOWLEDGMENT: NTIS  
 ORDER FROM: NTIS

PB-272931/7ST

#### 01 167499

##### CREOSOTE CROSSTIES

Review is made of the history of the development of pressure treatments for crossies from the early nineteen hundreds to date, and the effective increase of tie life that resulted.

Bescher, RH *Crossties* Vol. 58 No. 9, Sept. 1977, p 11

ACKNOWLEDGMENT: Department of Transportation Library  
 ORDER FROM: Railway Tie Association, 314 North Broadway, St Louis,  
 Missouri, 63102

DOTL JC

#### 01 167506

##### MOPAC'S "REORGANIZED" GANGS

By combining and reorienting its track maintenance forces, increasing mechanization and concentrating their activities, Missouri Pacific has increased productivity and controlled costs. The use of two crews, with each assigned to lay a single string of rail in the same track a day apart, has been a feature of the new system. Special crews perform other functions such as rebuilding crossings and turnouts. Attention is directed at perennial soft spots with various methods of stabilization being used.

*Progressive Railroading* Vol. 20 No. 9, Sept. 1977, p 89, Photos.

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

DOTL JC

#### 01 167508

##### BALLAST CLEANING FOR 200 KM/H TRACK

The demands of higher axle loads and high speeds require that British Railways utilize high-quality ballast and that this material be properly maintained. Mechanized cleaning produces significant changes in the track bed and ballast formation and the demand now is for higher performance from this equipment to reduce track occupancy time.

Eden, GA Peers, HC (British Railways Board) *Railway Engineer* Vol. 2 No. 5, Sept. 1977, p 8, 6 Fig.

ACKNOWLEDGMENT: Railway Engineer  
 ORDER FROM: ESL

DOTL JC

#### 01 167512

##### FLASH-BUTT WELDING USING MOBILE ON-TRACK MACHINES

Flash-butt welding of rails in the field is somewhat different from welding in a plant where there is no restriction on weight or longitudinal movement of one rail. Using a machine developed in the Soviet Union, a mobile welding has made up to ten welds per hour in Italy and Austria. Careful control of the process is necessary.

Riessberger, K (Franz Plasser) *Railway Gazette International* Vol. 133 No. 10, Oct. 1977, pp 388-391, 5 Fig., 1 Tab.

ACKNOWLEDGMENT: Railway Gazette International  
 ORDER FROM: ESL

DOTL JC

01 167554

**MONITORING THE QUALITY OF RAILS USING ELECTROMAGNETIC-- ACOUSTIC CONVERTERS**

The mirror-shadow method of ultrasonically testing railroad rails by the noncontact excitation of elastic shear waves is examined. A method is proposed for the testing of rails by the normal and inclined excitation of ultrasound (using electromagnetic--acoustic converters) under the conditions of a rail-welding workshop.

Boldyrev, YP (Leningrad Lenin Order Inst of RR Transport Eng);

Petrov, YV *Soviet Journal of Nondestructive Testing* Vol. 11 No. 4, July 1975, pp 421-425, 7 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

01 167911

**M/W PROBE 5, MO-PAC**

This series of articles presents an in-depth study of the maintenance-of-way policies and practices of the Missouri Pacific Railroad. Strong track is emphasized on the 11,700-mile system where policies such as bunching track gangs, continuing programs during traffic downturns and spending to realize savings are all practiced. The articles: The management viewpoint; Mo-Pac's M/W policy; Bunching work gangs in track rehabilitation produces big benefits; Facets of Mo-Pac bridge practices.

German, J Bertel, DJ *Railway Track and Structures* Vol. 73 No. 11, Nov. 1977, pp 19-29, Photos.

ORDER FROM: ESL

DOTL JC

01 167924

**BART'S OWN RAIL GRINDER SMOOTHS THE RIDE**

Bay Area Rapid Transit has its own Speno rail grinding train which operates each weekend when no passenger service is operated. Regular cycles of grinding, dependent on location, are scheduled for all of BART's 142 miles of double-track line. Curvature, stations, and segments where corrugations develop come in for concentrated attention.

*Progressive Railroading* Vol. 20 No. 10, Oct. 1977, p 61, 2 Phot.

ACKNOWLEDGMENT: Progressive Railroading

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

DOTL JC

01 167931

**FIFTEEN YEARS IN THE SERVICE OF RAILWAYS THROUGHOUT THE WORLD**

After summarizing briefly the types of surface defects in rails and their consequences, the author explains the advantages that experts expect to gain from track re-alignment in situ, not just technically but also economically and as regards safety and comfort. Also described is the SPENO re-profiling process used on over 50 rail networks, urban and mining railways.

Catzeflis, G *Rail International* No. 9, Sept. 1977, pp 465-468

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

01 167949

**NEW METHODS OF TIGHTENING BOLTS WITH A TORQUE WRENCH [Novyj metod natjazheniya bol'tov]**

No Abstract. [Russian]

Vejnblat, BM *Put'i Putevoye Khozyaistvo* No. 8, 1977, pp 30-31, 1 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 167971

**CONCRETE IN TRANSPORTATION CONSTRUCTION (1891-1976)**

The history of concrete pavement for highways and airfields is presented. Examples are given of pioneer projects, and developments in design and construction procedures since 1891 are traced. In addition to pavement, the paper covers the use of concrete in other highway appurtenances including shoulders, resurfacing, concrete Safety Shape barrier, and noise barriers. Recent uses of concrete in railroad and transit structures and the use of concrete in modern people mover systems are also covered.

Ray, GK (Portland Cement Association) *ASCE Journal of Transportation Engineering* Vol. 103 No. 5, Sept. 1977, pp 591-604, 19 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

01 168003

**INTENSIFICATION OF HEATING THE RAILS IN PULSED FLASH BUTT RESISTANCE WELDING [Intensifikatsiya nagreva rel'sov pri kontaktnoi svarke impul'nym oplavleniem]**

It is shown that application of a pulse controller permits one to shorten the time welding, to intensify heating, and stabilize the quality of welded joints. [Russian]

Kuchuk-Yatsenko, SI (Ukraine Academy of Sciences, USSR);

Krivenko, VG Bogorskii, MV *Avtomaticheskaya Svarka* No. 4, Apr. 1977, 4 pp

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

01 168097

**THE ECONOMICS OF 24 YEAR CYCLE TRACK MAINTENANCE USING HIGH SPEED TRACK RENEWAL TRAINS**

This report determines technical and economic feasibility of the track renewal concept of track maintenance, using the European track renewal trains as compared to the traditional method of component replacement on an as needed basis. Using the theory developed in the report, the value of second hand ties is determined, this being used to prove that the cascading of ties that result from the track renewal concept is economically worthwhile. The report is written in a format that enables easy comparison to individual railroad circumstances, justifies the implementation of this concept based on labor, equipment running cost, salvage and scrap tie savings only. A listing of intangible benefits and anticipated disadvantages of this concept is also included.

Burns, DR

Illinois Central Gulf Railroad Oct. 1976, 142 pp, Figs., Tabs., 3 Ref.

ORDER FROM: Illinois Central Gulf Railroad, Engineering Department, 233 North Michigan Avenue, Chicago, Illinois, 60601

01 168116

**PARTICULARITIES IN THE DEFINITION OF BENDING STRESSES IN RAILS, IN THE CASE OF HIGH SPEED RUNNING IN A ZONE WITH IRREGULAR FEATURES**

[Osobennost' opredeleniya izgibnykh naprjazhenij dvizheniya v zone nerovnostiej]

No Abstract [Russian]

Frisman, MA *Vestnik Vniit* No. 3, 1977, pp 32-35, 5 Fig., 3 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 169965

**CHECKING THE TOLERANCES FOR THE ANGLE OF THE RAIL BEARING SURFACE AGAINST THE SLEEPER [Sobljudenie dopuskov na poduklonku podrel'sovykh ploscadok spal]**

No Abstract. [Russian]

Zodzisskij, ML *Transportnoye Stroitel'stvo* No. 9, 1977, pp 22-23, 1 Tab., 2 Phot., 1 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 169966

**THE NEW STANDARDS FOR LONGITUDINAL TRACK CONNECTIONS [O novykh normah soprjazheniya elementov prodol'nogo profilja zeleznykh dorog]**

A short description of the technological norms applied for the construction of railway lines which include radii equal to or greater than 850 m. [Russian]

Blohin, EP *Transportnoye Stroitel'stvo* No. 9, 1977, pp 40-42, 3 Fig., 1 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

01 169977

**BALLAST CONSOLIDATION ON THE SOVIET RAILWAYS**

[Wzmocnianie podsypki na kolejach ZSRR]

The authors deal with the following questions: Reasons for deformation of the ballast, improvement of the quality of the broken stone, the use of asbestos ballast, the influence of ballast size on track distortion and stability, vibrations in the ballast and ways to reduce harmful effects. [Polish]

Albrecht, WG Waryzgin, ES *Problemy Kolejnictwa* No. 75, 1977, pp 7-18, Figs., 2 Tab., 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Problemy Kolejnictwa, Warsaw, Poland

01 170061

**TRACK STRUCTURES PERFORMANCE-COMPARATIVE ANALYSIS OF SPECIFIC SYSTEMS AND COMPONENT PERFORMANCE**

This report presents analyses of data, up to 50 million gross tons of traffic, from the Facility for Accelerated Service Testing (FAST). These analyses include concrete and wood tie track system performance and component performance, rail wear comparisons, ballast depth and type performance, ballast shoulder width, and subgrade performance. In addition, there is a summary of general FAST results to date which includes comments on the major maintenance performed on special trackwork and other sections of the track not specifically addressed in the main chapters of the report. Also, some of the information contained in this report was derived from data from other sources such as the Velim test track in Czechoslovakia.

Prepared in conjunction with U.S. Department of Transportation, Federal Railroad Administration.

Kish, A McConnell, DP McCafferty, RM Moody, HG Sluz, A Transportation Systems Center Techn Rpt. FRA/ORD-77/29, Sept. 1977, 150 pp, Figs., Tabs., 2 App.

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

PB-275177/AS, DOTL NTIS

01 170064

**LATERAL RESISTANCE OF RAILROAD TRACK**

Within the broader scope of research activities dealing with lateral track resistance sponsored by the Federal Railroad Administration, The Sabot test carried out by Chessie on its main line track furnishes specific data on the variability of lateral track resistance. Track panels were constructed with all new wood ties, old and new wood ties and new concrete ties for lateral load testing under various degrees of ballast settlements such as freshly tamped, mechanically compacted and trafficked.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Reiner, IA

Chessie System Final Rpt. FRA/ORD-77/41, Aug. 1977, 124 pp, Figs., 7 Ref., 5 Apps.

Contract DOT-FRA-20015

ACKNOWLEDGMENT: FRA

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PB 275166/AS, DOTL NTIS

01 170071

**LATERAL STABILITY OF BALLAST-BALLAST AND FOUNDATION MATERIALS RESEARCH PROGRAM**

This report presents the results of the lateral stability study of the Ballast and Foundation Materials Research Program. Full-scale lateral stability tests were conducted with a 2-rail, 3-tie system using slag, crushed limestone, and gravel as ballast. Various parameters including Peak Resisting Force and Displacement at Peak Resistance were chosen as possible measures of lateral stability. The results of the study indicate that the differences in the lateral stability behavior of the three ballasts tested is not significant. Also, the results indicate a peak L/V (lateral resistance/vertical force) ratio of about 0.8.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Hay, WW Peterson, HC Plotkin, DE Bakas, PT

Illinois University, Urbana Tech Rpt. FRA/ORD-77/61, Sept. 1977, 54 pp, 11 Fig., 3 Tab., 28 Ref.

Contract DOT-FR-30038

ACKNOWLEDGMENT: FRA

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PB-275035/AS, DOTL NTIS

01 170072

**A STUDY OF RAILROAD BALLAST ECONOMICS**

This report presents the results of Phase V--Economic Evaluation of the Ballast and Foundation Materials Research Program. The present "State of the Art" in the ballast costing area is discussed. The individual ballast costs are quantified to the extent possible using the data base compiled from the literature review and from replies to a survey received from 70 U. S. and Canadian Railroads. A discussion of the differences in ballast performance is presented. An equation to compute the additional cost justified to place a ballast of superior stability is formulated. It has been possible to quantify many of the costs associated with ballasting procedures; however, due to the wide diversity in operating conditions, procedures, gang organization, financial conditions and climatic factors, these costs vary greatly from railroad to railroad since many railroads do not take into account all costs in their costing exercises. The cost derived in this study can be used as an input to a general model for ballast selection.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Hay, WW Baugher, R Reinschmidt, AJ

Illinois University, Urbana Techn Rpt. FRA/ORD-77/64, Sept. 1977, 100 pp, Figs., Tabs., 13 Ref., 1 App.

Contract DOT-FR-30038

ACKNOWLEDGMENT: FRA

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PB-275102/AS, DOTL NTIS

01 170418

**IMPORTS OF NEW RAIL AND THE CRISIS IN THE STEEL INDUSTRY: SIZE-UP OF A COMPLEX SITUATION**

Rail imports to the U.S. have been growing as domestic demand has increased and production capacity has decreased. Imports have come from Canada, Great Britain, Germany and Japan. Cost has often been favorable, but quality control, requirements for special sections, alloys and heat treatment also receive extra attention from foreign producers.

*Railway Track and Structures* Vol. 73 No. 12, Dec. 1977, pp 23-25, 1 Phot.

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01 170421

**NONDESTRUCTIVE MEASUREMENT OF LONGITUDINAL RAIL STRESSES: APPLICATION OF THE ACOUSTOELASTIC EFFECT TO RAIL STRESS MEASUREMENT**

An ultrasonic probe has been designed, evaluated and shown capable of measuring longitudinal stress changes in railroad rails. The probe utilizes the effect of applied stress on wave velocity (acoustoelastic effect) to determine the stress change. Both laboratory and field evaluation has shown that the probe is capable of measuring stress changes with an accuracy of plus or minus 6.9 MN sq m (plus or minus 1 ksi).

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Egle, DM Bray, DE

Oklahoma University Final Rpt. FRA/ORD-77/34.1, Jan. 1978, 113 pp, 47 Fig., 7 Tab., 27 Ref., 2 App.

Contract DOT-OS-40091

ACKNOWLEDGMENT: FRA

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01 170465

**KEEPING ONSITE RAILROAD TRACKS IN GOOD SHAPE**

Although the information presented here cannot make plant engineering personnel into experts on railroad construction, it should serve as a guide to basic inspection and maintenance procedures for tracks on plant property. Tracks should be inspected regularly so that damage can be noted after it occurs, allowing small problems to be caught before they become major repair items. Annual inspection on a sunny spring day when it is easy to find volunteers will not suffice because ice formation on switches and poor

drainage will never be spotted on these days. A monthly tour of the tracks makes a more realistic schedule. All debris should be removed from the track area and from around switches and lights to make tracks safer and to aid in preventing derailments. The inspector should note low elevations along the tracks so they can be checked after a significant rainfall to see if drainage is adequate. Another reason for good drainage that is often forgotten in the warmer months is the prevention of winter icing which can shift tracks and prevent operation of switches.

Glass, JV (General Motors Corporation) *Plant Engineering* Vol. 31 No. 15, July 1977, pp 135-137

ACKNOWLEDGMENT: EI

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DOTL JC

01 170470

#### **AUTOMATED APPROACH TO ULTRASONIC RAIL FLAW DETECTION**

A brief description is given of an ultrasonic rail flaw detection and analysis

system. System components include a microcomputer designed by ENSCO for real time automated data analysis, pulse-echo electronics and sensor probe carriage equipment. The system operates by introducing ultrasonic pulses into the rail from 16 transducers located on the sensor probe carriage. A binary data stream is produced from the returning ultrasonic signals by electronically performing amplitude threshold tests in time gates which correspond to specific regions of the rail being investigated. The resulting binary data can be displayed on an event pen recorder for manual analysis and is input to the microcomputer for automatic identification of the structural signals returning from the rails.

Proc Southeastern Reg 3 Conf Williamsburg, Virginia, April 4-6, 1977.

Howerter, ED (ENSCO, Incorporated); Demuth, HP Cecon, HL Mould, JC

Institute of Electrical and Electronics Engineers Proceeding N 77CHO 1233-6 Reg 3, 1977, pp 303-306, 5 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: IEEE

02 053227

**PERMISSIBLE MASSES PER AXLE FOR TRAILER VEHICLES AS A FUNCTION OF THE WHEEL DIAMETER AND SPEED. THE EFFECT OF VEHICLE AND TRACK PARAMETERS UPON THE LOADS AT A DIPPED RAIL JOINT**

No Abstract.

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

International Union of Railways DT 59/C 113/E, Jan. 1977, 43 pp, 27 Fig., 1 Tab., 2 Ref.

ACKNOWLEDGMENT: UIC  
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DOTL RP

02 053232

**INTERACTION BETWEEN VEHICLES AND TRACK. A SURVEY OF CURRENT PRACTICE CONCERNING TRACK PARAMETERS AND VIEWS ON THEIR INFLUENCE ON VEHICLE RIDING**

The report contains the results of a preliminary enquiry into: the currently used types of rail, rail inclinations, track gauges and wheel tread profiles; the studies made and experience gained regarding the riding stability of vehicles and the wear phenomena on wheelset and rail.

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

International Union of Railways C 116/RP 7/E, Oct. 1976, 11 pp, 6 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

02 053238

**PERMISSIBLE MASSES PER AXLE FOR VEHICLES AS A FUNCTION OF THE WHEEL DIAMETER AND SPEED. VEHICLE MEASUREMENTS TO DEFINE THE PERMISSIBLE MASS PER AXLE FOR WAGONS WITH VERY SMALL WHEELS (DIAMETER LESS THAN 630 MM)**

This report contains the results of measurements with the SGP wagon, equipped with wheels of 350 mm diameter, and with the "Rolling road" wagon, equipped with 500 mm diameter wheels. Measurements with the SGP wagon (wheel diameter the of 350 mm) were made simultaneously on the vehicle and on the track, whereas the measurements with the "Rolling road" wagon (wheel diameter of 500 mm) were made on the track only. These tests allow a permissible mass per axle to be proposed for the wheel diameter range of 330 mm 59 630 mm.

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

International Union of Railways C 113/RP 5, Apr. 1976, 27 pp, 22 Fig., 16 Tab.

ACKNOWLEDGMENT: UIC  
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DOTL RP

02 053248

**BRAKING AND ACCELERATION FORCES ON BRIDGES AND INTERACTION BETWEEN TRACK AND STRUCTURE. BRAKING FORCES ON A PRESTRESSED REINFORCED CONCRETE BRIDGE WITH NEOPRENE BEARINGS**

The report gives results of braking effort measurements on a pre-stressed concrete railway bridge with 21.5 m span, with continuous ballast bed. Part of the tests were made on the bridge supported by steel bearings, the other part on the same bridge with neoprene bearings and the results were compared. The distribution of braking effort into the bridge abutments and rails were measured in the study with a short and a long train. The large influence of the neoprene bearings, which cause forces in rails to be increased, is significant.

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

International Union of Railways D 101/RP 11/E, Apr. 1977, 38 pp, 24 Fig., 14 Tab., 6 Phot., 14 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

02 053252

**INTERACTION BETWEEN VEHICLES AND TRACK. METHODS FOR ASSESSING THE COMFORT QUALITY OF PASSENGER VEHICLES**

After a description of the main methods used to evaluate the riding quality and an indication of the relations existing between them, the difficulties encountered in applying the ISO 2631 standard to rail vehicles are described. Some modifications in the ISO curves are proposed, mainly for the frequencies under 1 Hz and an application example is given. The need for further work is stressed.

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

International Union of Railways C 116/RP 8, 40 pp, 34 Fig., 4 Ref., 1 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

02 151282

**USER EVALUATION OF RIDE TECHNOLOGY RESEARCH**

The 23 organizations queried represent government, carrier, and manufacturing interests in air, marine, rail, and surface transportation systems. Results indicate a strong need for common terminology and data analysis/-reporting techniques. The various types of ride criteria currently in use are discussed, particularly in terms of their respective data base requirements. A plan of action is proposed for fulfilling the ride technology needs identified by this study. (Author)

Mckenzie, JR Brumaghim, SH  
Boeing Company Final Rpt. NASA-CR-2746, D3-11015-1, Nov. 1976, 63 pp

Contract NAS1-13908

ACKNOWLEDGMENT: NTIS  
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N77-11667/1ST, DOTL NTIS

02 153977

**FRICTION-CREEP AND WEAR STUDIES FOR STEEL WHEEL AND RAIL**

Some basic aspects of the friction-creep phenomena in the rolling of a steel wheel on a rail are studied with a qualitative analysis of stress, strain, adhesion and creep in the contact zone and the stresses on the remaining surface of the rail and the wheel. Some pertinent literature on the subject is briefly discussed. A friction-creep test facility was modified and improved to give more accurate friction-creep data. The electrical control and drive system was changed to give accurate speed of rotation and to dynamically brake the two wheels separately. Friction-creep data was taken with braking of both the small and the large wheels. The data obtained with small wheel braking showed higher coefficients of friction than that of the large wheel braking. Some preliminary reasons for the difference are qualitatively discussed. A preliminary study of the nature and progress of wear during rolling was done with two microscopes, installed for each wheel. With the help of a microswitch and flash gun, some qualitative observations were made on one spot on the wheel. Attempts are being made to study the nature and rate of wear quantitatively.

Prepared in cooperation with Association of American Railroads, Washington, D.C., and General Motors Corp., La Grange, Ill. Electro-Motive Div.

Karamchandani, KC Kumar, S Sciammarella, CA Seth, B Nailescu, L  
Illinois Institute of Technology, Association of American Railroads, General Motors Corporation, Federal Railroad Administration Intrm Rpt. IIT-TRANS-75-1, FRA/ORD-76-272, May 1975, 114 pp

Contract DOT-OS-40103

ACKNOWLEDGMENT: NTIS  
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PB-264873/1ST, DOTL NTIS

02 155084

**LOCOMOTIVE TRACK CURVATURE INDICATOR**

The patent application describes a system for dynamically measuring and displaying track curvature information to a locomotive engineer on a

real-time basis. A car mounted sensor produces a variable output responsive to changes in the car's orientation caused by variation in track curvature, a control circuit converts the sensor output into an electrical signal representative of the changes in orientation, and an indicator receives the signal and provides a dynamic display of the derived track curvature information. In a preferred embodiment, the sensor comprises an extendable line having one end attached to a bracket that is connected to the center of a supporting truck cross-frame, while the other end is wound on a retractable supply reel mounted on the car's frame. In response to relative movement between the car's frame and the supporting truck, caused by movement of the car over curved track, the length of the line withdrawn from the reel varies and is monitored by an electrical potentiometer that produces an output signal indicative of track curvature.

This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of application available NTIS.

Vrabel, JD

Department of Transportation Patent PAT-APPL-765-876, No Date, 17 pp

ACKNOWLEDGMENT: NTIS

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PB-264493/8ST, DOTL NTIS

## 02 158657

**LINDA 1: A PROGRAM SYSTEM FOR INVESTIGATION OF THE DYNAMIC BEHAVIOR OF RAILWAY VEHICLES [Linda 1-Ein Programmsystem zur Untersuchung des Dynamischen Verhaltens von Schienenfahrzeugen]**

A computer program is introduced which helps to establish linearized differential equations of motion schematically for any railway vehicle by an element procedure. Apart from the usual elements like springs, masses, and dampers, rigid connecting elements as well as specific railway vehicle elements (e.g. wheel sets) are introduced. At present, conservative and non-conservative eigenvalues and eigenvectors can be calculated by this program. The graphical output of speed dependent eigenvalues as root loci is demonstrated. [German]

Knothe, K Kik, W

Technical University of Berlin, West Germany ILR-11, 1976, 74 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

N77-18782/1ST, DOTL NTIS

## 02 159602

**MEANS FOR IMPROVING THE STEERING BEHAVIOR OF RAILWAY VEHICLES (ABRIDGMENT)**

Three specific means to improve the steering behavior of railway vehicles are under development. A new Canadian design is described which provides for a steering motion of the wheelsets in curves and a damping of the wheelset hunting. A modified conventional freight car truck is now being tested in which the parameters that govern curving and high-speed stability are virtually identical to those of the Canadian truck. However because these trucks use standard truck side frames, the radial curving is limited by the existing side frame clearances to about 4 deg of track curvature. A high speed transit car that uses a positive steering arrangement in addition to the basic construction feature of the truck designs described above is also outlined. Further highlights of these truck designs are outlined. Comments are also made on the truck steering mechanics. The truck designs described here can effect a considerable reduction in wheel wear, rail wear, truck component wear and fatigue, carbody component wear and fatigue, derailments, noise, traction power consumption, and constraints on the layout of rail transportation systems.

This article appeared in TRB Research Record No. 614, Transit Facility Operation.

List, HA (Railway Engineering Associates, Incorporated) *Transportation Research Record* No. 614, 1976, pp 35-37, 4 Fig., 9 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

## 02 162962

**CONTRIBUTION TO METHODOICAL INVESTIGATIONS IN THE WHEEL/RAIL RESEARCH PROGRAMME [Beitrag zum methodischen Vorgehen in dem Rad-Schiene-Forschungsprogramm]**

The methodical procedure is described in a complex research plan for the programme of "Research into the limits of the wheel/rail system" for the GFR Federal Ministry of Research and Technology. The author discusses the procedure and makes additions to it. [German]

Pintag, G *Leichtbau der Verkehrsfahrzeuge* Vol. 20 No. 6, Nov. 1976, pp 105-107, 2 Fig., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Leichtbau der Verkehrsfahrzeuge, Rosenheimer Strasse 145, Munich 80, West Germany

## 02 162963

**THE PROBLEM OF SIMULATING TRACK LAYOUT ON THE TEST BENCH [Zum Problem der Nachbildung von Trassierungselementen auf einem Rollpruefstand]**

The running behaviour of a vehicle in the wheel/rail system is largely influenced by line layout. The influence of line layout on vehicle running can be simulated on the test bench. The author uses a horizontal curve to show his conclusions on the construction of a test bench with a line layout simulation system. He describes the advantages of this type of test bench for examining vehicle running behaviour.

Guenther, C *Leichtbau der Verkehrsfahrzeuge* Vol. 20 No. 6, Nov. 1976, pp 107-112, 2 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Leichtbau der Verkehrsfahrzeuge, Rosenheimer Strasse 145, Munich 80, West Germany

## 02 162964

**THE LAWS OF RAIL VEHICLE RUNNING BEHAVIOR ON TRACK AND ON TEST BENCHES [Die Gesetzmässigkeiten des Laufverhaltens von Schienenfahrzeugen im Gleis und auf Rollpruefständen]**

Theoretical and mathematical methods have been developed for building test benches for examining rail vehicle running behaviour in order to obtain close correlation between results on the test bench and results on track. The running behaviour of a bogie vehicle on the test bench can be described by means of equations established for bogies and for vehicle bodies. Specific data on running behaviour can be obtained by means of this system of equations. [German]

Gramatke, KD Krettek, O *Leichtbau der Verkehrsfahrzeuge* Vol. 20 No. 6, Nov. 1976, pp 112-119, 21 Fig., 15 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Leichtbau der Verkehrsfahrzeuge, Rosenheimer Strasse 145, Munich 80, West Germany

## 02 162965

**TEST BENCH DESIGN [Die Auslegung von Rollpruefstaenden]**

Test benches built for examining vehicle running behaviour have not fully met requirements in the past. It has become necessary to build a new generation of test benches for testing vehicle running behaviour under conditions closer to reality. The main differences between reality and tests result from adhesion, creep, vehicle dynamics and track vibration. The authors describe a project that takes these factors into consideration. [German]

Krettek, O Gramatke, KD *Leichtbau der Verkehrsfahrzeuge* Vol. 20 No. 6, Nov. 1976, pp 120-125, 21 Fig., 24 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Leichtbau der Verkehrsfahrzeuge, Rosenheimer Strasse 145, Munich 80, West Germany

## 02 162966

**BUFFING IMPACT OF WAGONS [Le Tamponnement de wagons]**

The purpose of the study is to examine what takes place in a marshalling yard when one or more wagons are shunted at low speeds of less than 20 km/h towards one or more stationary wagons. General equations are used to examine several different examples. [French]

Raeber, V *Bulletin Technique Vevey* Vol. 37 1977, pp 39-65, 20 Fig., 14 Tab., 5 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ateliers de Constructions Mecaniques de Vevey, 1800 Vevey, Switzerland

02 163244

**STABILITY OF VEHICLES AT HIGH SPEEDS. THEORETICAL STUDY OF THE TRANSVERSAL DYNAMICS OF A BOGIE ON THE TRACK** [Stabilite des vehicules a grande vitesse. Etude theorique de la dynamique transversale d'un bogie dans la voie]  
Brief description is given of the study and programme of calculations worked out to determine transversal movement of a bogie on the track, whatever the range of movement. The results obtained have been confirmed by on line experiments. [French]

Sauvage, G Sartori, C *Revue Generale des Chemins de Fer* Vol. 96 Apr. 1977, pp 207-225, 21 Fig.

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

DOTL JC

02 163301

**INDUCED VIBRATIONS OF A FLEXIBLE GUIDEWAY SUBJECTED TO A LONG RAILROAD TRAIN** [Angefachte Schwingungen einer Elastischen Fahrbahn bei der Ueberfahrt eines Langen Zuges]

The non-uniform mass distribution of a long train is modelled by a periodic continuous load. This moving load can cause resonance and instability of the vibrations of a bridge or a beam-elevated guideway. The amplitude of vibration increases with time, and therefore with the length of the crossing train. An approximation is given for that length where the vibration amplitude reaches some critical value. By suitably relating the beam length to the car length the resonance amplitude can effectively be reduced. [German]

Schweitzer, G (Technical University of Munich, West Germany) *Ingenieur-Archiv* Vol. 46 No. 1, 1977, pp 53-64, 11 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

02 163715

**ASSESSMENT OF THE EFFECT OF THE BODY SUSPENSION SYSTEM ON THE RUNNING STABILITY OF COACHES** [Ocena wplywu ukladu zawieszenia podwozia na statecznosc biegu wagonu osobowego]

Taking as his example two types of coach body suspension, the author describes the effect of the suspension system and its structural parameters on coach running stability. This analysis was carried out using two types of equations for running: a simplified system of differential equations taking account only of the main system parameters and the phenomena linked with vehicle running. [Polish]

Marciniak, Z  
*Pojazdy Szynowe* No. 4, 1976, pp 30-37, 6 Fig., 7 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Pojazdy Szynowe, Warsaw, Poland

02 163716

**VERTICAL EFFECTS OF VEHICLES ON THE TRACK** [Senkrechte Wirkungen der Fahrzeuge auf den Eisenbahnkoerper]

Greater speeds and vehicle axle-loads and line throughput cause heavy stresses for infrastructure which requires repairs. The new methods described require closer knowledge of the forces in infrastructure when under load and an explanation is given of how to measure such stresses. The author also considers the mathematical model of the effect of a moving force in the elastic-isotropic half-space and compares this with the results of laboratory measurements. [German]

Jirsak, Z *DET Eisenbahntechnik* Vol. 25 No. 4, Apr. 1977, pp 166-169, 8 Fig, 2 Phot., 7 Ref.

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

02 163719

**INFLUENCE OF THE DESIGN OF A MOTIVE POWER UNIT ON THE DYNAMIC STRESS ON THE TRACK** [Vlijanie konstrukci tjagovogo privoda na dinamiceskie nagruzki puti]  
No Abstract. [Russian]

Belaev, AI *Vestnik Vniizt* No. 3, 1977, pp 15-19, 2 Fig., 1 Tab., 4 Ref.

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

02 163720

**CALCULATION OF THE EFFECTS OF THE DIFFERENT PARAMETERS OF A MATHEMATICAL MODEL, IN THE CASE OF RUNNING TESTS** [Ucet vlijaniya nekotoryh parametrov matematicheskoy modeli pri issledovanii duizenija zeleznodoroznogo ekipaza po krivoliniijnym ucastkam puti]  
No Abstract.

Ponomarev, BV Mokrij, TF *Vestnik Vniizt* No. 3, 1977, pp 35-38, 9 Fig., 4 Ref.

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

02 163742

**PHOTOGRAMMETRIC MEASUREMENTS DURING LOAD TESTS ON RAILWAY BRIDGES WITH A HIGH VOLUME OF TRAFFIC** [Photogrammetrische Messungen bei Belastungsproben von Eisenbahnbruecken an stark frequentierten Strecken]  
No Abstract. [German]

Abendroth, H Dueppe, RD *Eisenbahntechnische Rundschau* Vol. 26 No. 6, June 1977, pp 388-396, 1 Tab., 10 Phot., 4 Ref.

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

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02 163743

**CONDITIONS WITH WHICH TRACK MUST COMPLY FOR NORMAL OPERATING SPEEDS ABOVE 160 KM/H** [Oberbautechnische Voraussetzungen fuer Regelgeschwindigkeiten ueber 160 km/H]

Results of tests and investigations on the DB aimed at improving track for speeds of up to 200 km/h are presented. The article includes a study of vehicle/track dynamics and defines three track quality criteria to assess safety, riding comfort and vehicle maintenance requirements. [German]

Froehlich, P *Eisenbahntechnische Rundschau* Vol. 26 No. 5, May 1977, pp 301-310, 7 Fig., 1 Tab., 5 Ref.

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

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02 163784

**CONTACT STRESSES FOR CLOSELY CONFORMING BODIES--APPLICATION TO CYLINDERS AND SPHERES**

Since worn wheels and rails contact conformally, the existing contact stress theories for nonconformal contact are not adequate. In this report a general numerical method of solution for three dimensional, frictionless, conformal, elastic contact problems is presented for the first time. The method is used to analyze the conformal contact of a sphere indenting a spherical seat and a cylinder indenting a cylindrical seat. The results of the sphere-spherical seat problem compared well with experimental data. Results of the cylinder-cylindrical seat problem were in close agreement to a known analytic solution of this problem. For both analyses, results compared favorably with Hertzian theory for problems with small contact regions. A method is given for defining the boundaries of the large contact regions, and for solving the associated governing singular integral equation of the first kind. A general iterative procedure is developed which converges to the true three dimensional contact region. In addition the solution to a non-Hertzian contact problem with a multiply connected contact region is solved; namely, the case of two spheres in contact where one of them has a surface defect or pit.

Sponsored by the U.S. DOT's Office of the Secretary, Program for University Research. Technical Monitor for the study was Clifford Gannett, Office of the Secretary, U.S. DOT. See also report dated 22 Apr 75, PB-251238.

Woodward, W Paul, B  
Pennsylvania University, Philadelphia, Department of Transportation,  
(MEAM Report 76-1) Final Rpt. DOT-TST-77-48, Dec. 1976, 272 pp  
Contract DOT-OS-40093

ACKNOWLEDGMENT: DOT, NTIS  
ORDER FROM: NTIS

PB-271033/3ST, DOTL NTIS

02 163794

#### TRACKING & RIDE PERFORMANCE OF ELECTRO-MOTIVE 6-AXLE LOCOMOTIVES

The three-axle truck has been investigated to determine correlation between ride quality and derailment tendency. The tests, instrumentation and interpretation of results are described. The SDP40F was tested on marginal track, in situations where truck hunting can occur, and where it could be compared with two-axle locomotive and freight car trucks heavily loaded. It was concluded that more documentation is needed for the load levels which different North American track structures can safely accommodate in terms of short-duration and cumulative loadings.

Presented at the 13th Annual Railroad Engineering Conference, Pueblo, Colorado, October 12-13, 1976, and included in the Conference Proceedings, "Railroading Challenges in America's Third Century--Improved Reliability and Safety," sponsored by the FRA's Office of Research and Development, U.S. DOT.

Klinke, WR Swenson, CA (General Motors Corporation)  
Federal Railroad Administration Conf Paper FRA/ORD-77/13, July 1977, pp 106-118, 17 Fig., 10 Ref.

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS

02 164407

#### STATIC AND DYNAMIC STABILITY OF A CLASS OF THREE-AXLE RAILWAY VEHICLES POSSESSING PERFECT STEERING

For railway vehicles having coned wheels mounted on solid axles there is, in general, a conflict between stability of lateral deviations from the motion along the track and ability to steer round curves. However, the three-axle vehicle with zero bending stiffness and with shear elasticity between all wheelsets can satisfy the requirements of perfect steering and for a range of values of equivalent conicity possesses both static and dynamic stability. The static and dynamic stability of the most general form of symmetric three-axle vehicles is investigated, and stability criteria derived.

Wickens, AH *Vehicle System Dynamics* Vol. 6 No. 1, May 1977, pp 1-19

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

02 164432

#### VEHICLE DYNAMICS--A PRACTICAL THEORY

The theories permit quantitative assessment of several aspects of vehicle behavior which it was not previously possible to calculate. These include hunting, response of vehicles to rough track and the compromise necessary between lateral stability and curve negotiation.

Wickens, AH Gilchrist, AO (British Railways) *Railway Engineer* Vol. 2 No. 4, Aug. 1977, pp 26-34, 12 Fig., 18 Ref.

ORDER FROM: ESL

DOTL JC

02 164433

#### IMPROVED DATA FROM LOAD-MEASURING WHEELS

Special spoked wheels have been instrumented by British Railways R&D to measure continuously all three directions of force during rotation of the wheel. The force transducer, a two bending-moment principle applied to overcome coupling produced by lateral and vertical forces, and vertical sensitivity increased by contouring the spokes are featured in the instrumentation set-up. The wheelset is installed on BR's laboratory coach and can measure forces at switch and crossing frogs, rail corrugation and other

wheel-rail interactions. The raw data can be processed by an on-board computer.

Pocklington, AR Allen, RA (British Railways) *Railway Engineer* Vol. 2 No. 4, Aug. 1977, pp 37-43, 10 Fig.

ORDER FROM: ESL

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02 165073

#### MEASUREMENT OF TRACK SPRING CONSTANT AND ATTENUATION COEFFICIENT

The movement of rails under passage of a train is attributable to the actions of the track spring system. This spring constant and a vibration attenuation coefficient have roles in riding characteristics of trains, in track deterioration and in generation of noises and vibration. This report suggests a method of obtaining a spring constant by a wheelset drop test and deals with calculation of these indices by interpreting other data.

Sato, Y *Permanent Way* Vol. 18 No. 4, No. 69, June 1977, pp 9-17, 19 Fig., 2 Tab., 2 Phot.

ORDER FROM: Japan Railway Civil Engineering Association, 1-18-7 Higa-shiueno, Taito-ku, Tokyo 110, Japan

DOTL JC

02 167028

#### MOIRE ANALYSIS OF PLANAR ELASTIC CONTACT FOR UNDERSTANDING WHEEL-RAIL TRACTION

The nature of adhesion and creep in the contact region between two planar surfaces with normal and tangential loads is experimentally investigated with moire analysis. This study is aimed at advancing the understanding of adhesion and creep in the contact zone between a steel wheel and rail. The contact region between a silicon block (width 2.4 in., and height 1.6 in.) and a thick plexiglass plate investigated. Loads of 0.33 lbs to 5.01 lbs were applied at angles of 0 degrees to 11.1 degrees from the vertical. Gratings of 300 and 302 lines/inch were placed on the contacting surfaces of the plate and block respectively. Movement of the moire fringes yielded the displacement fields. Analysis of the displacement fields for four loads at four different inclination angles shows that the adhesion zone appears as a region of restrained displacements. It is believed that ideal adhesion (i.e. zero displacements) is possible only for optically flat surfaces, and that surface roughness, as was present in this investigation, is responsible for restrained displacements in the adhesion zone. For only vertical loads, the adhesion zone was in the middle of the contact surface and creep zones were symmetrically placed on two sides. Under increasing load the adhesion zone decreases in size. This is as predicted by theory and the finite element method. Under inclined loads, the adhesion zone moves opposite the direction of horizontal components of loading. The adhesion zone will eventually move to the edge of the contact zone when there is a large enough tangential load. The experimental results were compared with a finite element analysis conducted at I.I.T. earlier and showed good agreement.

Prepared in cooperation with General Motors Corp., La Grange, Ill. Electro-Motive Div., and Association of American Railroads, Chicago, Ill.

Matic, P Kumar, S

Illinois Institute of Technology, General Motors Corporation,  
Association of American Railroads, Federal Railroad Administration  
Intrm Rpt. IIT-TRANS-77-1 No. 6, Apr. 1977, 41 pp

Contract DOT-OS-40103

ACKNOWLEDGMENT: NTIS  
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PB-270639/8ST, DOTL NTIS

02 167061

#### WEAR STUDIES FOR STEEL WHEEL AND RAIL. I. MECHANISMS AND QUALITATIVE ANALYSIS

The report describes some of the recent work done at I.I.T. to understand the mechanisms of wear between wheel and rail, and is based on experiments conducted on the 1:4.5 I.I.T. wheel-rail simulation facility which is briefly discussed in the report. Tests were carried out to establish the effects of load and friction coefficient on wear rate. Techniques were developed to collect and analyze data on wear particles and wear tracks under the scanning electron microscope. Surface finish measurements were also carried out as a function of these parameters. The flake type wear particles obtained in all the tests were explained in terms of a delamination process originating from subsurface crack nucleation and coalescence. A number of SEM photographs are included to support the qualitative analysis presented.



Sponsored in part by Association of American Railroads, Chicago, Ill. and General Motors Corp., La Grange, Ill. Electro-Motive Div.

Krishna, R Kalpakjian, S Kumar, S  
Illinois Institute of Technology, Federal Railroad Administration,  
Association of American Railroads, General Motors Corporation Intrm  
Rpt. IIT-TRANS-77-2 No. 7, June 1977, 71 pp

Contract DOT-OS-40103

ACKNOWLEDGMENT: NTIS

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PB-271045/7ST, DOTL NTIS

## 02 167205

### MODEL VERIFICATION OF LARGE STRUCTURAL SYSTEMS

A methodology was formulated, and a general computer code implemented for processing sinusoidal vibration test data to simultaneously make adjustments to a prior mathematical model of a large structural system, and resolve measured response data to obtain a set of orthogonal modes representative of the test model. The derivation of estimator equations is shown along with example problems. A method for improving the prior analytic model is included.

Lee, LT Hasselman, TK  
Wiggins (J.H.) Company Intrm Rpt. NASA-CR-150317, REPT-  
77-1267, June 1977, 121 pp

Contract NAS8-31950

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

N77-27428/0ST

## 02 167302

### GENERAL MODELS FOR LATERAL STABILITY ANALYSES OF RAILWAY FREIGHT VEHICLES

The report presents the development of general analytical models for use in exploring the nature of freight car hunting and for finding means of controlling the hunting behavior. These models result from one aspect of the Freight Car Dynamics research project conducted by Clemson and Arizona State Universities in cooperation with the Association of American Railroads. First, a model of a wheelset with lateral, yaw, and axle torsional degrees of freedom is developed. Secondly, two such wheelsets are included in a general model of a 9 degree of freedom truck that has lateral, yaw, and warp degrees of freedom in addition to relative lateral and yaw motions of the wheelsets with respect to the truck frame. By suitable choices of primary suspension elements, this general model may be specialized to become (1) a roller-bearing freight truck, (2) a plain-bearing freight truck, (3) a roller-bearing truck with primary suspension elements, (4) a passenger truck, (5) a generic model of a freight truck with interconnected wheelsets, or (6) a rigid truck. Finally, two such truck models are combined with a car body that has lateral, yaw, and roll rigid body degrees of freedom plus two degrees of freedom that serve to approximate the first lateral bending and torsional modes. For all three models, the effects of design parameters on the critical speed for hunting are examined.

Prepared in cooperation with Association of American Railroads, Chicago, Ill. Technical Center and Arizona State Univ., Tempe. Dept. of Mechanical Engineering. See also PB-252 290.

Law, EH Hadden, JA Cooperrider, NK  
Clemson University, Federal Railroad Administration, Arizona State  
University, Tempe, Association of American Railroads Technical Center  
Intrm Rpt. FRA/ORD-77/36, June 1977, 229 pp, Figs., 8 Tab., 51 Ref.,  
3 App.

Contract DOT-OS-40018

ACKNOWLEDGMENT: NTIS, FRA

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PB-272371/6ST, DOTL NTIS

## 02 167345

### STUDY OF FRICTION AND CREEP BETWEEN STEEL WHEEL AND RAIL

A systematic experimental, parametric and similitude investigation of the friction and creep behavior of a steel wheel rolling on a steel rail is given. Laboratory investigation was performed on the 1/5th scale experimental GM-IIT Wheel Rail Simulation Testing Facility reported on earlier. Investigation of the size and area of contact between the two wheels at

different stages of surface wear shows that the initially elliptical (near Hertzian) area of contact changes fast into a near rectangular shape with a several-fold increase, depending on the load and the duration of testing and wear. It was found that Kalkers Theory fits the nondimensionalized data well, when wheel surfaces are near perfectly smooth. The product of actual contact area and creep is always constant for a given normal load and friction coefficient regardless of the surface roughness and wear time. This constancy law was derived on the basis of experimental data. It has been shown here that for the elastic and smooth surfaces the Carter-Poritsky theory also predicts the product of creep and theoretical area of contact as constant for a given load and operating friction coefficient. Generalized expressions for the interrelationship of friction coefficient, creep, actual area of contact, normal load and shear modulus have been established on the basis of experimental data. Recommendations for future design improvements have been made on the basis of these relations.

Sponsored in part by General Motors Corp., La Grange, Ill. Electro-Motive Div., and Association of American Railroads, Washington, D.C.

Sciammarella, CA Press, M Kumar, S Seth, B Nailescu, S  
Illinois Institute of Technology, Federal Railroad Administration,  
General Motors Corporation, Association of American Railroads  
Technical Center Final Rpt. FRA/ORD-76/271, IIT-TRANS-76-2,  
July 1976, 106 pp

Contract DOT-OS-40103

ACKNOWLEDGMENT: NTIS

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PB-272713/9ST

## 02 167379

### DEVELOPMENT OF A SYSTEM TO DISPLAY AND RECORD SLACK ACTION IN FREIGHT TRAINS

This report summarizes the development of a system which senses, displays and records the slack action or inter-car movement in freight trains. The system, called the Draft-Buff Indicator (DBI), was developed to serve as a train-handling aid. It provides the user (railroad training officer, accident investigator or locomotive engineer) with a real-time display of the draft-buff distribution within a moving train and also provides a record of the information for later analysis. The report discusses the development of the sensors, transmitters, receivers and display which make up the system, as well as alternative versions of the system which were considered and rejected for various reasons. The report also discusses the various applications of the system in revenue service and in accident analysis up to the time of publication.

Vrabel, JD Sussman, ED Ofsevit, D  
Transportation Systems Center, Federal Railroad Administration Final  
Rpt. DOT-TSC-FRA-77-2, FRA/ORD-77/53, Aug. 1977, 62 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-272944/0ST

## 02 167507

### GERMAN MINISTRY ROLLER TEST PLANT AT MUNICH

Accurate reproduction of wheel/rail interaction at any speed and monitoring of this dynamic process are achieved by the roller test plant design; construction is being financed by the German Federal Ministry for Development and Technology. The fully computerized control exactly reproduces track conditions. The goals are basic research into vehicle dynamics and permanent way and the development of new railway vehicles.

Althammer, K (German Federal Railway, Munich) *Railway Engineer*  
Vol. 2 No. 5, Sept. 1977, p 15, 16 Fig., 20 Ref.

ACKNOWLEDGMENT: Railway Engineer

ORDER FROM: ESL

DOTL JC

## 02 167566

### SIMULATION ON A TEST MACHINE OF THE ACTUAL PATH OF A VARIABLE SPACING TYPE RAILWAY AXLE [Simulation sur machine d'essais du parcours reel d'un essieu ferroviaire a ecartement variable]

The S.N.C.F. Test Center at Vitry has been entrusted with the development of a test machine for the simulation of the actual path of a railway axle. Previously, tests in service on track have been carried out in different conditions and for different track qualities. Processing the results in a

computer has enabled the definition of the signals for the two excitation paths (horizontal and vertical). From this data it has been possible to design and develop a test machine. Its basic principle is to transmit to the axle in a fixed position the horizontal and vertical stresses through a frame hinged about a fixed point. Stresses are applied by means of slave-controlled hydraulic jacks. The excitation signals transmitted to these jacks are elaborated by a program from data previously recorded and stored. [French]

Jutard, M (French National Railways) *Revue Generale de l'Electricite* Vol. 86 No. 4, Apr. 1977, pp 312-318

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

## 02 167918

### RAIL ROLLOVER--THE STATE OF THE ART

This is a survey and description of work performed in the area of rail overturning. It includes analytical work, as well as test results from both field and laboratory. Comparisons between different tests and their results are made. The various causes and related phenomena are discussed, together with techniques for dealing with this problem.

This Bulletin will be part of Proceedings Volume 79 (1978).

Zaremski, AM (Association of American Railroads) *AREA Bulletin* No. 664, 1977, pp 1-26, 15 Fig., 46 Ref., 2 App.

ORDER FROM: AREA

DOTL JC

## 02 167941

### AERODYNAMICS OF HIGH-SPEED TRAINS BASED ON A COMPARISON OF RESULTS FROM MODEL TESTS, FULL-SCALE MEASUREMENTS AND THEORETICAL STUDIES [Vergleich Zwischen Modellund Originalmessergebnissen Sowie der Theorie zur Schnellbahn-Aerodynamik]

The aerodynamics described were conducted to predict the air resistance for performance calculations, aerodynamic forces for calculation of stability and wheel/rail dynamics and transient air pressures for window or structure loads and passenger comfort criteria. [German]

Neppert, H (Messerschmidt-Boelkow-Blohm); Sanderson, R *Glaser's Annalen ZEV* Vol. 101 No. 4, Apr. 1977, pp 97-102, 30 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

## 02 167951

### RECENT SWEDISH WORK ON RAIL VEHICLE DYNAMICS

Since 1968, the Swedish Railways have done a considerable amount of research on railway vehicle dynamics and running stability. The article gives the main results of work achieved by linear analysis, analog simulation, digital simulation, and hybrid simulation, of models with up to 45 degrees of freedom and very different, sometimes quite new vehicle configurations.

Sjoestedt, LE *Rail International* Vol. 8 No. 9, Sept. 1977, pp 441-448, 8 Fig., 11 Ref.

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

DOTL JC

## 02 167985

### SIMULATION OF MULTIBODY VEHICLES MOVING OVER ELASTIC GUIDEWAYS

This paper describes the present state of a general purpose computer program for calculating the dynamic response of vehicles travelling over guideways which may be elastic. The linearized state-equations of motion for general multibody vehicles are constructed automatically by the program, these equations are supplemented by the equations for the active subsystems. Finally, the vehicle system equations are combined with the modal equations for elastic guideways and the complete set of coupled equations is solved simultaneously by numerical integration.

Kortuem, W Richter, R *Vehicle System Dynamics* Vol. 6 No. 1, May 1977, pp 21-35, 8 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

## 02 168009

### A CAR ROCKING MECHANISM

A car rocking mechanism has been designed and constructed at the Southern Railway's Test Laboratory in Alexandria, Virginia. The mechanism can accept any 100-ton freight car with high center of gravity. Its two electro-hydraulic cradle units impart a rocking motion to the car, which then behaves as it would when moving over rail with staggered joints. Size of low joints, wave form, forward speed, length of rail, and curve conditions can be varied. Any car response, such as roll angle or wheel lift, can be observed and recorded in laboratory conditions.

Contributed by the Rail Transportation Division of ASME for presentation at the Winter Annual Meeting, Atlanta, Georgia, November 27-December 2, 1977.

Reynolds, DJ Blank, RW (Southern Railway System)  
American Society of Mechanical Engineers Conf Paper 77-WA/RT-11, 1977, 8 pp, 5 Fig., 1 App.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

## 02 168011

### TECHNIQUES FOR MEASURING WHEEL/RAIL FORCES WITH TRACKSIDE INSTRUMENTATION

A characterization of the rail loading environment is a key factor in all aspects of improved railroad track performance. The quantitative description of rail loads is a primary input to studies of rail stress, reliability, and failure prediction, as well as other research and testing of rail and track structural components. In addition, the wheel/rail loads provide an important measure of vehicle/track interactive response in terms of reliability and safety of operation. In this paper, techniques for the measurement of wheel/rail loads using trackside instrumentation are discussed, based on experience accrued over two years of field measurements. These trackside measurements have provided a basis for the evaluation by AMTRAK of new locomotives and passenger equipment, and were used in a Department of Transportation-sponsored program for evaluating loads on concrete-tie track. Wheel/rail load data representative of freight and passenger traffic are presented to illustrate an application of the measurement techniques.

Contributed by the Rail Transportation Division of ASME for presentation at the Winter Annual Meeting, Atlanta, Georgia, November 27-December 2, 1977.

Ahlbeck, DR Harrison, HD (Battelle Columbus Laboratories)  
American Society of Mechanical Engineers Conf Paper 77-WA/RT-9, 1977, 8 pp, 10 Fig., 10 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

## 02 168013

### RIDE QUALITY OF AUTORACK CARS

In order to measure the ride quality of freight cars used in the transportation of automobiles, an over-the-road instrumented test was conducted. Various suspension arrangements were tested including several that contained supplementary hydraulic dampers. Their recent application to certain autorack cars posed a question as to their effectiveness and contribution to vertical ride quality and it was considered important to evaluate their performance. Further, other suspension arrangements not incorporating the use of supplementary hydraulic dampers were tested to determine if ride quality could be improved in other ways. The object of these tests, then, was to determine the effect that various levels of spring stiffness, friction damping, and the application of supplementary hydraulic damping devices have on the ride quality of an autorack car. Ride quality, for the purpose of this test report, will be defined as the level of vertical acceleration (both RMS and magnitude) measured at the longitudinal car center line over the body centerplate on the A-deck.

Contributed by the Rail Transportation Division of ASME for presentation at the Winter Annual Meeting, Atlanta, Georgia, November 27-December 2, 1977.

Greenfield, LP (Trailer Train Company); McLean, LA (Seaboard Coast Line Railroad); Wolf, EJ (Trailer Train Company)  
American Society of Mechanical Engineers Conf Paper 77-WA/RT-7, 1977, 10 pp, 22 Fig., 4 Tab.

ACKNOWLEDGMENT: ASME

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DOTL RP

02 168016

**HIGH-SPEED LATERAL STABILITY OF A FREIGHT CAR RELATED TO MODIFICATIONS OF CONVENTIONAL TRUCKS**

High speed lateral stability of freight cars is one facet of a truck performance mode requiring improvement in control. A 70-ton (63.6-mt) freight car truck of conventional three-piece design was analyzed and tested on a dynamic simulator leading to recommendations for truck modifications to improve high speed lateral stability. These modifications and other were later field tested with a 70-ton (63.6-mt) freight car to demonstrate the degree of control derived from single as well as multiple changes to the truck. The results are presented in terms of RMS graphs.

Contributed by the Rail Transportation Division of ASME for presentation at the Winter Annual Meeting, Atlanta, Georgia, November 27-December 2, 1977.

Andresen, JA Byrne, R (Southern Pacific Transportation Company)  
American Society of Mechanical Engineers Conf Paper 77-WA/RT-4,  
1977, 4 pp, 10 Fig., 1 Ref.

ACKNOWLEDGMENT: ASME

ORDER FROM: ESL

DOTL RP

02 168057

**A VISIT TO THE USSR SHCHERBINKA RAIL TEST LOOP**

The Shcherbinka rail test loop, completed in 1932, includes a 6-km (3.7 mile) outer ring with a perfectly circular and perfectly level track of 965-m (3136 ft.) radius that provides absolutely uniform resistance for locomotive testing. Today, the test loop also includes two slightly shorter inner rings that have tangent inserts and grades to make possible other types of tests. The test center also includes a laboratory with a wheel-rail rig that permits testing of the dynamics of an individual wheel set and another that makes possible per-wheel weighing of rolling stock. In all there are a couple of dozen specialized laboratories in the test track area where investigations precede or supplement the running tests carried out on the closed loops. Among these installations is one for electric rolling stock, not only components, but also complete new locomotives and cars may be appraised. Thyristors and diodes for traction circuits, commutatorless traction motors, and electrical coupling of the axles of ac locomotives have all been investigated. A related facility works on catenary and pantograph problems, checking wear of contact wires, effectiveness of insulators, and methods of minimizing oscillations in the overhead system. The railroads of Russia are among the only ones on which freight operations correspond closely with those conducted in North America in terms of distances, train speeds, axle loadings and train weights. Shcherbinka has a major role in developing the design and maintenance standards that become mandatory for the 26 regional railway administrations. The regional groups must then do the maintenance and run the trains that handle more than 60 percent of all Russia's freight movement.

Houser, FN *Transportation Research News* No. 73, Dec. 1977, pp 2-4, 4 Phot.

ORDER FROM: TRB Publications Off

02 169955

**MOVEMENT OF NON-STATIONARY AIR IN UNDERGROUND TUNNELS. AN APPROXIMATION METHOD FOR EVALUATING AIR CURRENTS [Die instationaere Luftstroemung in U-Bahn-Tunneln. Eine Naeheruungsloesung zur Berechnung des Anfachvorganges]**

Equations can be obtained for evaluating air currents produced by trains in tunnels by means of an approximation method of evaluating the increase in speed of an underground trainset as the driver accelerates after stopping in a tunnel. The results of calculations have been compared against results obtained from measurements and both coincide with each other. [German]

Rohne, E *Schweizerische Bauzeitung* Vol. 95 No. 40, 1977, pp 705-711, 14 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Verlags-Ag der Akademischen Technischen Vereine, Postfach 630, 8021 Zurich, Switzerland

DOTL JC

02 169961

**THE "VEHICLE" SUB-SYSTEM IN THE RAIL/WHEEL RESEARCH PROGRAMME OF THE FEDERAL MINISTRY FOR RESEARCH AND TECHNOLOGY [Das Subsystem "Fahrzeug" im Rad/Schiene-Forschungsprogramm des Bundesministeriums fuer Forschung und Technologie]**

Since 1972 the West German Ministry for Research and Technology has been subsidizing a large-scale project of investigation into the limitations of the wheel/rail system. Work in connection with vehicles consists mainly of basic research on track/vehicle interaction, construction of an experimental laboratory-vehicle and manufacture of bearings to be tested on test units. The results are intended to provide a basis for making decisions on transport policy, to compare unconventional transport systems and improve wheel/rail techniques. [German]

Luebke, D *Eisenbahningenieur* Vol. 28 No. 9, 1977, pp 350-353, 3 Phot., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

02 169973

**MEASUREMENT OF PRESSURE ON THE TRACK BED EXERTED BY VEHICLES RUNNING AT HIGH SPEEDS [Bodendruckmessungen bei Schnelfahrten]**

Report on the measurements taken by the DB during high speed tests on the line between Bielefeld and Hamm. The article describes the measuring equipment and tells of the results obtained when BR 103 and other locomotives covered 6 types of track at 160 km/h: Slab track, track laid on ballast and various types of concrete ties, with and without rubber pads, and track with wooden crossties. [German]

Erler, HJ *Eisenbahntechnische Rundschau* Vol. 26 No. 9, Sept. 1977, pp 593-596, 10 Fig., 6 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

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

DOTL JC

02 170056

**TRAIN-TO-TRAIN REAR END IMPACT TESTS--VOLUME I--PRE-IMPACT DETERMINATION OF VEHICLE PROPERTIES**

This final report documents these nine tests. Volume I, Pre-Impact Determination of Vehicle Properties, summarizes the vehicle properties obtained prior to the impact tests. These vehicle properties were used in computer simulation of the impact tests and included weights, pitch moments of inertia, spring rated, vertical center of gravity location, and linear dimensions. Volume II, Impact Test Summaries, describes the impact tests. The impact tests were remotely controlled with impact speeds ranging from 3 to 30 mph. An array of approximately 20 high-speed cameras and 50 channels of data, including accelerations, strains, and displacement, documented the impacts. Volume III, Impact Test Summaries Appendix, is an appendix to Volume II. It contains the original data of the impact test.

Available in set of 3 volumes, PB 274415. See also vol. 2 RRIS 02 170057 and Vol. 3 RRIS 02 17058. Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Anderson, RL

Ultrasystems, Incorporated, (DOT-TSC-FRA-76-7, I) Final Rpt. FRA-/ORD-76/303, I, Mar. 1977, 100 pp, 62 Fig., 16 Tab., 1 App.

Contract DOT-TSC-840-1

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

PB-274416/AS, DOTL NTIS

02 170057

**TRAIN-TO-TRAIN REAR END IMPACT TESTS--VOLUME II--IMPACT TEST SUMMARIES**

This final report documents these nine tests. Volume I, Pre-Impact Determination of Vehicle Properties, summarizes the vehicle properties obtained prior to the impact tests. These vehicle properties were used in computer simulation of the impact tests and included weights, pitch moments of inertia, force deflection characteristics, vertical center of gravity

location, and linear dimensions. Volume II, Impact Test Summaries, describes the impact tests. The impact tests were remotely controlled with impact speeds ranging from 3 to 30 mph. An array of approximately 20 high-speed cameras and 50 channels of data, including accelerations, strains, and displacement, documented the impacts. Volume III, Impact Test Summaries Appendix, is an appendix to Volume II. It contains the original data of the impact test.

Available in set of 3 volumes, PB 274415. See also volume I RRIS 02 170056 and volume 3, RRIS 02 170058. Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Anderson, RL Cramer, PL  
Ultrasystems, Incorporated, (DOT-TSC-FRA-76-7, II) Final Rpt.  
FRA/ORD-76/303, II, 7703, 124 pp, 72 Fig., 14 Tab.

Contract DOT-TSC-840-3

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

PB-274417/AS, DOTL NTIS

## 02 170058

### TRAIN-TO-TRAIN REAR END IMPACT TESTS--VOLUME III--APPENDIX A: IMPACT TEST DATA--APPENDIX B: REPORT OF INVENTIONS

This final report documents these tests. Volume I, Pre-Impact Determination of Vehicle Properties, summarizes the vehicle properties obtained prior to the impact tests. These vehicle properties were used in computer simulation of the impact tests and included weights, pitch moments of inertia, force deflection characteristics, vertical center of gravity location, and linear dimensions. Volume II, Impact Test Summaries, describes the impact tests. The impact tests were remotely controlled with impact speeds ranging from 3 to 30 mph. An array of approximately 20 high-speed cameras and 50 channels of data, including accelerations, strains, and displacement, documented the impacts. Volume III, Impact Test Summaries Appendix, is an appendix to Volume II. It contains the original data of the impact test.

Available in set of 3 volumes, PB 274415. See also Volume I, RRIS 02 170056 and volume 2, RRIS 02 170057, Bulletin 7801. Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Anderson, RL Cramer, PL  
Ultrasystems, Incorporated, (DOT-TSC-FRA-767, III) Final Rpt.  
FRA/ORD-76/303, III, Mar. 1977, 342 pp, Figs., 2 App.

Contract DOT-TSC-840-3

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

PB-274418/AS, DOTL NTIS

## 02 170095

### SUSPENSION DYNAMICS, VOLUME 1. TRUCK SUSPENSION

This study is a further extension of the Harmonic Roll Series case studies reported on by Track Train Dynamics, Phase I, in Volumes I to IV (R-172, R-173, R-174, and R-184). It is essentially the first part of an extensive parametric study to be conducted during Track Train Dynamics, Phase II. This study, similar in scope to the previous investigations, concerns itself with the roll problem as well as the bounce phenomenon. The purpose of the work contained herein is to aid car and truck designers by showing the effects of changes in various parameters on roll and bounce behavior. In some instances computer simulations are the only method which can be used to check performance; i.e., checking wheel lift and other tendencies. Obviously, for safety reasons, field testing of potentially dangerous conditions would be precluded.

An International Government-Industry Research Program on Track-Train Dynamics.

Korpics, FJ  
Association of American Railroads, Railway Progress Institute,  
Transport Canada Research and Development Centre Tech Rpt. R-224,  
Nov. 1976, 89 pp, 48 Fig., 5 Tab., 4 App.

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

DOTL RP

## 02 170099

### THE DRAG ON VEHICLES IN TUNNELS

Conditions simulating a high speed ground transportation vehicle travelling in a long tunnel have been experimentally and analytically investigated to determine the effects of certain factors on the aerodynamic drag of the vehicle. The same vehicles and tube were used in two types of tests. In one, the vehicle was in a flowing air stream but remained stationary with respect to the tube, simulating wind tunnel testing. In the other the vehicle was propelled along the tube under air flow conditions simulating an infinitely long tube. The results show that the relative motion of the wall reduces the drag by the significant factor of about 45 percent in the range of this study. Compressibility effects are shown to be important at low vehicle speeds. The analytic prediction for choking in the annular region is experimentally verified. The presented variation of drag co-efficient as a function of velocity provides a transition between the extensive data which is available for drag coefficient at Mach number zero and available data at high Mach number with essentially constant Reynolds number.

Harman, CM Davidson, JV *High Speed Ground Transportation Journal*  
Vol. 11 No. 2, June 1977, pp 177-187

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

## 02 170420

### LATERAL/VERTICAL MODEL, USER'S MANUAL

This report represents the user manual documentation for the Lateral/Vertical Computer program. The program described simulates the dynamic responses of a freight car truck with flanged wheels. Emphasis is on the wheel-rail interaction. The program can be used to study freight car derailments due to wheel climb. Also, high speed hunting can be studied. The program model describes a single freight car truck with a suspended mass on top. L/V (Lateral force/Vertical force, a derailment tendency coefficient) is part of its output.

This is a Computer Program Documentation Report and an International Government-Industry Research Program on Track Train Dynamics.

Rockefane, RC Tse, YH Martin, GC  
Association of American Railroads Technical Center R-237, Feb. 1977,  
74 pp, 5 Fig., 4 Ref., 2 App.

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

DOTL RP

## 02 170447

### HYBRID SIMULATION OF A RAILWAY BOGIE [Hybridsimulering av en jarnvagsboggie]

The purpose of the report is to supplement the stability analysis with a time history simulation. A mathematical model of a railway bogie running on an arbitrarily shaped, flexible track was programmed. The intention was to verify the usefulness of hybrid simulation methods for train simulation. Great attention was paid to solving the practical problems involved. The aim was to get an interactive system with very high accessibility.

Knoll, G Sjustedt, L Lindqvist, B  
Swedish State Railways 1976, 90 pp

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Swedish State Railways, Development Department, Stockholm, Sweden

## 02 170473

### LONGITUDINAL VIBRATIONS OF A BEAM WITH A MOVING LOAD

In the present paper the longitudinal vibrations of a hinged statically determinate beam acted upon in the longitudinal direction by a moving concentrated load is examined. It is assumed that there are no resisting forces and the problem is solved both by taking account of the inertia of the load and the approximation that neglects it.

Dmitriev, AS *Soviet Applied Mechanics* Vol. 12 No. 2, Feb. 1976, pp 182-186

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

02 170624

**MINIMUM TANGENT LENGTH BETWEEN REVERSE CURVES  
FOR SLOW SPEED**

The objective of this report is to determine the minimum tangent length between reverse curves for slow speed operation. Within the report reverse curves from 6 deg through 16 deg which have no spiral and no superelevation were studied. The test train consists were operated at speeds equivalent to 3 inches of unbalanced superelevation. The Quasi-Static Lateral Train Stability Model program was used to determine the maximum L/V (lateral/Vertical forces) ratio and the maximum coupler lateral angles and this information was analysed to determine minimum tangent lengths.

Gatton, CL

Association of American Railroads Technical Center Tech Rpt. R-228,  
Oct. 1976, 44 pp

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

03 053229

## TESTS WITH AUTOMATIC COUPLERS: WORK CARRIED OUT BY THE SPECIALISTS COMMITTEE B51 FROM JANUARY 1974 TO DECEMBER 1975 AND STATE OF THE STUDIES AND TESTS MADE IN CONNECTION WITH THE INTRODUCTION OF THE AUTOMATIC COUPLER

The report gives information about the state of the work in connection with the introduction of the automatic coupler and the studies and tests carried out in this respect in the reporting period from January 1974 to December 1975. The following questions are discussed in particular: performance tests with automatic couplers of the basic type (UIC 1969e); studies and tests in connection with the design of a special version of the automatic coupler for passenger coaches and first design of such a coupler body; further studies to overcome the effect of longitudinal compressive forces in the train formation by using different variants of universal articulations; studies and tests concerned with the unrestricted use of passenger coaches in freight trains; studies with passenger coaches with automatic couplers, with mixed mechanical couplers and mixed airline connectors, with improved intermediate pieces for train ferry operations, with cross-beam and sliding cradle suspension as well as relating to the question of coupler stresses and wear properties in operation; studies concerned with the question of the use of the electro-pneumatic brake; acceptance tests with a) variants of the coupler body, b) exchange components; state of the work on UIC and joint UIC/OSJD leaflets.

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

International Union of Railways B51/RP18/E, Oct. 1976, 130 pp, 33 Fig., 5 Tab.

ACKNOWLEDGMENT: UIC

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DOTL RP

03 053230

## WHEELSETS WITH ASSEMBLED AXLEBOXES: DESIGN, MAINTENANCE AND STANDARDISATION. CALCULATION OF AXLES, PART 1: FORCES AND MOMENTS TO BE TAKEN INTO CONSIDERATION; RECOMMENDED GEOMETRIC FORMS AND SURFACE CONDITIONS

Commencing from the axle calculation methods used by different railway administrations (or by axle manufacturers) and the measurements made during line tests, the report proposes vertical and lateral forces to be allowed for in the calculation of wagon-axes. The incidence of the forces introduced by braking (on the wheel or with axle mounted discs) has also been examined. In taking the experience of some major administrations as a basis (experimental studies and service results) the report also proposes some recommendations on the subject of geometric forms to be adopted for the different constituent parts of an axle (relative dimensions and transitions between sections of different diameter) and the preferred surface conditions on the different parts. The complete axle calculation method will form the subject of a comprehensive report which will include the recommendations of the present report.

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

International Union of Railways B136/RP3/E, Oct. 1976, 30 pp, 6 Fig., 2 Tab.

ACKNOWLEDGMENT: UIC

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03 053233

## STANDARDISATION OF WAGONS. SPECIFIC SPRING DEFLECTION OF LEAF SPRINGS

The report deals with the mean specific spring deflection  $C(a)$ , value used for characterising leaf springs and it also contains indications for the determination and practical measurement of this magnitude. A uniform calculation procedure to determine this magnitude, deduced empirically from existing calculation formulae is valid for most of the springs with linear characteristics, as shown during the verification of springs made for this purpose. Furthermore, a relation is revealed between the mean specific spring deflection and the overall spring deflection in the double link suspension and for both numerical value pertaining to the usual spring designs are indicated. The indications concerning springs used in operation may furnish a basis for further investigations.

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

International Union of Railways B12/RP 25/E, Oct. 1976, 43 pp, 11 Fig., 4 Tab.

ACKNOWLEDGMENT: UIC

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DOTL RP

03 053245

## DEVELOPMENT OF A DEVICE FOR THE DETECTION OF WHEEL-FLATS OF A CERTAIN SIZE. COMPARATIVE STUDY OF THE KOLUMBUS AND JUL 400 DETECTORS IN TRAFFIC

The final report compares the results of the application in traffic of the Kolumbus and JUL 400 detectors with CSD, MAV, CFF, SJ and PKP and conclusions are given.

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

International Union of Railways A 110/RP 5/E, Apr. 1977, 25 pp, 1 Fig., 4 App.

ACKNOWLEDGMENT: UIC

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03 053246

## DISTRIBUTION OF THE TEMPERATURE IN ICE COOLED OR MECHANICALLY REFRIGERATED VEHICLES. COMPARISON OF AIR DISTRIBUTION SYSTEMS IN A 20' REFRIGERATED CONTAINER--PART II

The tests described in this report were carried out at the Vienna Arsenal Testing Station as well as at the Railway Research Institutes in Rome and Warsaw and are a continuation of the tests described in the preceding report RP 2. This was connected with the aim of checking the possibility of improving the temperature distribution in a mechanically refrigerated container by modifying the air circulation system as well as checking the influence of load conditions.

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

International Union of Railways Final Rpt. B 127/RP3/E, Apr. 1977, 22 pp, 47 Fig., 5 Tab.

ACKNOWLEDGMENT: UIC

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DOTL RP

03 154021

## LTV/SIG METROLINER TRUCK TEST

No Abstract.

Set includes PB-265 134 thru PB-265 136, RRIS 154022 thru 154024; RRIS 03 154022-23 in RRIS Bulletin 7702, 03 154024 in RRIS Bulletin 7801.

Vought Corporation, Federal Railroad Administration 3 Vols., 1975, 567 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265133-SET/ST, DOTL NTIS

03 154024

## LTV/SIG METROLINER TRUCK. FINAL DESIGN REPORT

The Vought Systems Division of the LTV Aerospace Corp. (LTV) in association with the Swiss Industrial Company (SIG) of Neuhausen Rhine Falls, Switzerland, has designed, manufactured, and tested the LTV/SIG Truck under contract to the Department of Transportation (DOT). The LTV/SIG Metroliner Truck design was derived from the SIG M-Type Truck. The primary design objective of the program, performed under contract to DOT, was to provide a truck having improved ride comfort at speeds to 160 mph for the Penn Central Metroliner route. The design features a welded steel frame and bolsters, a coil spring/bellcrank primary suspension, an air spring secondary suspension, and elastomeric components to minimize noise/vibration transmission. A worn wheel profile is used with its attendant advantages in wear and maintenance. Truck designs were completed to allow the use of either General Electric or Westinghouse propulsion systems. However, only the former configuration was completed

through final assembly due to the unavailability of government-furnished Westinghouse traction equipment. Because most of the analysis and design was done in Switzerland, the metric notation is used extensively in this report.

See also volume 2, PB-265 135, RRIS 03 154023, 7702. Also available in set of 3 reports PC E09, PB-265 133-SET.

Bumgardner, HM Dean, FE Hall, DW, II  
Vought Corporation, Federal Railroad Administration Final Rpt.  
FRA/ORD-76/250, Aug. 1975, 345 pp

Contract DOT-FR-20049

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-265136/2ST, DOTL NTIS

03 162950

**LIGHT ALUMINIUM ALLOY COACHES FOR SHORT DISTANCE TRAFFIC [Nahverkehrswagen in Aluminium-Leichtbauweise]**

The weight of this coach is 3,720 kg less than the similar light-weight coach made of steel, yet the bodywork meets the strength stipulations of UIC Leaflet 567-1. Simplifications in production as a result of bodywork design have cut down manufacturing time which compensates almost entirely for the extra cost of using aluminium. [German]

Heiss, M *Eisenbahntechnische Rundschau* Vol. 26 No. 3, Mar. 1977, pp 123-130, 6 Fig., 2 Tab., 4 Phot., 2 Ref.

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

DOTL JC

03 162955

**GLASS FIBRE REINFORCED RESIN MATERIALS FOR THE CONSTRUCTION OF RAILWAY VEHICLES [Glasfaserkunststoffe fuer den Bau von Schienenfahrzeugen]**  
No Abstract. [German]

Wagener, K *Leichtbau der Verkehrsfahrzeuge* Vol. 21 No. 1, Jan. 1977, pp 21-24

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Leichtbau der Verkehrsfahrzeuge, Rosenheimer Strasse 145, Munich 80, West Germany

03 162961

**A 9-CAR MECHANICALLY-REFRIGERATED TRAIN FOR INTERNATIONAL TRAFFIC [9-Wagen-Kuehlzug fuer den Transitverkehr]**

This train was built to meet the transport requirements of UIC Member Railways. In addition to the central power supply from a special car, another feature is that the cars can be mechanically refrigerated individually. The technical and economic parameters of this new train are compared against those of earlier models to show the improvements made by the use of large sections and special insulating materials.

Fietsch, H *DET Eisenbahntechnik* Vol. 25 No. 3, Mar. 1977, pp 106-110, 2 Fig., 2 Tab., 2 Phot., 7 Ref.

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

03 163224

**STUDY ON FATIGUE LIFE OF CAR-AXLE**

An evaluation of the fatigue life of a car axle under service loads is made. Experimental data and theoretical analyses are used for appraising stress frequency distribution, the fatigue life for the press-fit axle and actual service life.

Tanaka, S *Railway Technical Research Inst Quarterly Reports* Vol. 18 No. 1, Mar. 1977, pp 25-31, 10 Fig., 2 Tab., 1 Phot., 6 Ref.

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

DOTL JC

03 163225

**IMPROVEMENTS OF THE INTERIOR-TYPE PLYWOOD AND FLOOR BOARD OF FREIGHT CARS**

Japanese National Railways initiated development of a freight-car lining material superior to plywood and a flooring which would outperform the wood planks previously used. Test equipment was developed to measure impact strength and other qualities of existing and proposed materials. Composites of polyester plate and plywood showed best promise for lining and Laminated-Veneer Lumber for flooring. A method of repairing holes in wood lining and floors was also developed.

Yamano, K *Railway Technical Research Inst Quarterly Reports* Vol. 18 No. 1, Mar. 1977, pp 32-33, 4 Fig., 1 Tab.

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

DOTL JC

03 163231

**FREIGHT ROLLING STOCK DEVELOPMENTS SINCE 1965, AND FUTURE PROSPECTS: REPORT ON THE FRENCH RAILWAY INDUSTRIES, STUDY OF RAILWAY TECHNOLOGY**

Freight cars built for French National Railways over the past decade are characterized by their specialized design and new technical features. Four-axle cars are replacing two-axle cars and details are given of trucks, brake equipment, axle loads and ability to operate at high speeds. Various types of closed, open-top and flat cars are described.

Sorel, M (French National Railways) *French Railway Techniques* No. 1, 1977, pp 15-38, 34 Fig., Tabs.

ORDER FROM: ESL

DOTL JC

03 163264

**WROUGHT STEEL RAILWAY WHEELS--A BASIS FOR DEVELOPMENT**

A description is given of the areas of wrought railroad wheel development which are being actively pursued in Australia including abrasive wear resistance of wheel steels, resistance of wheels to fracture, residual stress distribution, and profile design to match applied loading conditions.

McDonald, RJ (Commonwealth Steel Company Limited); Mair, RI *BHP Technical Bulletin* Vol. 20 No. 2, Nov. 1976, pp 7-14, 14 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

03 163266

**PROTOTYPE TESTS FOR DRY FREIGHT CONTAINERS**

The structural tests which are understood to be included in the ISO Prototype Tests are discussed. Requirement for repetitive testing of dimension is evaluated.

*Cargo Systems International* Vol. 4 No. 2, Feb. 1977, 2 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

03 163290

**STRENGTH OF THE SHRINK FIT ON A SHAFT AND STRESSES IN A COMPOSITE WHEEL DURING SHRINK FIT ASSEMBLY**

The application of a shrink fit assembly for joints with an interference instead of a press fit ensures a higher strength for them and simplifies the assembly technology. The results of an investigation carried out to determine the parameters for the shrink fit assembly of a wheel pair for a narrow-gauge diesel locomotive are examined.

Andreev, GY *Russian Engineering Journal* Vol. 56 No. 4, 1976, pp 56-58, 1 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

03 163296

**SWISS-EXPRESS COACHES OF THE FEDERAL SWISS RAILWAYS [Le vettura Suisse-express delle ferrovie federali svizzere]**

A detailed description of the new coaches, designed to provide maximum comfort and allow high speeds on the winding Swiss railways is given.



Aluminum is used very extensively both in the frame and in the cladding. Alloys used are extruded and rolled Al-Zn-Mg and rolled Al-Mg3. Welding is used throughout the structure. [Italian]

Geiser, JP *Alluminio* Vol. 45 No. 12, Dec. 1976, pp 636-640

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

03 163306

## STRAIN GAUGING OF ALUMINIUM HOPPER WAGONS

The development of quite serious and unexpected fatigue cracks in a number of aluminum hopper wagons, hauling coal in Central Queensland, led Queensland Railways to a program of investigation in an attempt to define the operating stresses which were affecting the structural integrity of the vehicle. The vehicle is of a complex design and difficult to analyze on paper, and it appeared that the stresses may have been higher in some regions than would be predicted. Practical stress analysis using strain gaging to define the service stresses imposed on the vehicle is presented.

Schonfeld, D (Queensland Railway, Australia) *Non-Destructive Testing (Australia)* Vol. 13 No. 10, Oct. 1976, pp 9-15

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

03 163713

## SIMULATION OF HOT BOXES. THE DB HAS BUILT A COMPUTER-CONTROLLED TEST BENCH FOR WHEELSET BEARINGS [Heisslaeufer werden simuliert. Bundesbahn errichtete rechnergesteuerten Radsatzlager-Pruefstand]

The test bench brought into service in Minden is designed for testing two bearings at the same time at speeds up to 400 km/h. This test bench is necessary for safety in railway operations in view of the increasingly high speeds and axle-loads. [German]

VDI Nachrichten Vol. 31 No. 6, 1977, 8 pp, 2 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VDI-Verlag GmbH, Postfach 1139, Graf-Recke-Strasse 84, 4 Dusseldorf 1, West Germany

03 163714

## RESEARCH ON WEAR-RESISTANT MATERIALS FOR RAILWAY ROLLING STOCK WHEELS [Werkstoffentwicklung fuer verschleissaeermere Eisenbahnraeder]

A study of work-hardened running surfaces of wheels, carried out with an electron microscope, has shown that the formation of carburized particles was a significant factor in wear. The rolling movement in contact with the rail destroys the flakes of cementite, and particles are detached from the texture of the metal. At the same time, flakes of ferrite, which are soft originally, are cold-hardened by the running movement, and cause cracks. The article reports on research to improve resistance to wear and thermal shock in steels used for making wheels. [German]

VDI Nachrichten Vol. 31 No. 20, 1977, 18 pp, 9 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: VDI-Verlag GmbH, Postfach 1139, Graf-Recke-Strasse 84, 4 Dusseldorf 1, West Germany

03 163723

## RESEARCH INTO THE OPTIMUM SIZES OF SUB-ASSEMBLIES IN COACH BODYWORK CONSTRUCTION [Untersuchungen zur optimalen Sektionsgrosse im Reisezugwagen-Rohbau]

On the basis of current practice in rail vehicle construction and literature on efforts to achieve rational construction, a study has been carried out into the technical problem of bodywork construction by assembling a larger number of parts and sub-assemblies, taking the specific case of coach body roofs and sides as an example. Results underline the advantages of having fewer components and show the link between the number of components and the cost of production. [German]

Terbst, W *DET Eisenbahntechnik* Vol. 25 No. 4, Apr. 1977, pp 154-156, 7 Fig., 6 Ref.

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

03 163755

## ASPECTS DETERMINING THE SPRINGING OF RAIL VEHICLES AT HIGH SPEED [Bestimmende Gesichtspunkte zur Schienenfahrzeugabfederung bei hohen Geschwindigkeiten]

The article shows mathematical diagrams representing five types of suspension, including the Czechoslovak inclined spring suspension, the American bogie with pendular suspension, a Japanese roller construction and a suspension with an inclined arrangement of spring parts. [German]

Freibauer, L *DET Eisenbahntechnik* Vol. 25 No. 5, May 1977, pp 205-207, 7 Fig., 1 Phot.

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

03 163773

## UPDATED LRC CLINCHES FOOTHOLD IN HIGH-SPEED PASSENGER MARKET

Design of the first two five-car Light Rapid Comfortable (LRC) production trainsets for Amtrak is described. Higher powered diesel locomotives and other changes are incorporated in these trains, scheduled for delivery in 1978/1979, as compared with the prototype which has operated for several years. Completion of an extensive test program has proven the validity of the original design principles and the LRC builders have hopes for further orders.

*Railway Gazette International* Vol. 133 No. 9, Sept. 1977, 3 pp, 2 Fig., 5 Phot.

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03 163790

## LOCOMOTIVE CAB DESIGN DEVELOPMENTS

This is a status report on the development of a locomotive cab design predicated on human and other engineering disciplines which can lead to specifications for a cab that is in concert with operational and safety considerations. The development, sponsored by Transportation Systems Center, is based on a list of functional requirements derived from locomotive systems management tasks and train handling techniques. A mock up and a mobile idler car with the cab for controlling trailing locomotive units are also described.

Presented at the 13th Annual Railroad Engineering Conference, Pueblo, Colorado, October 12-13, 1976, and included in the Conference Proceedings, "Railroading Challenges in America's Third Century--Improved Reliability and Safety," sponsored by the FRA's Office of Research and Development, U.S. DOT.

Robinson, J (Boeing Vertol Company)  
Federal Railroad Administration Conf Paper FRA/ORD-77/13, July 1977, pp 33-44, 21 Fig.

ACKNOWLEDGMENT: FRA  
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03 163795

## FREIGHT DRAW GEAR SYSTEMS PAST-PRESENT-FUTURE

The evolution of the automatic coupler and the forces to which contemporary couplers are subjected are described. Current problems and forecasts of future requirements, including further automation, are then discussed.

Presented at the 13th Annual Railroad Engineering Conference, Pueblo, Colorado, October 12-13, 1976, and included in the Conference Proceedings, "Railroading Challenges in America's Third Century--Improved Reliability and Safety," sponsored by the FRA's Office of Research and Development, U.S. DOT.

Hinson, AE (Southern Railway Company)  
Federal Railroad Administration Conf Paper FRA/ORD-77/13, July 1977, pp 122-127, 13 Fig.

ACKNOWLEDGMENT: FRA  
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DOTL NTIS

03 163796

## TRUCKS FOR 100 MPH FREIGHT SERVICE: DESIGN-PERFORMANCE-SAFETY-RELIABILITY

This paper describes the causes of unsatisfactory high speed performance of standard freight car trucks and the design philosophies which can avoid such

problems. Test results and service experience with one such high-speed truck are detailed. Such a design provides a margin for future speed increases and offers reduced wear rates for present operations.

Presented at the 13th Annual Railroad Engineering Conference, Pueblo, Colorado, October 12-13, 1976, and included in the Conference Proceedings, "Railroading Challenges in America's Third Century--Improved Reliability and Safety," sponsored by the FRA's Office of Research and Development, U.S. DOT.

Weber, HB (Midland-Ross Corporation)  
Federal Railroad Administration Conf Paper FRA/ORD-77/13, July 1977, pp 128-137, 6 Fig., 1 Tab.

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS

## 03 164409

**SERVICEABILITY TESTING OF ROLLER BEARINGS: INFLUENCES ON LENGTH OF LIFE [Betriebsfestigkeitspruefung an Radsatzlagern. Einflüsse auf die Lebensdauer]**

The useful service of roller bearings is shorter than the calculated length of life due to effects resulting from operation and maintenance. Deutsche Bundesbahn's new servo-hydraulic test stand in Minden is designed for identification and quantitative analysis of the influence of different operational conditions on the length of life. The paper describes the method and programme to be applied for testing the roller bearings, the aim being an improvement of overhauling economy and the provision of well-founded data for development purposes. [German]

Schenk, H *Glaser's Annalen ZEV* Vol. 101 No. 5, May 1977, pp 137-141

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

## 03 164410

**MATERIAL TESTING OF WHEELSET ROLLER BEARINGS--PROOF OF QUALIFICATION AND FAILURE [Werkstoffpruefung an Radsatz-Rollenlagern. Erkenntnisse aus Bewaehrung und Versagen]**

Although the wheelset roller bearings normally in use on Deutsche Bundesbahn's (DB) stock have proved satisfactory--the annual number of hot-boxes amounts to about 0.00001 of the total stock--even isolated failures must be checked up on account of the strict safety requirements to be observed in railway operation. During the past 15 years, bearing failures have been experienced, for instance, due to damaged cages, loosening of the inner races, chipping of the track for the outer and inner rings and incorrect assembly. The extraordinary small number of hot-boxes still being experienced could be even further reduced if improved and more precise methods would be applied for testing the bearings and their assembly. Life estimates account only for the destruction of the materials. The useful life is, however, also reduced by wear, high or unexpected stresses, faults in manufacturing or mounting as well as by mismatch or unsuitable treatment of the components. To account for the effect of the longer bearing life and the partly higher loading, the influences acting on the bearings must be systematically investigated and criteria established, permitting the end of the useful life to be defined. [German]

Egelkraut, K *Glaser's Annalen ZEV* Vol. 101 No. 5, May 1977, pp 129-136

ACKNOWLEDGMENT: British Railways  
ORDER FROM: ESL

DOTL JC

## 03 164426

**STUDY OF RAILROAD NOISE REDUCTION BY NOISE-PROOF WHEELS**

In recent years, noise pollution created by railroad vehicles has become a major problem that must be solved urgently. The Teito Rapid Transit Authority and Sumitomo Metal Industries Ltd. have received a subsidy from the Transportation Ministry of Japan to investigate the vibration and noise characteristics of several types of soundproof wheels. This paper presents the results of laboratory and field tests on the soundproof wheels, comparing them with conventional steel wheels. It is concluded that the resilient soundproof wheel can reduce noise under the car-body floor from 3 to 5 decibels, while the damping soundproof wheel can reduce it from 1 to 3 decibels. [Japanese]

Satoda, K Nishimura, S Suzuki, M Sugawara, S Takamichi, H Asano, T *Sumitomo Metals* Vol. 29 No. 1, Jan. 1977, pp 68-81, 5 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

## 03 164445

**THE METRO AT ATLANTA [Le Metro d'Atlanta]**

The Metropolitan Atlanta Rapid Transit Authority (MARTA) has ordered 100 coaches for the metro lines now being built in Atlanta, capital of Georgia (USA), from the "Societe Franco-Belge de materiel de Chemin de fer" (Franco-Belgian Railway Rolling Stock Company). Delivery will commence in June 1978 and the rolling stock is designed to meet specifications and requirements that are quite different from those generally encountered in Western Europe. The body of the coaches is similar in many respects to that of the MF77 Series of the Paris Transport Authority (RATP) and their common origins are obvious. They have an integral body and chassis without framework of sheet metalwork. The sides, underframe and roof consist of extruded aluminum sections welded together. The electrical equipment, supplied by Garrett and designed for the 750 V 3rd rail system, includes two direct-current traction motors on each bogie. The traction motor speed is controlled by thyristor chopper equipment. A dual braking system is provided using electric regenerative brakes and pneumatic friction brakes. [French]

*Revue Generale des Chemins de Fer* July 1977, pp 399-406, 3 Fig., 2 Phot.

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

DOTL JC

## 03 164450

**FREIGHT CAR TRUCKS: THE CONTINUING SEARCH--AND NEED--FOR IMPROVEMENT**

The three-piece freight car truck, standard in North America, has been found with inherent deficiencies which might be overcome if the industry were willing to make an investment for lateral and vertical cushioning comparable to that already made for longitudinal cushioning. The problems with current trucks, attempts to introduce designs which would perform better, and activities in freight car truck research, past and present, are described.

Houser, FN *Railway Age* Vol. 178 No. 17, Sept. 1977, pp 24-28, 1 Fig., 1 Tab., 2 Phot.

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## 03 165036

**STATISTICALLY BASED ASSUMPTIONS ON THE STRESSES TO WHICH RAILWAY VEHICLE WHEELSETS ARE SUBJECTED [Statistisch bergruendete Annahmen ueber die Beanspruchung bei Radsatzlagerungen von Eisenbahnfahrzeugen]**

The writer considers that mechanical parts should be designed on the basis of their resistance to fatigue, and of tests to simulate the actual cyclic loading they will be subjected to in service and the statistical frequency with which these cycles occur. The writer demonstrates such a method using the case of wheelsets. [German]

Waechter, K Schulze, E *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 24 No. 1, 1977, pp 47-63, 12 Fig., 6 Tab., 30 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Hochschule fuer Verkehrswesen Friedrich List, Friedrich List Platz 1, Dresden 801, East Germany

## 03 165053

**CONSIDERATIONS ON PROBLEMS OF SERVICE LIFE IN SOLID-CAST RAILWAY VEHICLE WHEELS WITH SHOE BRAKES [Betrachtungen zu Problemen der Lebensdauer bei klotzgebremsten Monobloc-Eisenbahnradern]**

No Abstract. [German]

Mombrei, W Weidemann, S *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 24 No. 1, 1977, pp 19-28, 2 Fig., 1 Tab., 5 Phot., 15 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Hochschule fuer Verkehrswesen Friedrich List, Friedrich List Platz 1, Dresden 801, East Germany



03 165075

## DEPARTMENT OF TRANSPORTATION SYSTEM FOR TRAIN ACCIDENT REDUCTION (DOT-STAR)

The on-train monitoring system involves thermal sensing and shock detection which can indicate derailment. Activation of any sensor on a freight car produces a pulse of electrical energy that in turn fires an explosive valve, thereby venting the brake line and activating the braking system. The thermal sensor continuously monitors temperature of solid or roller journal bearings. The shock environment of derailment differs little from that of some normal over-the-road environments and this sensing system is being refined.

Presented at the 26th Meeting of the NBS' Mechanical Failures Prevention Group (MFPG), held at the ITT Research Institute, Chicago, Illinois, May 17-19, 1977.

O'Steen, JK (Naval Surface Weapons Center)  
National Bureau of Standards Conf Paper NBS Spec Pub. 494, Sept. 1977, pp 191-204, 18 Fig.

ORDER FROM: GPO

S/N-003-003-01844-9, DOTL RP

03 165076

## COMPARISON OF VIBRATION ANALYSIS TECHNIQUES FOR RAILROAD ROLLER BEARING DIAGNOSTICS

This paper summarizes investigation of roller bearing defect diagnosis utilizing high frequency vibration techniques. Two devices are reported, one for use at trackside or in wheel shops and the other for initial certification at manufacturing facilities. The first system must be rugged and simple, the second has the qualities of a laboratory device. It is concluded that high frequency peak amplitude detection is a method of weeding out bearings that should be removed from or never enter service.

Presented at the 26th Meeting of the NBS' Mechanical Failures Prevention Group (MFPG), held at the ITT Research Institute, Chicago, Illinois, May 17-19, 1977.

Waldron, WD (Shaker Research Corporation)  
National Bureau of Standards Conf Paper NBS Spec Pub 494, Sept. 1977, pp 205-222, 16 Fig.

ORDER FROM: GPO

S/N-003-003-01844-9, DOTL RP

03 165078

## FINAL PHASE 14 REPORT ON STUB SILL BUCKLING STUDY

Over a period of years there has been a series of buckling incidents involving nonpressure type tank cars. These buckling incidents in practically all cases only involved the stub sill (non-continuous center sill) designs without exterior coils. With very few exceptions only older cars which were not designed to current AAR specifications were involved. This study was undertaken to determine if there should be any difference in design requirements between stub sill and continuous sill tank cars. Four stub sill design cars built in the mid 1960's and five current design cars were tested. An extensive number of 3 element strain rosettes were applied to both the inside and outside of the tanks. The current cars were tested to the existing requirements of 1000 Kips static compression load and 1,250 Kips impact load, and the older cars were tested to the load limits which they could sustain without permanent damage. This report describes the entire study and concludes that the current designs of stub sill tank cars comply with the requirements of the current AAR design manual. It is recommended that the design criteria for stub sill tank cars should remain the same as currently required for continuous sill tank cars and other freight cars.

Prepared under the RPI-AAR Tank Car Safety Research and Test Project.

Graves, CT Olson, LL  
Association of American Railroads Technical Center Res. Rpt.  
RA-14-1-38, AAR-R-276, July 1977, 203 pp, 4 Ref.

ACKNOWLEDGMENT: AAR

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

DOTL RP

03 166445

## GENERAL VEHICLE TEST INSTRUMENTATION EVALUATION

A General Vehicle Test System (GVTS) has been developed by the Transportation Systems Center, Cambridge, Massachusetts to facilitate rail

transit vehicle testing at the Transportation Test Center (TTC), Pueblo, Colorado. This system was designed to be responsive to requirements specified in the publication GENERAL VEHICLE TEST PLAN (GVTP) for URBAN RAIL TRANSIT CARS, report number UMTA-MA06-0025-75-14. This report presents the results of evaluation tests carried out on the GVTS at the TTC, Pueblo, Colorado, in May 1975. The GVTS is an integrated instrumentation system consisting of transducers, signal conditioners, signal filters, interface and control electronics, a data acquisition system, signal monitoring and output devices, and all related hardware and software. The objective of this test series is to evaluate the performance of the instrumentation system under actual rail transit operating conditions. Parameters evaluated include vehicle current, voltage, acceleration/vibration pressure, pressure, temperature, displacement, and strain. The GVTS as tested provides 37 of the 48 required Standard Outputs described in the GVTP.

See also report dated September 75, PB-250575. General Vehicle Test Plan RRIS 03, 133090, 7701 Bulletin.

Babb, LV

Transportation Systems Center, Urban Mass Transportation Administration Final Rpt. DOT-TSC-UMTA-77-12, UMTA-MA-06-0025-77-9, Mar. 1977, 214 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-269598/9ST, DOTL NTIS

03 167505

## AUTOMATIC REPROFILING FOR NW'S WHEELS

A computer-controlled wheel lathe which profiles worn wheels from all freight cars on Norfolk and Western is the heart of a new high-production shop facility at Portsmouth, Ohio. With the lathe, other wheel machines and extensive materials handling equipment, this shop now performs work previously done at three shops on the railroad. The shop is tooled to produce 700 wheelsets on a five-day week schedule, sufficient for the railroad which operates almost 95,000 freight cars.

*Progressive Railroading* Vol. 20 No. 9, Sept. 1977, pp 100-108, Photos.

ACKNOWLEDGMENT: *Progressive Railroading*

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

DOTL JC

03 167556

## ADJUSTABLE SPRING RATE SUSPENSION SYSTEM

A previously described special suspension spring, known as the "elastica" suspension, is discussed in some more detail. The versatility of this suspension is illustrated by demonstrating how it can be adjusted to provide an enhanced selection of nonlinear spring rates.

Shoup, TE (Houston University); Simmonds, GE *AIAA Journal* Vol. 15 No. 6, June 1977, pp 865-866, 4 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

03 167599

## PROCEDURE FOR OPTIMIZING RAPID TRANSIT CAR DESIGN. ABRIDGMENT

This paper discusses a methodology that can be used to either develop an approximate initial car design or to analyze an existing design by varying the number of design elements to determine their effects. A computer program was developed to implement the methodology. The program is designed to perform an economic analysis that provides the minimum total annual costs. A set of equations was developed to describe the interactions between car design elements and cost. The study concludes that there are many possibilities for using this methodology. Sensitivity analysis have shown that the program operates realistically. Cost comparisons may be made for cars of different lengths, various interest rates on capital investment, and various system parameters such as headway, demand, and system length. This program may also be updated for new data and new costs to account for inflation, changing technology and other factors.

From TRB Record 627, Rail Transit. This paper is from Huss' doctoral dissertation submitted to the Polytechnic Institute of New York.

Huss, MF (Department of Transportation); Roess, RP (Polytechnic Institute of New York) *Transportation Research Record* No. 627, 1977, pp 4-7, 1 Tab.

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### 03 167604

#### MODEL FOR COST-EFFECTIVE MAINTENANCE OF RAIL TRANSIT VEHICLES IN URBAN MASS TRANSIT SYSTEMS

A new computer-based model to assist rail transit management in determining maintenance schedules for rail transit vehicles is presented. The model evaluates the aggregate cost and service implications of conducting prescheduled inspections and preventive maintenance activities for the various components of a transit vehicle. The model also consolidates information on size of vehicle fleet, cost of maintenance and repair of vehicle parts, relations between maintenance frequency and subsystem failures, and historical patterns of the different types of in-service breakdowns. On this basis, the model determines relations among preventive maintenance alternatives, average number of transit cars available for peak service, expected number of in-service car failures, and the total cost of maintenance and repair. The model was originally developed for use by the Massachusetts Bay Transportation Authority in Boston. Preliminary findings in the initial application of the model to generate and evaluate alternative maintenance schedules for the authority's Red Line suggest that use of the model could result in noticeable, though probably not dramatic, savings for this particular line. The authority intends to refine the data used in these analyses and to extend the use of this model to its other lines. The model is a conversational FORTRAN program. It can be adopted for use in any rail transit system that has the required data on vehicle maintenance and repair activities. /Author/

From TRB Record 627, Rail Transit.

Rosenthal, SR Herniter, JD Welam, UP (Boston University) *Transportation Research Record* No. 627, 1977, pp 21-28, 4 Fig., 1 Tab.

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### 03 167923

#### SP'S ENTRY FOR HIGH INTERMODAL STAKES

Southern Pacific and ACF Industries have cooperated in the development of a double-stack prototype car for container-on-flat-car service. The goals include reduction of car weight, ability to run shorter trains with heavier payloads and reductions in locomotive fuel consumption. The design process and comparisons with other equipment for handling containers are included.

Welty, G *Railway Age* Vol. 178 No. 21, Nov. 1977, pp 16-18, 1 Phot.

ACKNOWLEDGMENT: Railway Age

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### 03 167962

#### BOGIES WITH ONE AXLE WITH IDLER WHEELS [Halbdrehgestelle auf Losraedern]

The author first presents the theoretical advantages of having tractive stock using trucks with one axle with idler wheels: hunting is eliminated, there is less wear of wheels and smoother running. He then describes various methods for constructing trucks with one axle with idler wheels to avoid possible disadvantages which could arise. Lastly, he puts forward solutions for adapting this type of truck to various tractive units (electric, diesel and linear motors). [German]

Ahrens, R *Eisenbahntechnische Rundschau* Vol. 26 No. 7/8, July 1977, pp 517-522, 12 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

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

DOTL JC

### 03 167995

#### X-RAY APPARATUS FOR THE MEASUREMENT OF RESIDUAL STRESSES IN RAILWAY WHEELS

Theory of the X-ray method of measuring residual stress with a film technique is briefly outlined. An apparatus in use at B. H. P. Melbourne Research Laboratories for measuring residual stresses in railway wheels is described. Results obtained and problems found to date are reported.

Stevens, PJ (BHP, Melbourne Research Laboratory, Australia) *Journal of the Australian Institute of Metals* Vol. 21 No. 4, Dec. 1976, pp 186-190, 12 Ref.

ACKNOWLEDGMENT: EI

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### 03 168012

#### WEAR TEST ON COUPLER CARRIER WEAR PLATES

Wear testing of coupler carrier wear plates was carried out by mounting them in a framework which moved them side-to-side beneath stationary couplers testing on the wear plates. Criterion used for comparison was the resulting wear rate on the coupler shank plate, with the proviso that the carrier wear plate itself should have a reasonable life. It was found that, of the carrier plates tested, mild steel did badly, hardened steel and gray iron did twice as well and manganese plates did still better. The non-metallic plates, however, caused almost zero wear to the coupler shank plate.

Contributed by the Rail Transportation Division of ASME for presentation at the Winter Annual Meeting, Atlanta, Georgia, November 27-December 2, 1977.

Blank, RW Reynolds, DJ (Southern Railway System)

American Society of Mechanical Engineers Conf Paper 77-WA/RT-8, 1977, 5 pp, 5 Fig., 2 Tab.

ACKNOWLEDGMENT: ASME

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### 03 168014

#### OPTIMIZING RAILROAD FREIGHT CAR TRUCK SUSPENSION SYSTEMS HAVING COULOMB DAMPING

This paper describes the design process followed in developing a 100 ton freight car truck suspension system having coulomb damping. Classical linear vibration analysis was used for the conceptual design phase. Within the constraint placed upon truck suspension systems, a constant damping parameter, i.e., the ratio of friction force to static force imparted by the base, for all load conditions was established as a design goal. Optimization of the actual design parameters and comparison to existing truck suspensions was accomplished using the latest vehicle model developed by the AAR/TTD.

Contributed by the Rail Transportation Division of ASME for presentation at the Winter Annual Meeting, Atlanta, Georgia, November 27-December 2, 1977.

Bullock, RL (Standard Car Truck Company); Cooley, DB (Railroad System Dynamics, Incorporated)

American Society of Mechanical Engineers Conf Paper 77-WA/RT-6, 1977, 6 pp, 3 Fig., 4 Tab., 3 Ref., 1 App.

ACKNOWLEDGMENT: ASME

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### 03 168015

#### PROGRESS IN RAILWAY MECHANICAL ENGINEERING (1976-1977 REPORT OF SURVEY COMMITTEE) CARS AND EQUIPMENT

This survey of the annual ASME report covers some of the major developments in rail freight and passenger equipment made public in the last calendar year. It covers developments worldwide. In the freight area the main developments are aimed at transporting bulk commodities with some thought being given to multipurpose concepts. The passenger developments are continuing in LRVS, rapid transit, and commuters; however, long haul equipment is also being developed.

Contributed by the Rail Transportation Division of ASME for presentation at the Winter Annual Meeting, Atlanta, Georgia, November 27-December 2, 1977.

Manos, WP (Pullman Standard)

American Society of Mechanical Engineers Conf Paper 77-WA/RT-5, 1977, 9 pp, 40 Fig.

ACKNOWLEDGMENT: ASME

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### 03 168017

#### THERMAL DAMAGE AND RAIL LOAD STRESSES IN A 33-INCH RAILROAD CAR WHEEL.

Stresses in a 33-inch (.840 m) railroad car wheel in response to static rail loadings are presented on the basis of experimental work and theoretical predictions. In regions away from the contact area, the theoretical predictions are verified by experiment. The rail load stresses are compared to theoretically damaging thermal loads, and a possible method of analysis of fatigue damage from the combined loading is discussed.

Contributed by the Rail Transportation Division of ASME for presenta-



tion at the Winter Annual Meeting, Atlanta, Georgia, November 27-December 2, 1977.

Kipp, RM Wetenkamp, HR (Illinois University, Urbana)  
American Society of Mechanical Engineers Conf Paper 77-WA/RT-2,  
1977, 7 pp, 13 Fig., 2 Tab., 12 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

## 03 168018

### DETECTION OF FLAWS IN RAILROAD WHEELS USING ACOUSTIC SIGNATURES

A system for automatic inspection of railroad wheels using acoustic signatures is proposed. There is a discussion of the types of defects which need to be found. The main components of a system are then outlined. It is concluded that impact is the best way to excite the wheel into vibration because of the rich spectrum of resonances generated. Detection of sound radiated into the air by a microphone is the best way to obtain the acoustic signature for finding cracks in the rim or plate, but flat spots or shattered rims are best detected with an accelerometer mounted on the rail. Methods of processing the signals from the detection transducers are then examined. Finally some preliminary laboratory and field tests of such systems are described.

Contributed by the Rail Transportation Division of ASME for presentation at the Winter Annual Meeting, Atlanta, Georgia, November 27-December 2, 1977.

Nagy, K Dousis, DA Finch, RD (Houston University)  
American Society of Mechanical Engineers Conf Paper 77-WA/RT-1,  
1977, 7 pp, 18 Fig., 2 Tab., 2 Ref., 1 App.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

## 03 168019

### SUMMARIZATION AND COMPARISON OF FREIGHT CAR TRUCK LOAD DATA

Methods of summarizing and presenting freight car truck load data obtained on service tests are described. Data from four separate test programs are presented in various formats. The data show considerable ranges in the load magnitudes and rates of occurrence from the various test environments. This type of information is essential for evaluating the fatigue, safety, and reliability properties of freight car truck components.

Contributed by the Rail Transportation Division of ASME for presentation at the Winter Annual Meeting, Atlanta, Georgia, November 27-December 2, 1977.

Johnson, MR (IIT Research Institute)  
American Society of Mechanical Engineers Conf Paper 77-WA/RT-3,  
1977, 7 pp, 18 Fig., 5 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

## 03 168111

### DEVELOPMENT AND TESTING OF ROLLING STOCK

Extreme climatic conditions and the need for high reliability to avoid disrupting the heavy flow of traffic on SZD tracks means that every new locomotive, coach and car is subjected to extensive development trials and tests in service over a number of years before series production begins.

Fufryansky, NA *Railway Gazette International* Vol. 133 No. 7, July 1977, pp 258-260, Photos.

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

DOTL JC

## 03 169981

### PARIS METRO CARS SET DESIGN STANDARDS FOR SERIES ALUMINIUM PRODUCTION

An aluminum transit car design which its builder finds costs less to construct than an equivalent steel design is being produced for Paris and Atlanta. Societe Franco-Belge will build 1,700 such cars in three slightly varying body configurations. The concept is based on long extrusions incorporating a large

number of supports for fittings as well as for actual assembly and with longitudinal joints designed for simultaneous automatic welding. Details of the structural sections and of assembly processes are given.

*Railway Gazette International* Vol. 133 No. 12, Dec. 1977, pp 469-475, 2 Fig., 2 Tab., 6 Phot.

ORDER FROM: ESL

DOTL JC

## 03 170082

### MACHINE TOOLS ON THE DB: EFFICIENT AND ECONOMICAL [Werkzeugmaschinen bei der DB: aufgabengerecht-wirtschaftlich]

After some background information on the conditions of acquisition and scrapping of machine tools on DB, the article describes some of the more recently-acquired units: Machine for rebuilding wheel flanges by welding in a CO<sub>2</sub> atmosphere, machine for cleaning trucks by waterjet under pressure, numerical control vertical wheel lathe, and automatic-copying, high-performance lathe. [German]

Voss, KH *Die Bundesbahn* Vol. 53 No. 9, Sept. 1977, pp 657-665, 7 Phot.

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

## 03 170091

### THE CONTROL SYSTEM FOR RUNNING STABILITY OF THE SHINKANSEN

On the high-speed Shin Kansen line, ride quality is assured by measurements on revenue trains in regular operation. Vibration monitoring is done by teams riding trains with instruments which can be moved from car to car. A calibrated wheelset is used for determining the lateral and wheel loads, quotient of which is the derailment coefficient. Under development is a wheel flat inspection system. While the emphasis of this article is on the condition of rolling stock as a means of guiding maintenance, track is also routinely inspected with its irregularities analyzed by computer.

Ono, J (Japanese National Railways) *Japanese Railway Engineering* Vol. 17 No. 1, 1977, pp 14-16, 8 Fig., 1 Tab., 1 Phot.

ACKNOWLEDGMENT: Japanese Railway Engineering  
ORDER FROM: Japan Railway Engineers' Association, 2-5-18 Otemachi, Chyoda-ku, Tokyo, Japan

DOTL JC

## 03 170094

### WHEEL RESEARCH, VOLUME I. ELASTIC STRESS ANALYSIS, ELASTIC FINITE-ELEMENT STRESS ANALYSIS OF RAIL CAR WHEELS

This report describes the capabilities and validation efforts for an elastic finite element stress model of a railcar wheel. Theoretical techniques and computer operational procedures will be described in various manuals to be compiled at a later date. The model, comprised of three or more computer codes, will analyze any common railroad wheel configuration. Service inputs, expressed as braking energy-time coordinates or static mechanical rim and/or flange loads, may be evaluated as they affect strains throughout the wheel. Mechanical loads due to wheel-rail interactions and the effects of simulated service brake applications may be evaluated separately or conjunctively. A variety of options exist with regard to output forms. Wheel response to a simulated service input may be expressed in terms of strain, engineering stress or octahedral shear stress. An automatic data plotting capability permits data displays at the wheel surface or at selected interior planes. Analytical and experimental results were compared and found to agree within acceptable limits.

An International Government-Industry Research Program on Track-Train Dynamics.

Hopper, AT Johns, TG Sampath, SG Stoneisifer, RB Corliss, JM Davies, KB  
Association of American Railroads Technical Center, Railway Progress Institute, Transport Canada Research and Development Centre Tech Rpt. R-268, Feb. 1977, 106 pp, 45 Fig., 5 Tab., 23 Ref., 2 App.

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

DOTL RP

03 170096

**INTERIM AAR GUIDELINES FOR FATIGUE ANALYSIS OF FREIGHT CARS, VOLUME 1**

This interim specification is a guideline for fatigue analysis of freight cars. The methodology presented gives the designer or analyst a reliable technique for determining the fatigue life of a freight car or component when subjected to fluctuating stresses. Through the use of these guidelines, fatigue life calculations can be readily incorporated into the overall freight car design procedure.

An International Government-Industry Research Program on Track-Train Dynamics.

Przybylinski, P Halcomb, S

Association of American Railroads Technical Center, Railway Progress Institute, Transport Canada Research and Development Centre Tech Rpt. R-245, May 1977, 68 pp, 4 Tab.

ACKNOWLEDGMENT: AAR

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

DOTL RP

03 170101

**HIGHWAY AND RAILROAD EQUIPMENT FOR TRANSPORTING PERISHABLES IN EUROPE**

No Abstract.

Hinds, RH Bongers, AJ

Department of Agriculture No. 1061, 7705, 15 pp, Photos.

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO

ORDER FROM: Department of Agriculture, Agricultural Research Service, Beltsville, Maryland, 20705

03 170455

**OPTIMIZATION OF PNEUMATIC VIBRATION ISOLATION SYSTEM FOR VEHICLE SUSPENSION**

Air springs are perhaps the most versatile and adaptable type of suspension element. They provide practically frictionless action, adjustable load capacity and simplicity of height control. Initially, a vehicle suspension system with a pneumatic isolator connected to a fixed volume tank via parallel plate restrictor is considered. Here the damping is provided by the flow of air through the restricted passage which has an advantage over the conventional viscous shock absorber. Body movements are only considered to be vertical harmonic displacement. An optimization technique is applied to evaluate the optimum values of many parameters involved for which the maximum transmitted motion to the body would be minimum over the broad frequency range. Theoretical expressions for the transmissibility of the body and the wheel, optimum values of mass ratio, stiffness ratio and damping ratio are presented. Design data are presented nondimensionally for parameter variations which are sufficiently broad to encompass a wide range of practical engineering problems.

Paper for Meeting, September 26-30, 1977.

Esmailzadeh, E (Massachusetts Institute of Technology)

American Society of Mechanical Engineers Pap n 77-DET-17, 1977, 7 pp, 12 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

03 170463

**MASSIVE REDUCTION IN DRILLING TIME FOR RAILWAY WHEELS**

Using a very large special-purpose machine with opposed indexing turret heads, a variety of different patterns of through holes can be drilled in railway wheels, reamed, and chamfered at each end at a rate of 20 wheels per hour compared with a previous performance, using conventional methods of 10 wheels per day.

Astrop, AW *Machinery and Production Engineering* Vol. 130 No. 3353, Mar. 1977, pp 286-288

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

03 170567

**DIAGNOSIS ON THE ATTENUATIONS OF THE MOVEMENTS PROPER TO HIGH-COMFORT COACHES**

In railway vehicles, use is made of viscous-type shock absorbers to reduce the width of oscillation of the movements of the body and bogies. In this study an evaluation is made as to what percentage each movement is attenuated by the shock absorber, what proper frequencies are changed in the presence of a shock absorber having a determinate coefficient of attenuation, and where should a shock absorber be located in order to have effect on certain movements without influencing others. In the paper, an illustration is given of all these characteristics taking as a sample a High-Comfort type of coach. [Italian]

Panagin, R *Ingegneria Ferroviaria* Vol. 32 No. 9, Sept. 1977, pp 659-669

ACKNOWLEDGMENT: British Railways

ORDER FROM: ESL

DOTL JC

03 170623

**FREIGHT CAR DYNAMICS--DEMONSTRATION TEST AND ANALYSIS. VOLUME I--FREE VIBRATION STUDY**

Comprehensive examination of dynamic characteristics of a trailer-on-flat-car (TOFC) is conducted in this report using the finite element method. Three basic models or idealizations of the flat car, ranging from a simple beam model to a more sophisticated model composed of plate and beam elements are developed to analyze its dynamic behavior. They are discussed here in some detail. Results of a test program conducted at the Department of Transportation Test Center are used to qualify these models by comparing the predicated vibration mode shapes and frequencies with those observed during the actual flat car tests. In this volume, the flexural and torsional mode shapes and their associated natural frequencies obtained from each of the models are analyzed and compared with experimental results. Analytical results are obtained using SAP4 and NASTRAN finite element computer programs. In a subsequent volume, the forced vibration response, including dynamic stress, will be examined and a demonstration of the application of this analysis to fatigue design evaluation will be carried out.

Garg, VK Prasad, B Yau, JF

Association of American Railroads Technical Center Tech Rpt. R-280, Dec. 1977, 192 pp, 23 Ref.

ACKNOWLEDGMENT: Association of American Railroads Technical Center

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

04 053237

**ADHESION OF LOCOMOTIVES FROM THE POINT OF VIEW OF THEIR CONSTRUCTION AND OPERATION COMPARISON TESTS CARRIED OUT IN NOVEMBER 1975 BETWEEN OBB THYRISTOR LOCOMOTIVE CLASS 1044, AND SBB DIRECT-ENGINE LOCOMOTIVE RE 4/4 III, AND OBB CLASS 1042 WITH RESPECT TO THEIR EFFICIENCY AT THE LIMIT OF ADHESION**

This report describes the runs made in November 1975 in Austria for the purpose of comparing an OBB thyristor-controlled locomotive (class 1044) and two different types of locomotives with tap changers and a.c. motor belonging to the SBB (Re 4/4 III) and the OBB (class 1042).

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

International Union of Railways B 44/RP 12, Oct. 1976, 49 pp, 33 Fig., 4 Tab., 1 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

04 053243

**PROTECTION AGAINST SLIP, CONTROL AND REGULATION OF TRACTIVE EFFORT**

Definition of anti-slip devices. Adhesion limit detection method. Methods and equipment for measuring absolute speed. Functions and characteristics of a system permitting full slip dependent monitoring and regulation of tractive effort. Tests made to check such a system.

Restrictions on the use of this document are contained in the explanatory material. This Technical Document (DT) was compiled within the scope of activities of the ORE Specialists Committee for B44.

International Union of Railways DT 48 (B 44), May 1977, 36 pp, 14 Fig., 2 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL DP

04 159384

**ENGINEERING TESTS FOR ENERGY STORAGE CARS AT THE TRANSPORTATION TEST CENTER. VOLUME IV. RIDE ROUGHNESS TESTS**

The primary purpose of the tests documented herein was to demonstrate the principles and feasibility of an energy storage type propulsion system, and its adaptability to an energy storage type propulsion system, and its adaptability to an existing car design. The test program comprised four phases of tests on two New York City Transit Authority R-32 cars where the conventional propulsion system was replaced by an energy storage system. The four test phases were: verification of safe arrival, debugging procedures, performance verification tests, and expanded test program.

See also Volume 3, PB-269 402. Also available in set of 4 reports PC E10, PB-269 399-SET.

Curran, WT  
AiResearch Manufacturing Company, Transportation Systems Center,  
Urban Mass Transportation Administration Final Rpt. DOT-  
TSC-UMTA-77-6-4, May 1977, 168 pp

Contract DOT-TSC-838-4

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-269403/2ST, DOTL NTIS

04 162952

**THE VL 80 B TYPE ELECTRIC LOCOMOTIVE WITH RECTIFIER TRACTION MOTORS**

This locomotive is an eight-axle locomotive weighing 192 tonnes, with a continuous rating of 7320 kW at 69.5 km/h at 25 kV, 50 Hz and regenerative braking. The locomotive is propelled by eight axle-hung synchronous motors with inductors wound around the rotor. A thyristor connection supplies them at a frequency varying from 0 to 130 Hz.

Bondarenko, BR *Rail International* Vol. 8 No. 4, Apr. 1977, pp 179-184, 3 Fig., 1 Tab., 2 Phot.

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

DOTL JC

04 162956

**THE SERIES ER-22 W ELECTRIC TRACTIVE UNIT WITH RHEOSTATIC AND REGENERATIVE BRAKING FOR LOCAL TRAFFIC ROUND MOSCOW [Der Elektrotriebzug der Baureihe ER-22 W mit Widerstands-und Netzbremse fuer den Moskauer Nahverkehr]**

No Abstract. [German]

Dimant, J Zhivs, V *Elektrische Bahnen* Vol. 48 No. 4, Apr. 1977, pp 104-108, 1 Fig., 2 Tab., 3 Phot.

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

DOTL JC

04 162957

**REGENERATION AND ASSURED RECEPTIVITY IN RAIL RAPID TRANSIT**

Regenerative braking both saves energy and prevents tunnels becoming hot because of the thermal energy lost with non-regenerative braking. The traction network's permanent regeneration capacity is provided by means of shunt mounted rheostats or by means of kinetic regenerators with fly wheels. The document is a thorough study of how such a traction system works with line voltage and current charts, details of the amount of energy regenerated, improvement in tunnel ventilation systems, dimensions of electric equipment and economic viability.

Proceedings of the 4th Intersociety Conference on Transportation.

Metsch, WW

American Society of Mechanical Engineers Conf Paper D/0-14, July 1976, 21 pp, 20 Fig., 18 Tab., 15 Ref.

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

04 163229

**ELECTRICAL SYSTEMS ON THE PROTOTYPE APT**

Electrical equipment on British Rail's prototype Advanced Passenger Train (APT-P) has been grouped so that all but the most serious faults can be simulated by unit replacement of removable subassemblies. Each power car has a transformer and reactor supplying thyristor groups feeding four 750 kw body-mounted traction motors. Traction equipment supplied by ASEA is similar to that used on the Swedish Rc4 electric locomotives. Auxiliaries are supplied at 415 V 50 Hz three-phase from two 430 kVA motor alternator sets with diesel alternators as back-up.

Kemp, RJ (British Railways) *Railway Gazette International* Vol. 133 No. 8, Aug. 1977, pp 311-313, 3 Fig., 1 Phot.

ORDER FROM: ESL

DOTL JC

04 163230

**RC4, A FURTHER DEVELOPMENT OF ASEA'S THYRISTOR-CONTROLLED LOCOMOTIVES**

ASEA's thyristor-controlled locomotive class Rc4 is an example of a modular traction system, which permits the construction of different types of vehicle having a varying number of driven axles. The article describes the mechanical design, main circuits and control system of the Rc4 locomotive.

Soderberg, EAB Gunnarsson, L *ASEA Journal* Vol. 50 No. 2, 1977, pp 27-32, 9 Fig.

ACKNOWLEDGMENT: ASEA Journal  
ORDER FROM: Allmanna Svenska Elektriska Aktiebolaget, 4 New King Street, White Plains, New York, 10602

DOTL RP

04 163239

**THE THYRISTOR AND THE ELECTRIC TRACTION [De thyristor in de elektrische tractie]**

A survey of the application of power-diodes and thyristors in electric traction systems is given with their repercussion on the feeding supply networks for 50 Hz in form of harmonics. The better utilization of the adhesion is discussed. [Dutch]

Ankersomit, JE *Elektrotechniek* Vol. 55 Mar. 1977, pp 175-186, 30 Phot., 11 Ref.

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

04 163240

**THREE-PHASE CURRENT FOR A.C. TRACTIVE UNITS**

[Drehstromantrieb fuer Wechselstromtriebfahrzeuge]

The author considers the suitability of phase series converters used together with various current converters at the mains to supply power to three-phase current powered rail vehicles. He analyses in detail the various power supply units as far as their use on such vehicles is concerned. He ends by referring to the regulation and dynamics of the asynchronous motor. [German]

Loessel, W *Elektrische Bahnen* Vol. 48 No. 4, Apr. 1977, pp 82-90, 12 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

04 163242

**A STUDY OF UNEVEN WEAR IN COMMUTATORS**

Mathematical study using a diagrammatical test model of the phenomenon. The effects of mechanical wear that tends to develop in the commutator surface, which corresponds to the variations and is due to strains in the brushes, is represented by a Fourier series based on the angular velocity of the motor. The electric wear profile is also described. The author reaches conclusions about ways to lengthen commutator life.

Proceedings of the 4th ASME Intersociety Conference on Transportation.

Avery, RW Leever, RC

American Society of Mechanical Engineers D/O-16, July 1976; 9 pp, 10 Fig., 1 Phot., 1 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ASME

04 163268

**THYRISTOR LOCOMOTIVE WITH PHASE ANGLE CONTROL. PROTOTYPES 1044.01 AND 02 OF THE AUSTRIAN RAILROAD SYSTEM. PECULIARITIES OF CONTROL, INTERFERENCE**

[Thyristorlokomotive mit Anschnittsteuerung Prototypen 1044. 01 und 02 der OBB. Besonderheiten der Steuerung, Beeinflussung]

Both prototype locomotives series 1044 have undergone extensive measurements with regard to interference with telecommunication and signaling installations. The results of these measurements are given. Measures which have led to lower interference values are dealt with. The control of the locomotive is described. [German]

Breyer, W *Elektrische Bahnen* Vol. 48 No. 1, Jan. 1977, pp 15-22

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

04 163273

**DECENTRALIZED FEEDBACK CONTROLS FOR THE BRAKELESS OPERATION OF MULTILOCOMOTIVE POWERED TRAINS**

Presentation of an application of linear regulator theory to the control of multilocomotive powered unit trains. Locomotives are taken to be situated at the front, middle, and end of the train. Their feedback controls are linear functions of the deviations in locomotive schedule velocity and the coupler forces around the locomotive. The controls are designed by assuming that various locomotive-gondola car combinations are detached from the train. Computer simulation results are presented for a 62 car train traversing an undulating grade. The controls obtained are for the propulsion of the train as problems associated with braking are not considered. The control algorithm used in this short paper, where only local measurements are used for control, is an example of a decentralized control system.

McLane, PJ (Queen's University, Canada); Peppard,

LE Sundareswaran, KK *IEEE Transactions on Automatic Control* Vol. AC-2 No. 3, June 1976, pp 358-363, 19 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

04 163280

**ELECTRIC TRACTION MOTOR AS AN ELEMENT OF AN AUTOMATIC CONTROL SYSTEM [Tyagovyi elektrodvigatel' kak element sistemy avtomaticheskogo regulirovaniya]**

A nonlinear and a linearized model of a dc electric traction motor with series excitation are considered. It is recommended to utilize a linearized model for

preliminary variants of the calculation of a control system. It is advantageous to use the nonlinear model in calculating the final variant of the system by modelling the control process on a digital or analog computer. The maximum errors which may be expected with the introduction of different assumptions into the design schemes are pointed out. [Russian]

Savos'kin, AN Feoktistov, VP *Izvestia Vysshikh Ucheb Zaved, Elektromekhanika* No. 8, Aug. 1976, pp 829-834

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

04 163281

**IMPROVEMENT OF THE EFFICIENCY OF COOLING OF ELECTRIC TRACTION COMMUTATOR MOTORS WITH AXIAL VENTILATION [Povyshenie effektivnosti okhlazhdeniya kollektornykh tyagovykh elektrodvigatelei s aksial'noi ventilyatsiei]**

On the basis of experimental investigations, the possibility of improving the efficiency of cooling of electric traction commutator motors by changing the direction of the cooling air flow and by using an independent commutator cooling arrangement is demonstrated. At the same time, this permits a reduction in the medium and maximum values of armature overheating, given the same overall flowrate of the cooling air. [Russian]

Zolotarev, PA Potapkin, VA Komarets, AI *Izvestia Vysshikh Ucheb Zaved, Elektromekhanika* No. 8, Aug. 1976, pp 835-840

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

04 163282

**OPTIMIZATION OF TRANSITIONS IN STEPWISE CONTROL OF MAGNETIC FLUX OF TRACTION MOTORS [Ob optimizatsii perekhodov pri stepenchatom regulirovanii magnitnogo potoka tyagovykh dvigatelei]**

The principle of optimal transitions from one level of the magnetic flux (excitation current) of traction motors to another is set forth. Its realization permits the efficiency of a transportation installation to be raised. A method is presented and an example of calculation is given. [Russian]

Pisarik, LS (BSSR Polytechnic Institute, USSR) *Izvestia Akademii Nauk, Mekhanika Zhid Kosti* Vol. 28 No. 5/6, 1976, pp 42-48

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

04 163283

**INVESTIGATION OF THE EFFICIENCY OF LOCOMOTIVE GAS TURBINE ENGINES [Issledovanie ekonomichnosti lokomotivnogo GTD]**

The possibility of designing a locomotive gas turbine engine with a two-shaft arrangement and with intermediate combustion is demonstrated. At the same time, the efficiency of this locomotive would be 32% at maximum capacity. The maximum efficiency would be 34% at 80% capacity and would not drop below 30% within the range of capacity variation from 100 to 35%. [Russian]

Epifanov, VM Mikhal'tsev, VE Syromyatnikova, LI *Izvestia Vysshikh Uchebnykh Zavedenii, Mashinostr* No. 6, 1976, pp 94-98

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

04 163286

**TRANSIENT ANALYSIS OF D.C. MOTOR CONTROLLED BY POWER PULSES**

Three methods of transient analysis of a dc separately excited motor, controlled by a chopper with square-wave output voltage, are derived. These methods are compared with regard to accuracy and usefulness. The methods require much less computation time than is necessary for a step-by-step solution of the system differential equations, and in some cases can be used for deriving a transfer function of the pulse controlled motor.

Dubey, GK (Bradford University, England); Shepherd, W *Institution of Electrical Engineers, Proceedings* Vol. 124 No. 3, Mar. 1977, pp 229-230, 2 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC



04 163297

**ENERGY SAVING PUBLIC TRANSPORT**

The extent of the current British Rail Great Northern suburban electrification scheme comprises 111 route km and 365 single track km. The Outer Suburban part of the system uses a 25 kv single-phase overhead system; the Inner Suburban part, which must run in tunnels, is equipped with a 750 v dc third-rail system. The rolling stock consists of Class 312 four-car electric multiple units for the Outer Suburban service from King's Cross to Royston and Class 313 three-car electric multiple units providing the Inner Suburban service between Moorgate and either Hertford North or Welwyn Garden City. The Class 312 cars have a maximum speed of 90 mph, and a maximum acceleration of 0.9 mph/sec. Normal braking is about 1.8 mph/sec, with 2.2 mph/sec for emergency application. The Class 313 units have a maximum speed of 75 mph with rheostatic braking to 12-16 mph, using air-operated disc brakes to effect the final stop. Waste heat from rheostatic braking is used for warming the passenger accommodation. The Class 313 design enables electric current to be collected from either the 25 kv ac. overhead line equipment or from the 750 volts dc third rail systems. Changeover between overhead contact and conductor rail operation is controlled manually by the driver from the operative driving cab. When the 750 volts D.C. system is selected, the vacuum circuit breaker is locked open and the pantograph system physically locked in the down position. Indicator lamps show the system selected. If a train should run on to a live conductor rail section with the overhead contact equipment connected, or vice-versa, a buzzer sounds continuously until all the train equipments are correctly switched to the appropriate system.

*Energy Digest* Vol. 6 No. 1, Feb. 1977, pp 28-29

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

04 163298

**TUBULAR AXLE INDUCTION MOTOR FOR RAIL TRACTION**

By mounting an induction motor within a large diameter tubular railway axle British Rail Research & Development engineers are working on a drive system for railway vehicles which will overcome many of the disadvantages of the more traditional motors used currently for rail traction applications. Motor designers, mechanical engineers and electronics specialists at the railway Technical Centre, Derby, have designed a motor and power control system which eliminates the troublesome commutator and brushgear problems of d.c. series or a.c. commutator motors, removes the need for a gearbox and also provides a very effective braking action. The severe environment which exists within a railway axle dictates that only a rugged a.c. induction motor could be used for the development and an "inside-out" configuration has been employed, using the axle walls as the rotor revolving around the fixed inner stator. Special power conditioning equipment using thyristor inverters has been designed to provide the variable frequency variable voltage supply necessary to obtain the best torque/speed characteristics from the motor. Four prototype motors of a size which computer studies show would be suitable for powering multiple unit type trains are under construction for testing next year.

*Energy Digest* Vol. 6 No. 1, Feb. 1977, pp 30-31

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

04 163299

**THYRISTOR CHOPPER CONTROL USING MAGNETIC PULSE WIDTH MODULATOR**

The thyristor chopper control technique for electric vehicles using a magnetic pulse width modulator is described and the chopper control system for Japan's nation-wide Shinkansen Train car is given as an example. The operating mechanism of a newly-developed magnetic pulse width modulator and its function are analyzed. Using them to the best advantage has made it possible to integrate the principal functions for the chopper control, whereby a high degree of simplification of the control system has been attained. The excellent stability of the modulator electrical noise signals, unavoidable in electric vehicles, is noteworthy. Applications of the technique to battery-operated locomotives and battery-operated fork-lift trucks are also mentioned.

Presented at the 27th IEEE Vehicle Technology Group Annual Conference, Orlando, Florida, March 16-18, 1977.

Kiwaki, H (Hitachi Limited); Ibamoto, M Otazawa, N Toyama, J  
Institute of Electrical and Electronics Engineers Conf Paper  
77CH1176-7VT, 1977, pp 86-89, 4 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: IEEE

DOTL JC

04 163747

**REMOTE CONTROL OF LOCOMOTIVES HAULING HEAVY TRAINS [Distancionnoe upravlenie lokomotivami soedinennogo poezda]**  
No Abstract. [Russian]

Zirouhov, EI Levin, IG *Zheleznodorozhnyi Transport* No. 6, 1977, pp 49-53, 4 Fig., 2 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

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

04 163750

**DYNAMIC BEHAVIOUR OF THREE-PHASE ASYNCHRONOUS MOTOR DRIVING SYSTEMS [Dynamisches Verhalten von Antrieben mit Drehstromasynchronmotoren]**

The writer gives some 30 formulae and equations, and draws conclusions from them on the operation of these motors at variable speeds, particularly in the case of cyclic loading. [German]

Wachta, B *Elektrotechnische Zeitschrift, Ausgabe A* Vol. 98 No. 4, Apr. 1977, pp 283-287, 9 Fig., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

04 163752

**ANALYSIS OF THE HARMONICS CAUSED BY SMOOTHING FILTERS [Analiz odnozhennyyh i mnogozhennyyh g-obraznyh sglazivajuscih filtrov]**  
No Abstract. [Russian]

Stiben, GA *Vestnik Vniizt* No. 4, 1977, pp 5-8, 5 Fig., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

04 163771

**THYRISTORS AND ADHESION**

The near instantaneous response of thyristors makes it unnecessary to select motors and control schemes having a steep tractive effort/speed characteristic. With thyristors the aim should be to regulate motor current directly, rather than as a function of voltage across the terminals. No longer is it necessary or even desirable to connect motors in parallel. Each motor should have its own thyristor or chopper circuits for maximum adhesion and reliability.

Nouvion, FF (Traction Export Limited) *Railway Gazette International* Vol. 133 No. 9, Sept. 1977, pp 336-339, 2 Fig., 2 Phot.

ORDER FROM: ESL

DOTL JC

04 163805

**TRANSPORTATION AND THE FLYWHEEL**

The report was prepared by fourth year mechanical engineering students of Course 56-493 to complement design of flywheel related hardware. It states that further work should be directed at high-speed "superflywheels", as opposed to refinement of conventional high-density low-speed devices. Four aspects are presented: (i) State-of-the-Art introduces considerations and problems related to the design of high-speed flywheels and related components for energy storage systems. (ii) Applications outlines, primarily in a qualitative way, considerations related to application of flywheel energy storage systems to transportation problems. Brief specific discussions of a motor/generator system and hybrid flywheel system design with particular reference to fuel savings in automotive applications are also included. (iii) Applications to Urban Vehicles describes and discusses briefly two original preliminary designs for limited range, two passenger, flywheel-only, urban vehicles and drive trains. (iv) Bibliography presents a list of references selected as most useful from the large number of documents on which the report is primarily based.

Sponsored by the Transportation Research and Development Center, Department of Transport, Canada.

Grant, DS Rowan, DJ McLean, JA Fulcher, WB

Canadian Institute of Guided Ground Transport Final Rpt.  
CIGGT-77-5, May 1977, 81 pp, Figs., Tabs., Refs.

Contract D-500-361

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

04 164414

#### THYRISTOR CONTROLLED VARIABLE FREQUENCY DRIVES FOR AC MOTORS

There is a steadily growing field of application for static inverter equipment. Advances in inverter technology which offer increasing output rating coupled with a reduction in physical size are discussed. Economic aspects area considered, along with SCR switching block design.

James, M *Electronic Engineering* Vol. 49 No. 589, Mar. 1977, pp 49-52

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

04 164424

#### ANALYSIS OF THE PROFITABILITY RESULTING FROM THE INTRODUCTION OF IMPULSE STARTING IN TRACTION COMPLEXES OF THE POLISH RAILROAD SYSTEM [Analiza opłacalności wprowadzenia rozruchu impulsowego w zespołach trakcyjnych PKP]

Changes of operational parameters of the suburban rolling stock resulting from the introduction of SCR impulse starting equipment to replace resistance starting are analyzed. The effect of these changes on running costs is discussed under consideration of the changes appearing in the supply system. The notion of the modernization profitability index is introduced. It results from the comparison of the effectiveness indices of two comparable systems and makes it possible to determine the limit values of the modernization costs. As an example, the results of calculation for the suburban Polish Railroad rolling stock are given. [Polish]

Kotarski, F (Lodz Politechnic, Poland) *Przegląd Elektrotechniczny* Vol. 53 No. 2, Feb. 1977, pp 70-74, 10 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

04 165023

#### A METHOD OF CALCULATING LOCOMOTIVE PERFORMANCE

Many students of locomotive performance have been showing an interest in estimating power outputs during runs which they have timed and the author gives a basic, straightforward method for the assessment of power output.

Law, JNC *Modern Railways* Vol. 34 No. 346, July 1977, 3 pp, 2 Phot.

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

DOTL JC

04 165054

#### CHARACTERISTICS OF THE SECOND GENERATION OF ELECTRIC MOTIVE POWER UNITS [Probleme der elektrischen Triebfahrzeuge der zweiten Triebfahrzeuggeneration]

The new generation of motive power units will replace those put into service since 1960. The document is a study of the characteristics of these new units. [German]

Kahler, P Otto, J *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 24 No. 1, 1977, pp 145-154, 3 Fig., 3 Tab., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Hochschule fuer Verkehrswesen Friedrich List, Friedrich List Platz 1, Dresden 801, East Germany

04 165246

#### OPTIMUM DESIGN OF COMMUTATION CIRCUIT IN A THYRISTOR CHOPPER FOR DC MOTOR CONTROL

Expressions for the commutating capacitor voltage and current during the commutation period of the main and auxiliary thyristor in a chopper for a dc motor control system are found. After a successful commutation, a certain amount of energy is "stored" in the circuit components, and for best component utilization this stored energy has to be minimized. The procedure

for minimizing stored energy in the commutation circuit results in the selection of optimum values of commutating capacitors and inductors.

Ray, M (Calcutta University, India); Datta, AK *IEEE Transactions on Indust Elect & Control Instru* Vol IECU-23 N2, May 1976, pp 129-132, 6 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

04 166477

#### ENGINEERING TESTS FOR ENERGY STORAGE CARS AT THE TRANSPORTATION TEST CENTER

No Abstract.

Set of 4 volumes available from NTIS PB-268399. Set includes PB-269400 thru PB-269403.

AiResearch Manufacturing Company, Transportation Systems Center, Urban Mass Transportation Administration May 1977, 509 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-269399-SET/ST

04 166506

#### ASSESSMENT OF CONTROL TECHNIQUES FOR REDUCING EMISSIONS FROM LOCOMOTIVE ENGINES

The primary objective of this study was to determine the most effective method of reducing emissions of oxides of nitrogen from a two-cylinder version of an EMD series 567C locomotive engine. The NOx control techniques selected for use in this study included (1) change in fuel injector design, (2) variation in injection timing from the standard setting, (3) water induction, (4) air box bleed, (5) exhaust gas recirculation. Continuous measurements of unburned HC, CO, NOx and smoke opacity were made as the test engine was operated through a test cycle based on speed and load points characteristic of actual locomotive operation. Results of these tests are discussed.

Sponsored in part by Transportation Systems Center, Cambridge, Mass. See also PB-229 991.

Stormont, JO Springer, KJ  
Southwest Research Institute, Environmental Protection Agency, Transportation Systems Center Final Rpt. SWRI-AR-884, Apr. 1973, 320 pp

Contract EHS-70-108

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-270395/7ST

04 167086

#### EVALUATION OF FOUR DIFFERENT RAIL RAPID TRANSIT PROPULSION SYSTEMS

At UMTA request, APTA evaluated four different propulsion systems. Due to lack of precise estimates for acquisition, maintenance, and traction power savings, this analysis is qualitative and adheres to the guideline that system elements will be compared subjectively, based on known design features and conservative extrapolation. A comparison was made of Garrett's flywheel energy storage, GE's AC propulsion (pulse-width modulation-PWM), Delco's self-synchronous motor, and a regenerative chopper to determine life cycle costs and related factors that would impact on eventual selection and application for revenue service.

Greene, FS  
American Public Transit Association, Urban Mass Transportation Administration Final Rpt. UMTA/URRVS-77/01, Nov. 1976, 20 pp

Contract DOT-UT-60060

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-271301/4ST, DOTL NTIS

04 167291

#### FLYWHEEL PROPULSION SIMULATION

This report develops and describes the analytical models and digital computer simulations that can be used for the evaluation of flywheel-electric propulsion systems employed with urban transit vehicles operating over specified routes and with predetermined velocity profiles. The computer

simulation is divided into two sections. The first section simulates the dynamic behavior of the vehicle enroute, computes the energy and power requirements, and the power losses of each of the propulsion system components. The second section uses thermal models to compute the temperature rises of each of the propulsion system components. The simulations can be used to determine the suitability of a given flywheel-electric propulsion system for an intended mission. The simulation method can be applied to electric-drive systems for battery and flywheel energy-storage vehicles, to hybrid vehicles, and to vehicles operating from wayside power. The Appendices contain Mathematical Models, Input Constants for Computer Program, Parameter Listing for Computer Program, Tabular Outputs for Sample Run, Manufacturers' Data for Major Components, and Report of Inventions. (Portions of this document are not fully legible)

Kusko, A. King, CM  
Kusko (Alexander) Incorporated, Urban Mass Transportation  
Administration, Transportation Systems Center, (UMTA-MA-06-0044)  
Final Rpt. UMTA-MA-06-0044-77-1, May 1977, 196 pp

Contract DOT-TSC-1180

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-272259/3ST

## 04 167551

### DUTY CYCLES FOR TURBINE-POWERED TRAINS

The engine cycling rates for gas turbine powered trains is inevitably high particularly when considering free turbine engines. Conservative design minimizes the effect of LCF life and in field operations there have been no cases of failure on ST6 engines from this cause. Nevertheless it is good engineering practice to keep the cycling rates to a minimum by the use of suitable operating techniques.

From SAE Meeting, February 28-March 4, 1977.

Blizzard, CA (Pratt and Whitney Aircraft)  
Society of Automotive Engineers Preprint SAE 770285, 1977, 9 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

## 04 167925

### ENGINEERING TESTS FOR ENERGY STORAGE CARS AT THE TRANSPORTATION TEST CENTER. VOLUME I. PROGRAM DESCRIPTION AND TEST SUMMARY

The primary purpose of the tests documented herein was to demonstrate the principles and feasibility of an energy storage type propulsion system, and its adaptability to an existing car design. The test program comprised four phases of tests on two New York City Transit Authority R-32 cars where the conventional propulsion system was replaced by an energy storage system. The four test phases were: verification of safe arrival, debugging procedures, performance verification tests, and expanded test program. This report contains test data collected during the performance verification and expanded test program phases. Testing was conducted at the DOT Transportation Test Center, Pueblo, Colorado. The data was collected and processed in accordance with the General Vehicle Test Plan for Urban Rail Transit Cars.

Available in set of 4 reports PC E10, PB-269400-PB-269403. See also Volumes II-IV, RRIS 04 167926-167928 respectively; RRIS Bulletin 7801.

Curran, WT  
AiResearch Manufacturing Company, Transportation Systems Center,  
Urban Mass Transportation Administration Final Rpt. DOT-  
TSC-UMTA-77-6-1, UMTA-MA-06-0025-77-2, May 1977, 138 pp, 13 Fig.

Contract DOT-TSC-8381

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-269400/8SL, DOTL NTIS

## 04 167926

### ENGINEERING TESTS FOR ENERGY STORAGE CARS AT THE TRANSPORTATION TEST CENTER. VOLUME II. PERFORMANCE POWER CONSUMPTION AND RADIO FREQUENCY INTERFERENCE TESTS

The primary purpose of the tests documented herein was to demonstrate the principles and feasibility of an energy-storage-type propulsion system, and its adaptability to an existing car design. The test program comprised four

phases of tests on two New York City Transit Authority R-32 cars where propulsion system was replaced by an energy storage system. The four test phases were: verification of safe arrival, debugging procedures, performance verification tests, and expanded test program. This report contains test data collected during the performance verification and expanded test program phases.

Available in set of 4 reports PC E10, PB-269400-PB-269403. See also RRIS 04 167925, the first volume in RRIS Bulletin 7801 and Volumes III and IV, RRIS 04 167926-167927 respectively.

Curran, WT  
AiResearch Manufacturing Company, Transportation Systems Center,  
Urban Mass Transportation Administration Final Rpt. DOT-  
TSC-UMTA-77-6-2, UMTA-MA-06-0025-77-3, May 1977, 112 pp, 13 Fig.

Contract DOT-TSC-838-2

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-269401/6SL, DOTL NTIS

## 04 167927

### ENGINEERING TESTS FOR ENERGY STORAGE CARS AT THE TRANSPORTATION TEST CENTER. VOLUME III. NOISE TESTS

The primary purpose of the tests documented herein was to demonstrate the principles and feasibility of an energy storage type propulsion system, and its adaptability to an existing car design. The test program comprised four phases of tests on two New York City Transit Authority R-32 cars where propulsion system had been replaced by an energy storage system. The four test phases were: verification of safe arrival, debugging procedures, performance verification tests, and expanded test program. This report contains test data collected during the performance verification and expanded test program phases.

Available in set of 4 reports PC E10, PB-269400-PB-269403. See also Volumes I, II and IV, RRIS 04 167925, 04 167926 and 04 167928 respectively; RRIS Bulletin 7801.

Curran, WT  
AiResearch Manufacturing Company, Transportation Systems Center,  
Urban Mass Transportation Administration Final Rpt. DOT-  
TSC-UMTA-77-6-3, UMTA-MA-06-0025-77-4, May 1977, 91 pp, 13 Fig.

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-269402/4SL, DOTL NTIS

## 04 167928

### ENGINEERING TESTS FOR ENERGY STORAGE CARS AT THE TRANSPORTATION TEST CENTER. VOLUME IV. RIDE ROUGHNESS TESTS

The primary purpose of the tests documented herein was to demonstrate the principles and feasibility of an energy storage type propulsion system, and its adaptability to an energy storage type propulsion system, and its adaptability to an existing car design. The test program comprised four phases of tests on two New York City Transit Authority R-32 cars where the conventional propulsion system was replaced by an energy storage system. The four test phases were: verification of safe arrival, debugging procedures, performance verification tests, and expanded test program.

Available in set of 4 reports PC E10, PB269400-PB-269403. See also Volumes I-III, RRIS 04 167925-167927 respectively; RRIS Bulletin 7801.

Curran, WT  
AiResearch Manufacturing Company, Transportation Systems Center,  
Urban Mass Transportation Administration Final Rpt. DOT-  
TSC-UMTA-77-6-4, UMTA-MA-06-0025-77-5, May 1977, 168 pp, 13 Fig.

Contract DOT-TSC-838-4

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-269403/2SL, DOTL NTIS

## 04 167943

### ANALYSIS OF DYNAMICS OF FLOW IN A COUNTERCURRENT GAS-TURBINE AIR PREHEATER ON FULL-SIZED TRANSPARENT MODELS

The flow in a full-size cold model of air preheater for a locomotive gas-turbine engine was investigated. The model was transparent, and water was the modeling fluid instead of hot air and gas.

Kazdoba, AL (All-Union Correspondence Inst of Rail Eng, USSR);  
Ganin, GM Gusev, YK *Fluid Mechanics-Soviet Research* Vol. 5 No. 4, Aug. 1976, pp 99-103, 4 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**04 167945**  
**DIAGNOSTICS OF DIESEL ENGINES USING EXHAUST SMOKE AND TEMPERATURE**

An experimental sensor array that measures dynamic exhaust temperature and dynamic smoke for the purpose of diagnosing diesel engine fuel injection equipment was designed, built, and tested. The sensor array is portable and easily installed on truck tailpipes, and was tested using two 6V-53 Detroit Diesel engines. The dynamic temperature sensor is a very high response instrument capable of measuring changes in gas temperature in excess of 104F/second. The dynamic smoke meter is an optical device designed to measure very low levels of light opacity in the smoke plume, with a response compatible with the engine firing frequency. Dynamic exhaust temperature data had more diagnostic significance than dynamic smoke in the detection of maximum power degrading fuel injection faults. Gaseous exhaust emissions (CO, CO sub 2, O sub 2, NO sub x, and hydrocarbons) were also evaluated for their diagnostic merit and were found to be less significant than the dynamic temperature and smoke data under the no-load test constraints common to shop and field diagnosis.

For Meeting November 1-4, 1976.

Hambright, RN (Southwest Research Institute); Benson, HS  
Society of Automotive Engineers Preprint N 760833, 1976, 8 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**04 167947**  
**INTRODUCTION TO THE THEORY OF THREE-PHASE CURRENT DRIVE SYSTEMS VOLUME 1: PRINCIPLES VOLUME 2: APPLICATIONS [Einfuehrung in die Theorie geregelter Drehstromantriebe Bd. 1: Grundlagen Bd. 2: Anwendungen]**

This work deals in depth with three-phase current drive systems from the aspect of technical control problems. After providing some information on how the speed of rotation of three-phase current motors can be regulated, the theoretical bases are given for the study of the static and dynamic behaviour of synchronous and asynchronous motors in which the theories of 2 axis or single axis systems can be applied. The technical behaviour of the control of static frequency rectifiers is then considered. [German]

Buehler, H *Lehrbuecher der Elektrotechnik* 1977, 2 pp, 300 Phot., 77 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Lehrbuecher der Elektrotechnik, Basel, Switzerland

**04 167990**  
**AC DRIVING SYSTEMS FOR RAILROAD CARS [Drehstrom-Antriebssysteme fuer Bahnfahrzeuge]**

Various inverter systems used in conjunction with driving of railroad trains were investigated. An implemented system for dc feeding is described. This system is undergoing tests at a Berlin, Germany, subway double motor coach. Alternative installations are suggested for a universal locomotive of the West German railroads. [German]

Ciessow, G Goelz, G Grumbrecht, P *Technische Mitteilungen AEG-Telefunken* Vol. 67 No. 1, 1977, pp 35-43, 8 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**04 168008**  
**PROGRESS IN RAILWAY MECHANICAL ENGINEERING 1976-1977 REPORT OF SURVEY COMMITTEE LOCOMOTIVES**

This report covers motive power designs that have been delivered and developments undertaken in the survey period of September 1, 1976 to September 1, 1977. Data and photographs for seven new diesel locomotives, seven electric locomotives and two train sets are presented.

Contributed by the Rail Transportation Division of ASME for presentation at the Winter Annual Meeting, Atlanta, Georgia, November 27-December 2, 1977.

Baker, PH Schulze, FW (General Electric Company)  
American Society of Mechanical Engineers Conf Paper 77-WA/RT-12, 1977, 9 pp, 13 Fig., 3 Tab., 9 Ref.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

**04 168106**  
**REDUCING TORQUE AS A MEANS OF PREDICTING THE SERVICE LIFE OF CARBON BRUSHES IN SINGLE-PHASE COMMUTATION MOTORS [Die Drehmomentminderung als Hilfe fur die Bewahrungsprognose von Kohlebursen auf Einphasenkommutatormotoren]**

The torque of single-phase commutator motors drops at less than 300 rpm and reaches a minimum at zero speed under a full magnetic field at constant intensity. This drop varies according to the type of brush used. For the DB's BR 151 locomotives, the reduced torque at zero speed varied between 0.837 to 0.935 times the normal torque. Wear on brushes and commutator motors varied in parallel with the reduction in torque. The correlation between the two is sufficiently regular as to provide a means of predicting the service life of new types of brushes. However the negative commutation curve does not provide any significant information. [German]

Herrmann, W *Elektrische Bahnen* Vol. 48 No. 6, June 1977, pp 141-144, 5 Fig., 1 Tab., 1 Ref.

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

DOTL JC

**04 168114**  
**EXPERIMENTAL LOCOS FEATURE 1000 KW MOTORS WITHOUT COMMUTATORS**

Technological trends in the USSR for motive power units, particularly the experimental locomotive VL 80 V with synchronous motors.

*Railway Gazette International* Vol. 133 No. 7, July 1977, pp 260-261, 1 Fig.

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

DOTL JC

**04 168115**  
**CHOPPER EQUIPMENT FOR COACHES ON THE BRUSSELS METROPOLITAN RAILWAY [Les equipments a hacheurs des voitures du metro de Bruxelles]**

The author starts by recalling the main design principles and general characteristics of the coaches and then describes the overall layout of the chopper equipment giving details of the main parts: chopper and its controls, motors and fittings. He shows how the solutions adopted are original and stresses how well the equipment is suited to the constraints of operating on a metropolitan railway. [French]

*ACEC Revue* No. 304, 1976, pp 3-22, 11 Fig., 5 Tab., 17 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ateliers de Constructions Electriques de Charleroi, BP4, 6000 Charleroi, Belgium

**04 169960**  
**INTRODUCTION OF AUTOMATIC DRIVING AND BRAKING DEVICES ON DB TRACTIVE UNITS [Der Einsatz automatischer Fahr-Brems-Einrichtungen auf Triebfahrzeugen der Deutschen Bundesbahn]**

No Abstract. [German]

Goelle, HH *Eisenbahningenieur* Vol. 28 No. 9, 1977, pp 335-345, 14 Phot.

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

**04 169988**  
**IEEE TECHNICAL PAPERS PRESENTED AT THE JOINT ASME/IEEE/AAR (ASSOCIATION OF AMERICAN RAILROADS) RAILROAD CONFERENCE, 1977**

This volume contains eight papers dealing with technical aspects of rail transport, with particular emphasis on the Washington Metro system. Paper topics are: three-phase propulsion in diesel and electric locomotives for heavy freight and fast passenger service; computers in railroad control; rail analysis modeling; a feasibility study for the measurement of track modulus by railway track recorder cars; Washington Metro's rapid transit cars;

Washington Metro automatic train control system; electrical power systems of the Washington Metrorail Transit System; and dynamic on-line destination scheduling.

IEEE Tech Pap presented at the Jt ASME/IEEE/AAR (Assoc of Am Railroads) Railroad Conf Washington, DC, March 30-April 1, 1977. Individual papers from this conference are in RRIS Bulletin 7701 and can be found in the Corporate Author Index under the listing American Society of Mechanical Engineers.

Institute of Electrical and Electronics Engineers Conf Paper No. 77CH1237-71A, 1977, 59 pp

ACKNOWLEDGMENT: EI

ORDER FROM: IEEE

DOTL RP

04 169996

## ENERGY ON CALL

There is a tremendous range of possible approaches and concepts for storing energy in electric utility systems. Of these, seven were selected for consideration in this article. These are hydro pumped storage, compressed-air storage, thermal storage, electrochemical (battery) storage, flywheel (inertial) storage, chemical (hydrogen) storage, and superconducting magnetic energy storage. The article reports on a study whose objectives included determining the amount and distribution of off-peak energy on a seasonal, weekly, and daily basis, estimating the amount of on-peak energy that could be supported by off-peak energy, determining duty cycles for energy-storage devices, and determining break-even costs for energy-storage devices so they can be compared economically. The relative attractiveness of various forms of energy storage are shown in a chart.

Casazza, JA (Public Service Electric and Gas Company); Schneider, TR Sulzberger, VT *IEEE Spectrum* Vol. 13 No. 6, June 1976, pp 44-47, Refs.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

04 170079

## THE TECHNICAL ASSESSMENT OF TRANSPORT DRIVE SYSTEMS [Zur technischen Bewertung von Transportantriebssystemen] No Abstract [German]

Rose, H *Glaser's Annalen ZEV* Vol. 101 No. 8-9, Aug. 1977, pp 292-302, 6 Fig., 4 Tab., 13 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

04 170084

## CURRENT RETURN DEVICES FOR THE PROTECTION OF BEARINGS IN RAILWAY VEHICLES [Dispositivo de retorno de corriente para proteccion de rodamientos en vehiculos ferroviarios]

A short review of old and new practical devices used for the earthing or return circuits of electric current from various sources (traction, auxiliary circuits, lighting, converter equipment for air conditioning current, etc.) in railway vehicles. [Spanish]

Borrell, JA *AIT-Revue* No. 17, Aug. 1977, pp 59-61, 2 Fig., 6 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

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

04 170090

## AUTOMATION OF LOCOMOTIVE SHUNTING OPERATIONS AT MUSASHINO MARSHALLING YARD

As part of the virtual complete automation of its new hump classification yard in Tokyo, Japanese National Railways has developed a method of automation for the diesel switching locomotives used for the humping operation. The radio-controlled system for operation of locomotives with hydraulic transmissions under varying loads and with the ability to stop at precise points is discussed.

Nagase, K (Japanese National Railways) *Japanese Railway Engineering* Vol. 71 No. 1, 1977, pp 19-21, 3 Fig., 1 Tab., 2 Phot.

ACKNOWLEDGMENT: Japanese Railway Engineering

ORDER FROM: Japan Railway Engineers' Association, 2-5-18 Otemachi, Chiyoda-ku, Tokyo, Japan

DOTL JC

04 170092

## MULTIPLE-POWERED-UNIT TRAINS AS VIEWED FROM THE EMPLOYMENT AS ROLLING STOCK--THEIR DEVELOPMENT AND BACKGROUND

The merits of multiple-unit, as opposed to locomotive-hauled, trains and the reasons for adoption of such equipment by Japanese National Railways are explained. The advantages of both electric and diesel-powered m-u trains include variable train length, low axle loadings, greater adhesive weight, and improved train performance allowing running times to be reduced.

Hirota, Y (Japanese National Railways) *Japanese Railway Engineering* Vol. 17 No. 1, 1977, pp 7-10, 5 Fig.

ACKNOWLEDGMENT: Japanese Railway Engineering

ORDER FROM: Japan Railway Engineers' Association, 2-5-18 Otemachi, Chiyoda-ku, Tokyo, Japan

DOTL JC

04 170097

## THREE-PHASE OPERATION OF RAIL VEHICLES RUNNING ON D.C. AND A.C. CONTACT WIRES

For the operation of rail vehicles with asynchronous motors a current converter system is available which is suitable for both d.c. and a.c. contact wires. The components d.c. controller and inverter with machine are equipped with input smoothing for d.c. vehicles, while for a.c. vehicles there is a rectifier which operates with a power factor of almost 1. Inverter and machine operate with impressed current in an uncomplicated circuit. With the asynchronous machine there is none of the limitations which restrict the Zv diagram with the 16 2/3 Hz motor and the mixed-current series motor. Electric braking down to standstill is possible, even if the mains fail. The controllability of the asynchronous machine also complies with the dynamic requirements of slip and skid prevention. A tramcar is already in operation with this system and an underground railway car is being equipped with it. [German]

Meissen, W Sauer, H *Eisenbahntechnische Rundschau* Vol. 26 No. 7-8, July 1977, 3 pp

ACKNOWLEDGMENT: British Railways

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

DOTL JC

04 170283

## RECENT TRACTION MOTOR DEVELOPMENTS

Traction motor improvements have been due primarily to developments in insulating materials and methods of applying them, permitting higher temperatures, better dissipation of heat and higher space factors. While the most active weight of a motor is copper and steel, it is unlikely that metallurgical breakthroughs will improve mechanical strength, electrical conductivity or magnetic permeability of these metals. Current collection, commutation and commutator strength are near practical limits as peripheral and rotational speeds have gradually increased. Because the standard dc machine needs only minor changes to enable it to operate on pulsating current, the increasing popularity of a rectified ac supply presents no major problems.

This paper was presented at a number of centers in the 1976/78 sessions by Mr. D.L. Rawle.

Rawle, DL (General Electric Company Traction Limited) *Railway Engineer* Vol. 2 No. 6, Nov. 1977, 4 pp, 3 Tab.

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

DOTL JC

04 170284

## BR 200 KM/H TUBULAR AXLE MOTOR

In 1976 the British Railways Technical Centre produced a three-phase wheelset motor where the motor is mounted inside a tubular axle, the axle itself forming the rotor. Because the whole motor is unsprung, it must be light and able to withstand high shock loadings, conditions well met by squirrel-cage induction motors. A new design now being developed will have the stator as the axle with rotor and wheelset revolving around it. This arrangement removes the need for inner bearings and eliminates the stator lamination stack as a load bearing path.

Stokes, RW (British Railways Board Res & Development Division) *Railway Engineer* Vol. 2 No. 6, Nov. 1977, pp 13-15, 4 Fig., 5 Ref.

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

DOTL JC

04 170449

**STATIC CONVERTER FOR POWERING VARIOUS TYPES OF AUXILIARY EQUIPMENT**

No Abstract. [Russian]

Kosceev, LG *Vestnik Vniizt* No. 5, 1977, pp 10-12, 2 Fig., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

04 170453

**DISTRIBUTED MODEL FOR STRESS CONTROL IN MULTIPLE LOCOMOTIVE TRAINS**

A distributed model approach to the problem of coupler stress control in multiple locomotive trains is presented. The approach taken is to formulate the original problem in terms of a distributed parameter model with boundary controls. It turns out that the resulting model is conceptually quite useful and mathematically tractable. In the distributed model, the effects of changes both in system parameters and in the number of cars in a block are readily apparent. It is also to be expected that with an increase in the number of cars in a block the validity and usefulness of the model increases while a "Conventional" formulation becomes more intractable.

Davis, JH (Queen's University, Canada); Barry, BM *Applied Mathematics and Optimization* Vol. 3 No. 2-3, 1977, pp 163-190, 9 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

04 170462

**TAPERED ROLLER BEARING TRACTION MOTOR SUSPENSION**

The paper reviews some of the early history of tapered roller bearing motor suspension and discusses the designs used along with the lubrication practices. In addition, it shows that the trend in the United States, as well

as in many other parts of the world is to use tapered roller bearing traction motor suspension for new electric and diesel-electric locomotives in an effort to reduce locomotive maintenance costs, increase availability, and conserve costly petroleum products.

Heggy, RF (Timken Company); Hartzell, CE *Lubrication Engineering* Vol. 33 No. 9, Sept. 1977, pp 465-470, 7 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

04 170474

**HARDNESS OF COMMUTATOR FILM AS A FUNCTION OF ITS THICKNESS**

The way in which the loading parameters of an electrical sliding contact affect the thickness and hardness of the commutator film is investigated. The reduction in commutator-film hardness associated with an increase in film thickness is explained.

Isaev, VS Gogolev, AY Kovtun, VP *Soviet Electrical Engineering* Vol. 47 No. 5, 1976, pp 50-51

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

04 170570

**ELECTRIC LOCOMOTIVES IN THREE-PHASE CURRENT TECHNOLOGY**

After a short review of the development of electric traction vehicles, the requirements which have to be met in modern electric traction vehicles in regard to construction, production, service testing, operational use and maintenance, are listed. The development of the idea of an electric locomotive in three-phase current technology and the measures adopted for its realization are described. The advantages as against electric locomotives with commutator motors in regard to traction technique as also the systems for three-phase current traction vehicles are set forth. Finally the economic improvements to be expected by the use of traction vehicles in the three-phase current technology are looked at.

*Rail International* Vol. 8 No. 10, Oct. 1977, pp 490-498

ACKNOWLEDGMENT: Rail International

ORDER FROM: ESL

DOTL JC

05 163237

## THEORY OF EDDY-CURRENT BRAKES WITH THICK ROTATING DISK

No Abstract.

Singh, A *Institution of Electrical Engineers, Proceedings* Vol. 124 No. 4, Apr. 1977, pp 373-379, 1 Fig., 2 Phot., 16 Ref.

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

05 163744

## TEST OF BRAKE COMPONENTS WHEN RUNNING AT HIGH SPEEDS UP TO 250 KM/H ON THE GUETERSLOH-NEUBECKUM TEST LINE [Untersuchung der Bremskomponenten bei den Schnellfahrfahrten bis 250 km/h auf der Versuchsstrecke Guetersloh-Neubeckum]

These tests were made with a train consisting of 3 to 8 coaches, hauled by an E 103-118 locomotive. The purpose was to study the behaviour of disc brakes, brake blocks, magnetic rail brakes, anti-skid devices, and locomotive electric and shoe brakes. The article gives the temperatures recorded, braking distances, adhesion ensured, and the operating characteristics of anti-skid devices at very high speeds. [German]

Sonder, E Kuehl, H *Leichtbau der Verkehrsfahrzeuge* Vol. 21 No. 2/3, Mar. 1977, pp 44-47, 4 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Leichtbau der Verkehrsfahrzeuge, Rosenheimer Strasse 145, Munich 80, West Germany

05 163807

## INDUCTIVE COUPLING FOR TRANSMISSION OF BRAKING SIGNALS IN LONG FREIGHT TRAINS

The tuned, inductively-coupled connector proposed in CIGGT Project 1.17 has been carried to a state of development where it can be considered a viable signal-carrying inter-car connector for long freight trains. The transmission efficiency of the ferrite-cored device is 98 percent, with a useful bandwidth of 100 kHz. Computer simulations of 1 to 100 cascaded couplers, based on an accurate circuit model, and tests on 32 experimental connectors, have demonstrated that 0.1 watts, sufficient to operate a control solenoid, can be delivered to up to 40 cars having simple resistive loads, or up to 100 cars with more sophisticated demand-regulating loads. If the lines can be fed from both ends, as would be possible from mid-train locomotives or a caboose, the number of cars between power sources could conceivably be as large as 80 or 200, depending on the on-board car equipment used. Mechanical and electrical tolerances have been established. The principal

recommendation arising from this work is that the connector be field tested in the railway environment.

Aitken, GJM

Canadian Institute of Guided Ground Transport Final Rpt.  
CIGGT-77-4, Jan. 1977, 31 pp, Figs., 8 Ref., 5 App.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

05 165055

## EDDY-CURRENT BRAKES [Wirbelstrombremsen]

From Maxwell's equations, the author obtains a basic equation for partial shunt currents passing through a rotating disc in a magnetic field. From this he deduces the operation of an eddy-current brake, which he shows can be compared to an induction motor when a direct current passes through the stator. He thus deduces some of the properties of this brake in relation to the speed which gives the maximum torque, to the number of poles, and the effect on torque of the disc material: steel, cast iron, copper, aluminum. [German]

Schulze, R *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 24 No. 1, 1977, pp 155-158

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Hochschule fuer Verkehrswesen Friedrich List, Friedrich List Platz 1, Dresden 801, East Germany

05 166684

## BRAKE FRICTION MATERIALS: A MARKET SURVEY

A composition material developed by National Aeronautics and Space Administration (NASA) may be useful as an improved vehicle brake friction material. To assist NASA in identifying a potential market for this material, the SRI Technology Applications Team has conducted a survey of the market for vehicle brake friction materials in the United States. The purpose of this market survey is to outline the technical and economic requirements that a candidate composition friction material must meet before it can be considered a viable product. In addition the properties of composition brake friction materials currently on the market have been reviewed to identify those properties that, if improved, would be a useful advance to the product.

Wilhelm, JP Loomis, AV

Stanford Research Institute, National Aeronautics and Space Administration NASA-CR-149028, Aug. 1975, 84 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

N77-70130/8ST

06 053228

**TRANSMISSION OF INFORMATION THROUGH THE TRAIN LINE. ANALYSIS OF INTERFERENCE VOLTAGES ON INFORMATION CIRCUITS IN TRAINS**

At the request of the A 130 Specialists Committee, a measuring team of Vienna Arsenal Research Institute investigated, in 1974 and 1975, interference voltages on information circuits in moving trains on the systems of four European railways (FS, DB, PKP and SNCF). The interference voltages on information circuits, both on the information circuits through the automatic coupler and on the UIC loudspeaker circuit, were investigated regarding their effect on planned transmission systems using these circuits. Level conditions, frequency of occurrence and frequency distribution of the interference voltages, with different traction systems, are given in this report. Also, some results of experimental data transmission are included for comparison. In addition, test runs made by DB in the Munich area served to determine error rates on the basis of a transmission of data.

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

International Union of Railways A 103/RP3/E, Oct. 1976, 53 pp, 17 Fig., 18 Tab.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

06 053231

**AUTOMATIC IDENTIFICATION OF VEHICLES: LICENCES. DRAFT CONTRACT COVERING THE GRANTING OF LICENCES FOR RESPONDERS**

This report outlines the negotiations conducted by Working Party S1010 with Messrs. Siemens who have developed the SICARID microwave system. Appended to the report is a draft licencing contract patent rights and the technical specification for the responders.

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

International Union of Railways S1010/RP 1/E, Oct. 1976, 33 pp

ACKNOWLEDGMENT: UIC  
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DOTL RP

06 053239

**USE OF ELECTRONICS IN SIGNALLING. SOFTWARE VERIFICATION PROCEDURES FOR COMPUTER BASED SAFETY-SYSTEMS (DOCUMENTING, CHECKING AND TESTING)**

This report offers recommendations for the system documentation, program checking and system testing of computer based systems especially to be applied to systems used in safety applications.

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

International Union of Railways A 118/RP 11, Oct. 1976, 32 pp, 1 Ref., 5 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

06 053240

**TRANSMISSION OF INFORMATION THROUGH THE TRAIN LINE: SPECIFICATION FOR THE EXPERIMENTAL SYSTEM FOR TRANSMITTING INFORMATION THROUGH THE TRAIN LINE**

This specification for the experimental equipment for a system for transmitting information through the train pipes defines: the operating requirements and the technical requires to be fulfilled. This system is intended, in particular, to make it possible to control the doors, the lights and the heating of passenger trains. At a later stage of development it is envisaged that the system will provide for the indication of anomalies in freight trains.

Restrictions on the use of this document are contained in the explanatory material. Published in French, German and English.

International Union of Railways A 103/RP 4/E, Oct. 1977, 28 pp, 6 Fig., 3 Tab., 3 App.

54

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

06 053244

**APPLICATION OF THYRISTORS IN RAILWAY TECHNOLOGY: CONSEQUENCES AND REMEDIES. STUDY OF INTERFERENCE IN TELECOMMUNICATIONS LINES INCLUDING DATA TRANSMISSION WITH AC TRACTION**

Purpose: designed tests have been carried out in order to better understand the interference phenomena between overhead line and telecommunications line. These tests have shown the following situation: 1. The interference current does not necessarily constitute a criterion for the psophometric voltage in the telecommunication line since the coupling admittance of the interference medium as a function of frequency is not constant. 2. The resonance in the overhead line at and near the resonant frequency strongly reduces the coupling admittance of the interference medium so that these frequency components substantially govern the psophometric voltage. And 3. The peak value of the transverse voltage, and thus the error rate in data transmission, does not, like the psophometric voltage, increase proportionally with the length of exposure.

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

International Union of Railways A 122/RP 22/E, Apr. 1977, 46 pp, 68 Fig., 3 Tab., 8 Ref.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

06 053247

**ELECTRONIC TEST INSTALLATION (VIENNA ARSENAL). TESTS MADE AT THE ELECTRONIC TEST INSTALLATION IN THE YEAR 1975/76**

This is the ninth annual report on the electronic test installation, set up in Vienna jointly by the Office for Research and Experiments (ORE) of the International Union of Railways (UIC) and the Austrian Federal Research and Test Institute for data transmission and electronics questions relating to railway engineering. During the year covered by the report the work carried out at the test installation involved 3 subjects: 1) Modem test methods: Type testing started with 9600 bit/s and a new test facility was developed for testing group band modems (60 to 108 kHz). Routine testing with 1200/1600 bit/s was continued and the comparison of modems in section B of the report was extended. 2) Interference measurements for Committee A 103: To obtain a suitable selection of information transmission systems using data lines in moving trains electrical interference was examined on 4 member administrations. The overall report was compiled and a characteristics interference tape was prepared for practical testing of equipment. 3. Testing of automatic track gang warning installations for Committee A 124. A programme of measurements for testing the safety and reliability of such installations was prepared and first type tests were started.

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

International Union of Railways AZ 32/RP 9/E, Apr. 1977, 45 pp, 10 Fig., 2 Tab., 4 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

06 053249

**USE OF ELECTRONIC COMPONENTS IN SIGNALLING ELECTRICAL ENVIRONMENT AFFECTING RAILWAY SIGNALLING INSTALLATIONS. APPENDICES**

The present report on electrical interference in railways is intended to represent a catalogue of the knowledge and experience in European railways up to 1975. Quantitative information is given on interference sources as well as details on the coupling mechanisms through which electrical interference can affect the operation of equipment, with particular regard to electronic equipment. The report also proposes several measures to protect equipment against electrical interference although different factors make it impractical to recommend a standard code of practice. The measures and techniques described in Section 3 are of a general nature and their application will require the use of established engineering practice. The report also contains a brief account of the assessment of the replies obtained from an inquiry conducted with the European railway administrations.



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

International Union of Railways A 118/RP 10, Oct. 1976, 95 pp, 23 Fig., 9 Tab., 4 App.

ACKNOWLEDGMENT: UIC  
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DOTL RP

06 156323

## CONTROL IN TRANSPORTATION SYSTEMS, PROCEEDINGS OF THE IFAC/IFIP (INTERNATIONAL FOUNDATION FOR INFORMATION PROCESSING/IFORS (INTERNATIONAL FEDERATION OF OPERATIONAL RESEARCH SOCIETIES) INTERNATIONAL SYMPOSIUM 3RD, 1976

The Proceedings contain 42 papers presented at the Symposium. General topics covered in the technical sessions include highway system access and control, bus operations, rail/tracked systems, urban taxi-transit/public transportation systems, mathematics of traffic control, urban commuter and automated transit, transportation, land use and environment, urban network control systems, and optimization in urban transportation. The papers discuss various aspects of these topics, from theoretical, experimental, and practical application viewpoints. Selected papers are indexed separately.

Presented at the IFAC/IFIP/IFORS International Symposium, Columbus, Ohio, August 9-13, 1976.

International Federation of Automatic Control Proceeding 1976, 382 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: Instrument Society of America, 400 Stanwix Street, Pittsburgh, Pennsylvania, 15222

06 163238

## INSTALLATION OF REMOTE COMPUTER CONTROL BETWEEN MUNICH, PASING AND TUTZING [Aufbau der Rechner-Fernsteuerung Muenchen-Pasing-Tutzing]

On this line in the Munich area, a central control post for operating purposes is being built using, for the first time, the basic principles recommended by the Working Party responsible for planning the system of central operating control, set up by the DB. This article describes the purpose of the main parts of the system. The design is in accordance with a future standard of the BSZ (Central Operating Control) for a Siemens S.A. type of construction. [German]

Heissmann, R Ritt, E *Signal und Draht* Vol. 69 No. 3, Mar. 1977, pp 45-53, 5 Fig., 1 Phot., 2 Ref.

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

06 163241

## AUTOMATIC RADIO CONTROL FOR TRAIN RUNNING [Die Funkzugbeeinflussung]

The author explains how this new type of train running control works, where the tractive unit is controlled by directional radio installations with different pairs of frequencies and use of a microcomputer. To assess the worth of this system and how it can be used on a parallel with the track line system, thorough analysis is necessary. [German]

Frank, W *Signal und Draht* Vol. 69 No. 4, Apr. 1977, pp 69-76, 10 Fig.

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

06 163247

## A PECULIARITY OF RAILWAY SIGNALLING: THE OVERLAP [Une particularite de la signalisation ferroviaire: l'overlap]

After giving a concise historical background to railway signalling, the author defines overlap and the different ways of achieving it in practice; with the automatic block, the overlap involves there being a protective zone down the line from each block signal and this effects the block signal control for the section immediately up the line. The author then refers to uses of overlap on the metropolitan railways in London, Paris, Munich, Nuremberg and discusses the purpose of the system. [French]

Besacier, G *Revue Generale des Chemins de Fer* Vol. 96 Apr. 1977, pp 226-232, 11 Fig., 7 Ref.

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

DOTL JC

06 163248

## RADAR, A SYSTEM FOR MEASURING SPEED, DISTANCE AND ACCELERATION WITHOUT CONTACT [Vsb-RADAR, ein beruehrungslos arbeitendes Geschwindigkeits-Weg-und Beschleunigungsmessgeraet]

No Abstract. [German]

Meinel, H *Glaser's Annalen ZEV* Vol. 101 No. 3, Mar. 1977, pp 79-82, 4 Fig., 4 Tab., 3 Ref.

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

DOTL JC

06 163252

## LOOP TESTING DEVICES FOR DETECTING FAULTS AND PROBLEMS IN S60 TRACK DIAGRAM PUSHBUTTON SIGNAL BOXES [Ringleitungspruefeinrichtung zur Stoerungsortung in SpDrS60-Stellwerken]

Despite the ever increasing and concentrated use of circuit components in track diagram pushbutton signal boxes, it is essential for faults and problems in central circuits to be rapidly detected, located and corrected. The device described by the author is suitable for fulfilling the above conditions. [German]

Pimpl, O *Signal und Draht* Vol. 69 No. 3, Mar. 1977, pp 53-56, 1 Fig.

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

06 163270

## INDUCTIVE EFFECTS OF POWER LINES ON TRACK CIRCUITS [Indukcni vliv energetickych vedeni na kolejove obvody]

Parallel courses and crossings of high-voltage and extra-high-voltage lines with railroads affect safety devices of the latter. Particularly dangerous consequences may result from the influence on track circuits. The paper presents physical considerations, calculations, and limiting values of the detrimental influence of hv and ehv lines on track circuits. [Czech]

Vaclav, C (Yvzk Ustav Zeleznici, Czechoslovakia); Kyjovsky, V *Electrotechnicky Obzor* Vol. 66 No. 1, Jan. 1977, pp 18-22, 5 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

06 163271

## MICROPROCESSOR CONTROLLED RAILWAY SIGNALLING INTERLOCK

With the goal of establishing applicability of microprocessors in fields which have traditionally relied upon electromagnetic relays for logic functions, one of the commercially available microprocessor assemblies was interfaced with a specially designed display panel to illustrate the concept of a microprocessor controlled railway signaling interlock. The MPU was programmed to scan the status of the simulated block occupancy switches and display appropriate speed signals.

Presented at the Industrial Electronics and Control Instrumentation (IECI) Annual Conference--Industrial Applications of Microprocessors, in Philadelphia, Pa., March 21-23, 1977.

Herrman, RF (Spantronics Engineering)  
Institute of Electrical and Electronics Engineers Conf Paper 77CH1181-7-IECI, 1977, pp 2-7

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

06 163278

**DISCONTINUOUS INDUCTIVE DEVICE FOR THE AUTOMATIC STOPPING OF TRAINS AND THE RECOGNITION OF THE LOCATION OF THE PLATFORM FOR LINE "A" OF THE METROPOLITAN RAILWAY** [Dispositivo induttivo-discontinuo per l'arresto automatico del treno ed il riconoscimento dell'ubicazione delle banchina per la linea "A" della Metropolitana di Roma]

After a brief introduction on the necessities of utilization, a description is given of the characteristics and the working principles of the equipment in question. Lastly, brief mention is made of the other applications of VIATRON II. [Italian]

Catanoso, L (STEFER, Rome, Italy); Solimini, G *Ingegneria Ferroviaria* Vol. 31 No. 12, Dec. 1976, pp 11-18

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

06 163284

**SLOTTED WAVEGUIDE FOR BROADBAND COMMUNICATION WITH RAIL VEHICLES** [Ein Schlitzhohlleiter fuer Breitbandige Nachrichtenverbindungen mit Schienenfahrzeugen]

A slotted rectangular waveguide parallel to the track is introduced for continuous communication with high-speed trains. An antenna connected to the train reaches through the slot into the H//1//0-field inside the waveguide, thus setting up a connection with low overall attenuation and practically no radiation. The construction and the performance of the slotted waveguide are described and the results of a 100-m-prototype line are given. [German]

Lange, KP (Hochschule der Bundeswehr, West Germany); Dalichau, H *Elektrotechnische Zeitschrift, Ausgabe B* Vol. 30 No. 1, Jan. 1977, pp 92-94, 7 Ref.

ACKNOWLEDGMENT: EI

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06 163289

**SIGNALING ON THE VERY HIGH SPEED LINE** [La signalisation de la ligne a tres grande vitesse]

The solutions adopted for the signalling system described take account of the special features of the line: service operated with identical trains, relatively straight track, no level crossings, two very simple stations, fairly steep up and down gradients which can affect traffic flow. The author describes the technical characteristics of the signalling system: track-machine transmission, on-board equipment. The points will be switched by electric motors operated from remote-controlled free-lever signal boxes. Traffic will be controlled from a single central point with three functions: control of points, control of traffic, regulation of electric power. [French]

Weber, O *Revue Generale des Chemins de Fer* Vol. 95 Nov. 1976

ACKNOWLEDGMENT: EI

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DOTL JC

06 163300

**COMMUNICATION SYSTEM CUSTOM DESIGNED FOR THE MONTREAL METRO RAPID TRANSIT SUBWAY**

This system utilizes radiating coaxial cable to provide communications between: (a) subway trains and the Control Center; (b) subway trains; (c) maintenance personnel with portable units and trains, other maintenance personnel, or to the Control Center; (d) the Control Center and passengers on a selected train. Particular emphasis is given to the following: (a) an overview description of the rapid transit operation; (b) the radio communication requirements generated by the Montreal Metro Community (Montreal Urban Community); (c) a brief description of the system designed to conform to the communications requirements; and (d) a description of several special custom features of the system.

Presented at the 27th IEEE Vehicle Technology Group Annual Meeting, Orlando, Florida, March 16-18, 1977.

Leech, ER (WABCO, Union Switch & Signal Division); Outlaw, WT *Institute of Electrical and Electronics Engineers Conf Paper 77CH1176-7VT*, 1977, pp 137-143, 4 Ref.

ACKNOWLEDGMENT: EI

56

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DOTL JC

06 163754

**USE OF THE PONAB PROCESS HOT-BOX DETECTORS ON BUSY LINES** [PONAB na gruzonaprjazennyh linijah]

No Abstract. [Russian]

Podsisalov, JuS *Obrazcov, VL Zheleznodorozhnyi Transport* No. 4, 1977, pp 61-65, 4 Fig., 2 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

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

06 163756

**USE OF MARKOV'S RELIABILITY MODEL IN RAILWAY SIGNALLING** [Das Markowsche Zuverlaessigkeitsmodell in der Eisenbahn-Sicherungstechnik]

No Abstract. [German]

Fischer, K *DET Eisenbahntechnik* Vol. 25 No. 5, May 1977, pp 189-191, 3 Fig., 15 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

06 163774

**OPTIC CABLE TRIED OUT BESIDE BUSY ELECTRIFIED LINE**

A test installation of optical-fiber cable has been made by British Railways to determine the application of such communication circuits in areas where electrical interference from electrification can be a problem with metallic conductors. The installation is separate from BR communications in the 1-km test segment and is intended to monitor the quality of signal transmission through the optical cable. The cable is more than adequate for BR's data-handling requirements.

*Railway Gazette International* Vol. 133 No. 9, Sept. 1977, p 59, 2 Phot.

ORDER FROM: ESL

DOTL JC

06 163787

**THE SAFETY OF ELECTRONICS IN RAILROAD CONTROL SYSTEMS**

Ever-increasing demands for increased safety and efficiency in railroad operations has caused the designers of railroad control systems to consider ever more seriously the use of electronic parts and sub-systems in formulating control systems to satisfy these demands. This paper reviews the evolution of railroad control systems, identifies the major design principles upon which they have been based, and addresses the applicability of these principles to underpin electronic control systems having acceptable safety and efficiency.

Presented at the 13th Annual Railroad Engineering Conference, Pueblo, Colorado, October 12-13, 1976, and included in the Conference Proceedings, "Railroad Challenges in America's Third Century--Improved Reliability and Safety," sponsored by the FRA's Office of Research and Development, U.S. DOT.

Boyd, RK (TRW Railroad Control Systems)

Federal Railroad Administration Conf Paper FRA/ORD-77/13, July 1977, pp 7-15, 2 App.

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

DOTL NTIS

06 163799

**TRAIN TELECOMMUNICATIONS**

Train telecommunication can be classified into two types: Space radio wave and guided wave. Many telecommunications systems have been investigated by JNR and various systems are utilized in sections where there are special requirements. The goal is to standardize on two systems nationwide. Space radio will be used on the existing lines and a leaky coaxial cable line will be utilized for the Shinkansen routes.

Kishimoto, T *Railway Technical Research Inst Quarterly Reports* Vol. 18 No. 2, June 1977, pp 48-54, 4 Fig., 3 Tab., 4 Phot.

ACKNOWLEDGMENT: Japanese National Railways

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

DOTL JC

06 164421

**NEW CRITERION TO INCREASE THE INFORMATION CAPACITY OF THE PRESENT SYSTEM OF CONTINUOUS SIGNALING IN LOCOMOTIVES** [Un nuovo criterio per aumentare la capacità di informazione dell'attuale sistema di segnalamento continuo in locomotiva]

The system of automatic block with coded circuits, used on the principal Italian railway lines, poses serious limits, with the only four codes envisaged (75, 120, 180 and 270 cycles per minute) to the adoption of higher speeds which would be possible with changes of routing of the present lines, for example, Bologna-Milan. The article describes a criterion to increase the number of codes which is compatible with the repeater equipment already in service, namely of also modulating the phase of the track current. This solution would appear to be particularly advantageous when the phase modulation is carried out with the same codes used in amplitude modulation for the simplicity of the modulators. A description is then given of a possible system of phase modulation detection to be used on board the locomotives. [Italian]

Caporossi, R *Ingegneria Ferroviaria* Vol. 32 No. 3, Mar. 1977, pp 177-180

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

06 164428

**RADIO CONTROLLED DIESEL SHUNTERS**

The author reports that Hoogovens Ijmuiden BV steel works, in North Holland, have been studying locomotive shunting operations under portable radio control and have developed full remote control of its new O & K diesel shunter fleet in conjunction with Theimeg, overcoming interference problems and noise-level confusion to site staff. Hoogovens currently have 21 shunting locomotives modified to operate by portable wireless control and a General Electric Bo-Bo of 90 t.

Ensink, T *Railway Engineer* Vol. 2 No. 1, Jan. 1977, 4 pp

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

06 164453

**CAR IDENTIFICATION: CLOSED-CIRCUIT TV ENTERS THE PICTURE**

Union Pacific has been using television camera/recording/playback devices for car identification as a possible alternative to the automatic car identification system. The reliability is higher than that of aci systems and requires no special installations on the rolling stock. Possible future refinements are discussed.

*Railway Age* Vol. 178 No. 15, Aug. 1977, pp 30-31, 4 Phot.

ORDER FROM: ESL

DOTL JC

06 165045

**AUTOMATIC DRIVING ON THE PARIS METRO** [Le pilotage automatique du metro de Paris]

No Abstract. [French]

Voisin, G Perrin, JP *Bulletin de Documentation et d'Information-RATP* Apr. 1977, pp 4-16, 21 Phot., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Regie Autonome des Transports Parisiens, 53 ter. Quai des Grands Augustins, B.P. 70-06, 75271 Paris, France

06 165057

**NEW METHODS FOR PLANNING RADIO-COMMUNICATIONS NETWORKS** [Neue Methoden der Funknetzplanung]

A radio-communications network must be designed so that radio waves reach all receivers with a minimum of emitters in order to keep to a minimum the cost of equipment and the number of frequency bands used. This problem can be resolved by means of the Japanese "Okumura" method based on studies of the topographical characteristics of the region involved

and on a group of corrective coefficients and wave propagation diagrams. The two articles describe the fundamental principles of the method and give examples of their application to specific cases at the DB. [German]

The article continues in the June issue, pp 128-131.

*Signal und Draht* Vol. 69 No. 5, May 1977, pp 106-114, 15 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

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

06 165081

**SURVEY OF INDUCTIVE COMMUNICATION SYSTEMS**

A survey is made of various inductive systems proposed for low frequency train communication. It is found that thick dielectric jackets or coaxial and metallic shields may be required to reduce the environmental effects that lead to high attenuation. Twisted wire cables with inversely connected coupling antennas attain reduction of induced electrical noise and of radiated fields. External noise interference in various environments is discussed. Analysis is made of the coupling variation effect due to wire separation.

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

Chin, GY Yoh, P

Transportation Systems Center, (DOT-TSC-FRA-74-13) Intrm Rpt. FRA-ORD&D-75-35, Apr. 1975, 60 pp, 20 Fig., 5 Tab., 16 Ref.

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

DOTL NTIS, DOTL TF23.U68A34

06 167565

**VARIATIONAL FINITE-ELEMENT SOLUTION FOR DISSIPATIVE WAVEGUIDES AND TRANSPORTATION APPLICATION**

A procedure is developed for determining the complex propagation constants and associated complex electromagnetic fields as a function of frequency for electromagnetic waves propagating along an inhomogeneous waveguide composed of dissipative materials and having a complicated shape. The wave equation, which is complex because of the presence of dissipative materials, is transformed for computer solution into a matrix eigenvalue equation by the application of the Rayleigh-Ritz variational method in conjunction with the finite-element method. The results are reviewed for several simple dissipative waveguides for which analytical results are computed for comparison. A novel proposal is then investigated in which a railroad track acts as a surface waveguide for a rapid-transit collision-avoidance system. The results illustrate the usefulness of the numerical method developed and suggest that the modified steering rail warrants further investigation for rapid-transit systems.

McAulay, AD (Honeywell Mar System) *IEEE Transactions on Microwave Theory Technology* Vol. MTT No. 5, May 1977, pp 382-392, 28 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

06 167913

**CONTROLLING THE WORLD'S BUSIEST INTERCHANGE: CHATELET-LES HALLES**

In the peak hour 144 trains will pass through the junctions on each side of the Chatelet station in Paris after the Regional Transit Authority and French National Railways services are interconnected. To schedule trains at 60 second headways, automatic train operation and supervision of movements by computer are considered essential, but manual operation will be retained outside this terminal area. A form of moving block using several short track circuits will allow trains to enter platforms as preceding trains are pulling out.

*Railway Gazette International* Vol. 133 No. 11, Nov. 1977, pp 424-426, 3 Fig., 2 Phot.

ORDER FROM: ESL

DOTL JC

06 167914

**CAB DISPLAY OF APT'S PERMISSIBLE SPEED**

Because British Rail's Advanced Passenger Train may run through curves faster than other trains, the operator will be given a positive indication in the cab of speed limits higher than those derived from his knowledge of the

route for conventional trains. Such a system, using passive transponders between the rails, is being installed between London and Glasgow in time for introduction of prototype APT's into revenue service at 200 km/h in 1979. Techniques used to insure high integrity performance by electronic equipment which is not fail-safe may well find wider applications in train control and signaling.

Cardani, AA (British Rail) *Railway Gazette International* Vol. 133 No. 11, Nov. 1977, pp 413-416, 3 Fig., 2 Phot.

ORDER FROM: ESL

DOTL JC

06 167929

#### TWO-WAY WORKED LINES LOGIC

Modern signalling and computerized control of fully track-circuited lines enables traffic densities to be increased but greater flexibility of operation does not necessarily come from signalling lines for operation in both directions.

Jansen, W *Railway Engineer* Vol. 2 No. 4, July 1977, p 17, 2 Fig., 2 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

06 167930

#### OPTICAL FIBRES COULD OVERCOME AWKWARD ENVIRONMENT PROBLEM

Optical transmission is under test for areas with noise and high voltage difficulties, and explosive atmospheres, and seems successful.

Burkitt, A *Engineer* Vol. 245 No. 6332, Aug. 1977, p 18

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Morgan-Grampian, Incorporated, 16 West 61st Street, New York, New York, 10023

DOTL JC

06 167950

#### CENTRALISED TRAFFIC CONTROL ON THE DB [Betriebssteuerzentralen bei der DB]

Explanation of the solutions adopted by the DB to automate the work of traffic controllers still further by installing computers. These solutions have already been applied at Saarbrücken and Munich. [German]

Kalusa, M *Wheels of the World* Vol. 8 No. 9, Sept. 1977, pp 431-441, 8 Fig., 3 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Wheels of the World, Brussels, Belgium

06 167959

#### THE PETRI NETWORK AND RAILWAY SIGNALLING TECHNIQUES [Petri-Netze in der Eisenbahnsignaltechnik]

The Petri mathematical theory was developed in the GFR in 1962; Petri diagrams are graph representations of functional processes governed by logic. The following examples are given: an automatic block section, controls for points and crossings with ancillary instruments such as decision tables, and hierarchy procedures. The article explains how these can be used in studying signalling projects. [German]

Gottschalk, W *Signal und Draht* Vol. 69 No. 8, Aug. 1977, pp 171-179, 9 Fig., 3 Tab., 7 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

06 167960

#### THE EFFECT OF HARMONIC OSCILLATION IN POWER SUPPLY AND AUDIO-FREQUENCY REMOTE CONTROL SYSTEMS ON RAILWAY LIGHT SIGNALS [Beeinflussung von Lichtsignalen in Eisenbahnsignalanlagen durch Oberschwingungen der Netzspannung und durch Tonfrequenzrundsteueranlagen]

No Abstract. [German]

Jaeger, K *Signal und Draht* Vol. 69 No. 8, Aug. 1977, pp 179-181, 4 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

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

06 167978

#### ELECTROMAGNETIC FIELDS OF A DIPOLE SOURCE IN A CIRCULAR TUNNEL CONTAINING A SURFACE WAVE LINE

The propagation mode that behaves as an axial surface wave at high frequencies is examined for a frequency range from 1 MHz to 1 GHz. The attenuation reaches a maximum value at frequencies of the order of 100 MHz where the absorption loss by the tunnel wall is most significant. In the range from 1 to about 10 MHz, the attenuation rate is approximately proportional to frequency and is only weakly dependent on the conductivity of the region external to the tunnel walls. The results are consistent with earlier investigations for surface wave lines located over a homogeneous half-space.

Wait, JR (Colorado University, Boulder); Hill, DA *International Journal of Electronics* Vol. 42 No. 4, Apr. 1977, pp 377-391, 13 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

06 167986

#### NEW SIGNAL BOX AT VERSAILLES-CHANTIERS [Le nouveau poste de Versailles-Chantiers]

The section under the control of the new box described which was opened in January 1977, runs from Sevres Rive-Gauche to St-Quentin en Yvelines, both stations included, and covers 38 km. The box works the points and signals and controls traffic fully over this section of line. The actual line situation and position of trains is known at any moment by means of automatically operated display panels and cathode screens, the programming of the train servicer, and automatic route setting. [French]

Audouin, J Retiveau, R *Revue Generale des Chemins de Fer* Vol. 96 Mar. 1977

ACKNOWLEDGMENT: EI

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DOTL JC

06 168001

#### SIMPLIFIED EQUATION FOR THE SHIELDING FACTOR OF MULTIPLE SHIELDING CONDUCTORS

Electromagnetic interference problems have become increasingly important due to the development of high-voltage bulk-power transmission lines and the expansion of ac railway systems. The shielding factor of the shielding conductor is very important in calculating the electromagnetically induced interference voltage. In conventional methods of calculation, the resultant shielding factor of multiple shielding conductors is represented by the product of shielding factors of individual conductors and the effect of mutual interaction between shielding conductors are neglected. As a result, the calculated induced voltage does not always agree with the actual one and the calculated results are often too optimistic. On the other hand, the exact expressions of induced voltage which are derived taking into account the mutual interaction between shielding conductors are too complicated and impractical. This paper proposes a simplified expression for the shielding factor of multiple shielding conductors. A feature of the proposed method is that it always gives a result on the safe side. The proposed method can be applied to a railway system as well as to a transmission system.

Sakai, H (Sophia University, Japan); Mori, T *Electrical Engineering in Japan* Vol. 96 No. 2, Mar. 1976, pp 95-99, 11 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

06 169958

#### SWISS FEDERAL RAILWAYS AUTOMATION OF RAILWAY OPERATION

Description of the state of automation of the signalling installations of the CFF. The important basic ideas, limiting conditions and present developments are discussed.

Stalder, O

Institution of Railway Signal Engineers Sept. 1977, p 12, 9 Phot., 10 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Institution of Railway Signal Engineers, 1 Ashbourne Close, London W5, England

06 169995

#### CASE OF INDUCTIVE CO-ORDINATION

The co-ordination of the expansion of both power and communication networks, to avoid the problem of excessive longitudinally induced voltage

on communication and signal circuits, is a matter of increasing importance. This paper deals with the design and installation of railway signal and communication cables in a case where elaborate shielding from the influence of a proposed new adjacent power system was required. A discussion of the paper is appended.

Elek, GR (Canadian National Telecommunications); Rokas, BE *IEEE Transactions on Power Apparatus and Systems* Vol. PAS No. 3, May 1977, pp 834-840, 5 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

06 170093

## SAFETY SYSTEM FOR TRAIN OPERATIONS CONTROL

The high density of traffic and high speeds on Japanese National Railways make important reliable signaling and safety devices. Described are the evolution of automatic train stop, cab signals, automatic speed supervision and other controls.

Iwasa, K (Japanese National Railways) *Japanese Railway Engineering* Vol. 17 No. 1, 1977, pp 4-6, 7 Fig., 1 Tab.

ACKNOWLEDGMENT: Japanese Railway Engineering  
ORDER FROM: Japan Railway Engineers' Association, 2-5-18 Otemachi, Chiyoda-ku, Tokyo, Japan

DOTL JC

06 170098

## ELECTRIC INDUCTION IN RAILWAY OPERATION

The author discusses problems of electric induction on the railways with particular reference to high-speed running tests and considers important parameters such as traction current 1F, disturbance current 1ST and the harmonic oscillations in the contact-wire current, as well as the measuring techniques involved. Also dealt with are the possible effects of induction on signalling and telecommunications equipment. Evaluation of the measurements obtained shows that, if appropriate steps are taken, functional faults or similar undesirable phenomena caused by a.c. traction stock are not to be expected. [German]

Giersberg, H *Eisenbahntechnische Rundschau* Vol. 26 No. 7-8, July 1977, pp 455-460

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

DOTL JC

06 170285

## ELECTRICAL INTERFERENCE FROM THYRISTOR-CONTROLLED DC PROPULSION SYSTEM OF A TRANSIT CAR

Analysis and measurement of radiated and conducted electromagnetic interferences were performed on a transit car equipped with chopper-controlled dc propulsion system. The measured values of the radiated

interference showed significant disagreement with the calculated values. It was determined from the analysis of the measured data that the voltage drop caused by the dc propulsion-current harmonics contributed to the discrepancies. Extensive tests on the 3/4-mi (1.2-km) long third-rail fed test track at the General Electric plant in Erie, PA, showed that the interference levels generated from the chopper-controlled propulsion equipment are acceptable. However, it is felt that the existing and impending electromagnetic compatibility (EMC) standards are, in some instances, neither technically sound nor realistic. Suggestions are made for the improvements of standard and measurement procedures.

Chowdhuri, P Williamson, DF *IEEE Transactions on Industry Applications* Vol. IA-13, Nov. 1977, pp 539-550, 18 Fig., 3 Tab., 14 Ref.

ACKNOWLEDGMENT: IEEE Transactions on Industry Applications  
ORDER FROM: ESL

DOTL JC

06 170461

## PRACTICAL EXPERIENCE IN THE DETECTION OF HOT AXLE BOXES ON RAILWAY TRAINS

Outlines of the design concepts of the detection instrumentation followed by an account of the major environmental problems encountered and the solutions devised to overcome them and a brief account of the present status of such equipment are given. A carefully controlled evaluation shows that the performance of the equipment is satisfactory and its availability with minimum maintenance is good.

Inst Phys Conf Ser n 34, Oper of Instrum in Adverse Environ, Invited and Contrib Pap from the Conf, London, England, October 4-5, 1976.

Thompson, LR *Institute of Physics, London, Conf Series Proc* 1977, pp 53-64

ACKNOWLEDGMENT: EI  
ORDER FROM: Institute of Physics, 47 Belgrave Square, London SW1X 8QX, England

06 170469

## AUTOMATIC TRAIN CONTROL FOR RAIL RAPID TRANSIT SYSTEMS

Most all rail rapid transit systems operate on a block signal approach for the basic train detection and protection system. This block system is described and two laws implicitly used in a control system are discussed. It is shown that these two laws are used as the basis for the hierarchical control system concept. Automatic train control systems are described for several current rail systems. References are discussed which indicate the future of this technology and the research areas which need to be pursued.

Proc of the Jt Autom Control Conf, San Francisco, California, June 22-24, 1977.

Goodson, RE (Purdue University)  
Institute of Electrical and Electronics Engineers Proceeding Vol. 1 N 77CH 1220-3CS, 1977, pp 481-488, 8 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: IEEE

07 137043

**EYEWITNESS TESTIMONY**

The report deals with the following question: When a person has witnessed some unusual event such as a traffic accident, how can complete and accurate information best be obtained about that event. The research focuses specifically on the influence that questions asked subsequently to an event have (1) on the answers to those questions, (2) on the answers to subsequent questions, and (3) on the witness' memory for the incident he has experienced. A major conclusion is that questions asked subsequently to an event can contain new information which becomes integrated into the original memory, causing an alteration or a reconstruction of the witness' memory for that event. Some recommendations are given for how questions can be asked in as neutral a way as possible. In addition, other factors that are known to affect the accuracy and completeness of an eyewitness account are briefly outlined.

Loftus, EF

Washington University, Seattle, Urban Mass Transportation Administration, (UMTA-WA-11-0004) Final Rpt. UMTA-WA-11-0004-75-1, UMTA-WA-11-0004-75-1, Sept. 1975, 22 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-253985/6ST, DOTL NTIS

07 155007

**NIGHT VISION AND DARK ADAPTATION (A BIBLIOGRAPHY WITH PERFORMANCE RELATIONSHIP (ABRIDGMENT))**

Research reports are cited on the physiological aspects of night vision, as applied to human engineering, for motor vehicle operators, pilots, military personnel, and other persons who must perform in low intensity illumination.

Supersedes NTIS/PS-76/0133, and NTIS/PS-75/172.

Crockett, PW

National Technical Information Service Bibliog. Apr. 1977, 111 pp, 106 Ref.

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

NTIS/PS-77/0187/3ST, DOTL NTIS

07 159209

**RIDE QUALITY JUDGEMENTS AS A FUNCTION OF ENVIRONMENTAL, PERSONALITY, AND RIDE SPECTRA CORRELATES**

Personality and demographic correlates, as well as physical correlates, of ride-quality judgements in a field situation namely, in selected passenger-train ride segments, were identified and investigated.

Coates, GD

Old Dominion University Final Rpt. NASA-CR-152626, Mar. 1977, 29 pp

Grant NSG-1225

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

N77-20774/4ST, DOTL NTIS

07 159325

**EXPERIMENTAL DESIGNS AND PSYCHOMETRIC TECHNIQUES FOR THE STUDY OF RIDE QUALITY**

A major variable in both the cost of any new transportation system and rider acceptance of the system is the ride quality of its vehicles. At this time, there exists no set of objective criteria which would allow the transportation system designer to determine what level of ride quality would be considered acceptable by a wide variety of potential passengers. The purpose of the study was to establish statistically acceptable techniques for the development of methods for relating physical measures of vehicle vibration to passenger estimates of ride quality.

Prepared in cooperation with Human Sciences Research, Inc., McLean, Va. Sponsored by the Office of the Secretary, Office for Systems Development and Technology, Office of Systems Engineering, U.S. DOT.

Havron, MD Westin, RA

ENSCO, Incorporated, Human Sciences Research, Incorporated, Transportation Systems Center Final Rpt. DOT-TSC-OST-76-54, May 1977, 301 pp

Contract DOT-TSC-864

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-268584/0ST, DOTL NTIS

07 162967

**WORLD-WIDE REVIEW OF WORKING CONDITIONS [L'examen social mondial]**

A review of working conditions in twenty-five companies in seven industrialized countries (GFR, United States, France, Great Britain, Italy, Japan, Sweden). The companies were chosen from among four major sectors (the steel industry, the automobile construction industry, banking, and rail transport) and certain aspects were examined (collective bargaining, work hours, employment, training, information, working conditions, health/safety, retirement, fringe benefits, bonuses, trade union life, women workers). [French]

Favard, E *L'Expansion* No. 106, Apr. 1977, pp 143-171, Tabs.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Technic Union S.A., 10 rue Lyautey, Paris 16e, France

07 163044

**REVIEW OF NEEDS OF USERS OF RIDE QUALITY TECHNOLOGY (ABRIDGEMENT)**

This paper attempts to provide a broad view of the needs of those who use ride quality technology, and proposes a possible course of action to fulfill those needs. The user needs were assessed by both personal interviews and questionnaires. The study results indicate the need for a common basis of terminology for meaningful discussion of ride quality. The different types of criteria in use are discussed, and the need for improvements in the ride quality data base are presented. A recently developed method, generally applicable to all modes of transportation, was identified for quantifying passenger satisfaction and determining value decisions for existing and conceptual vehicles. Action is proposed which calls for the establishment of an organization with national responsibility to coordinate, evaluate, and analyze a total effort to quantify passenger satisfaction and value transfer functions for the 4 transportation modes.

This article appeared in Transportation Research Record No. 611, Railroad-Highway Crossings, visibility, and Human Factors.

McKenzie, JR Brumaghim, SH (Boeing Company) *Transportation Research Record* No. 611, 1976, p 45

ORDER FROM: TRB Publications Off

DOTL JC

07 163045

**COMPARISON OF DRIVER DYNAMICS WITH ACTUAL AND SIMULATED VISUAL DISPLAYS**

As part of a comprehensive program to explore driver-vehicle system response in lateral steering tasks, describing functions and dynamic data have been gathered in several milieu. These milieu include a simple fixed-based simulator with only an elementary roadway delineation display; a fixed-based statically operating automobile with terrain displayed by a wide-angle projection system; and a full-scale moving-base automobile operating on the road. Dynamic data with the two fixed-base simulators compared favorably and implied that the impoverished visual scene, lack of engine noise, and simplified steering wheel characteristics in the simple simulator did not induce significant driver dynamic behavior variations. The fixed-base versus moving-base comparisons showed that the moving base had substantially greater crossover frequencies on the road course; this frequency can be ascribed primarily to a decrease in the driver's effective latency. When considered with previous data, the moving-base full-scale versus fixed-base simulator differences are ascribed primarily to the motion cues present on the road course rather than to any visual field differences. /Author/

This article appeared in Transportation Research Record No. 611, Railroad-Highway Crossings, Visibility, and Human Factors.

McRuer, DT Klein, RH (Systems Technology, Incorporated) *Transportation Research Record* No. 611, 1976, pp 46-48, 5 Fig., 9 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

07 163256

**EMPLOYMENT OUTLOOK IN RAILROAD OCCUPATIONS**

This bulletin provides employment statistics for the following railroad occupations: brake operators, conductors, locomotive engineers, shop trades, signal department workers, station agents, telegraphers, telephoners, tower operators, track workers.

Department of Labor Statistics L 2.3:1875-71, 76, 11 pp, Figs.

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO

ORDER FROM: GPO

S/N-029-001-01686-7

07 163731

**CARRYING AND LIFTING OPERATIONS IN THE TRANSPORT OF PHYSICALLY DISABLED [Transportsystem foer roerelshindrades foerflyttning till och resa med flyg, buss och tag]**

The paper is a summary of studies and experiments aimed at facilitating the transportation of the physically disabled and those accompanying them. First the carrying and lifting are analysed on the basis of experimental findings and theoretical considerations as well as practical experience and comprises types of wheel-chairs and other carrying aids. The second section presents those solutions to the problem of wheel-chair design that have been subjected to practical evaluation. In the discussion chapter the importance of making it easier to get about out of doors and to travel is emphasised. [Swedish]

Brattgard, SO

Gothenburg University, Sweden 1977, 46 pp

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Gothenburg University, Sweden, Department of Handicap Research, Gothenburg, Sweden

07 163749

**PSYCHOLOGICAL ASPECTS OF THE WORK OF DRIVING LOCOMOTIVES WITH A ONE-MAN CREW [Psychologische Aspekte der Lokfuehrerarbeit bei Einmannbedienung]**

The article contains statistical analysis of results of a survey of 713 locomotive drivers, and conclusions as to the psychological appreciation of the work of train driving.

Biskup, E Dydynska, K *Verkehrsmedizin und Ihre Grenzgebiete* Vol. 24 No. 5/6, 1977, pp 231-244, 14 Tab., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

07 163788

**TRAIN DYNAMICS ANALYZER**

The Train Dynamics Analyzer is a compact, computer-based system designed as a training tool for locomotive engineers. The system uses a mathematical model to predict the longitudinal dynamic conditions encountered during operation of freight trains. A CRT display provides operating instructions to assist with the set up procedures for a simulated run, provides graphic and tabular descriptions of the train selected for the run and in the final phase presents a performance summary. The TDA can also be used for developing handling procedures for special train consists or unusual track conditions and for investigating certain aspects of train accidents.

Presented at the 13th Annual Railroad Engineering Conference, Pueblo, Colorado, October 12-13, 1976, and included in the Conference Proceedings, "Railroading Challenges in America's Third Century--Improved Reliability and Safety," sponsored by the FRA's Office of Research and Development, U.S. DOT.

Stephenson, JG (Freightmaster Division, Halliburton Services)

Federal Railroad Administration Conf Paper FRA/ORD-77/13, July 1977, pp 16-23, 21 Fig.

ACKNOWLEDGMENT: FRA

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DOTL NTIS

07 165037

**NIGHT WORK. EFFECTS ON THE WORKER'S HEALTH AND SOCIAL LIFE [Le travail de nuit. Effets sur la sante et la vie sociale du travailleur]**

In industrialized countries, night work is becoming increasingly prevalent and this raises a number of questions: is night work medically harmful, particularly for women? Is it socially acceptable? Is it economically necessary and justified? Should it be subject to special legislation? The publication endeavors to give a reply to these questions. [French]

Carpentier, J Cazamian, P

International Labour Office 1 Volume, 1977, 87 pp

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: International Labour Office, Geneva, Switzerland

07 165041

**CHANGE ON RAILWAYS. THE PERSONNEL PROBLEM**

Technology, working methods and objectives of railways have undergone extensive and rapid changes. The author, a member of the British Railways Board, has made a study of the problems resulting from these with respect to personnel, staff planning, adaptation to totally new attitudes of employees to their work and their employers, and adaptation to a changing legal structure.

Rose, CA *Rail International* Vol. 8 No. 7/8, July 1977, pp 363-367

ACKNOWLEDGMENT: International Union of Railways, BD

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DOTL JC

07 165043

**MEDICAL ASPECTS OF THE TRANSPORT INDUSTRY**

[Verkehrsmedizin und Verkehrstechnik]

An account of the DB's handling of medical problems arising in the transport industry: staff medical examinations, aptitude tests for train-drivers and staff in positions involving safety, ergonomic studies with regard to place of employment such as driver's cabs, study into the physiological effects of very high speeds, retraining schemes, new aptitude profiles, study into distribution of tasks and work-breaks over the working day. [German]

Moritz, HJ *Glaser's Annalen ZEV* Vol. 101 No. 6, June 1977, pp 204-206

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

07 167209

**PROCEEDINGS AND FINDINGS OF THE 1976 WORKSHOP ON RIDE QUALITY**

The workshop was organized around the study of the three basic transfer functions required to evaluate and/or predict passenger acceptance of transportation systems. These are the vehicle, passenger, and value transfer functions. For the purpose of establishing working groups corresponding to the basic transfer functions, it was decided to split the vehicle transfer function into two distinct groups studying surface vehicles and air/marine vehicles, respectively.

Subm-Sponsored by NASA. Conf-Proc. Held at Fairlee, VT., 13-15 Oct. 1976.

Kuhlthau, AR

Virginia University NASA-CP-2006, Dec. 1976, 86 pp

Contract DOT-AS-60060

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

N77-27710/1ST

07 167522

**VIBRATION AND PASSENGER COMFORT**

This paper considers the effects of vehicular vibration on passenger comfort and reports the results of a series of questionnaire investigations to examine both the qualitative and quantitative effects of vibration. Although in their infancy, it is argued that field investigations of the type described in this paper are of more value to the design engineer than are many of the investigations carried out under laboratory conditions. However the author points out that the measurement errors and problems incurred during field investigations are much increased compared with laboratory studies. Relationships between vibration and motion intensity and journey comfort level are shown graphically.

Osborne, DJ (University College, Swansea) *Applied Ergonomics* Analytic  
Vol. 8 No. 2, June 1977, pp 97-101, 3 Fig., 10 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-228238)  
ORDER FROM: ESL

07 168010

# **TRAIN DYNAMICS ANALYZER: A TRAINING SIMULATOR FOR LOCOMOTIVE ENGINEERS**

Equipment has been developed that enables a locomotive engineer to observe the effects of his control actions on a train. The system is called the Train Dynamics Analyzer (TDA). By using a computerized mathematical model in conjunction with a locomotive control stand, the equipment presents information through typical conventional control stand indicators and gages and a CRT display. The display consists of a representation of the train as it moves along the track profile with grades, curves, mileposts, and town names; a plot of coupler forces and brake cylinder pressures throughout the train; average acceleration; simulation time; and head and remote locomotive throttle positions.

Contributed by the Rail Transportation Division of ASME for presentation at the Winter Annual Meeting, Atlanta, Georgia, November 27-December 2, 1977.

Stephenson, JG Mosier, JE (FreightMaster Division of Halliburton Services)  
American Society of Mechanical Engineers Conf Paper 77-WA/RT-10,  
1977, 8 pp, 13 Fig.

ACKNOWLEDGMENT: ASME  
ORDER FROM: ESL

DOTL RP

07 169959

# **THE DESIGN OF DRIVER'S CABS**

Examination of the operational role and environmental requirements of the driver with particular reference to structures, visibility, environment, controls and instrumentation. The basic characteristics for an optimum cab layout are suggested.

Powell, AJ Cartwright, A *Institution of Mechanical Engineers Proceedings*  
Vol. 191 No. 33, 1977, pp 195-205, 8 Phot.

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

DOTL JC

07 170065

# **RESEARCH LOCOMOTIVE AND TRAIN HANDLING EVALUATOR DEFINITION-CONCEPT 1**

Describes results of simulator design concept tradeoffs to create a research facility capable of eliciting realistic behavior from railroad train operators. Examples of research programs that could be carried out are presented. Initial cost, operating staff and costs, buildings and utilities test subject logistics and downstream improvements are included. The overall research needs that can be met uniquely by such a research simulator facility are presented along with a schedule for design, procurement, delivery and installation of such a simulator at the Pueblo, Colorado FRA Research Center.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C. Also see PB-276362/AS.

Hulbert, S Wheeler, J Dompe, R Witham, C Csanky, L  
MB Associates, (MB-R-76/109) Intrm Rpt. FRA/ORD-77/46, Aug.  
1977, 260 pp, Figs., Tabs., Refs., 3 App.

Contract DOT-FR-64260

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

PB-276363/AS, DOTL NTIS

07 170066

# **RESEARCH LOCOMOTIVE AND TRAIN HANDLING EVALUATOR DEFINITION-CONCEPT 2**

This report analyzes the technical and research requirements of an evaluator to evaluate human factors involved in railroad train handling. North American and British accident statistics are reviewed to determine how human actions relate to train accidents. From these statistics evaluator

experiments are defined which will produce data that will be useful in making train operations more safe. An investigation is made of modern simulation technology to establish the level of operational realism that can be provided in a evaluator to support the defined experimental research. Where multiple technical approaches were found to a given evaluator requirement a summary trade-off report is made. It was found that present art will permit the construction of an evaluator to perform extensive research into human factors related to train handling practices. Research goals are divided into three areas of evaluator testing: basic research into train handling techniques, evaluation of train handling practices, displays and controls, and investigations of train accidents.

Prepared in conjunction with Grumman Aerospace Corporation and Transmark for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Turpin Systems Company, (TSC-J2 70) Intrm Rpt. FRA/ORD-77/55, Aug. 1977, 574 pp, Figs., Tabs., Refs., 2 App.

Contract DOT-FR-64192

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

PB-276491/AS, DOTL NTIS

07 170067

# **RESEARCH LOCOMOTIVE AND TRAIN HANDLING EVALUATOR DEFINITION-CONCEPT 1. VOLUME I-EVALUATOR PERFORMANCE SPECIFICATION**

Performance specifications for a train handling and locomotive research evaluator are set forth in Volume I. These are based upon a study of design concept trade-offs to create a research facility capable of eliciting realistic behavior from railroad train operators. Results of these studies are presented in Volume II along with examples of research programs that could be carried out. Initial cost, operating staff and costs, buildings and utilities test subject logistics and downstream improvements are included in Volume III. The overall research needs that can be met uniquely by such a research evaluator facility are presented along with a schedule for design, procurement, delivery and installation of such a simulator.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Hulbert, S Wheeler, J Dompe, R Witham, C Csanky, L  
MB Associates, (MB-R-77/25) Final Rpt. FRA/ORD-77/45.I, Sept.  
1977, 86 pp, Figs., Tabs.

Contract DOT-FR-64260

ACKNOWLEDGMENT: FRA  
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PB-276364/AS, DOTL NTIS

07 170068

# **RESEARCH LOCOMOTIVE AND TRAIN HANDLING EVALUATOR DEFINITION-CONCEPT 1. VOLUME II-DETAILED SYSTEM STUDIES**

Performance specifications for a train handling and locomotive research evaluator are set forth in Volume I. These are based upon a study of design concept trade-offs to create a research facility capable of eliciting realistic behavior from railroad train operators. Results of these studies are presented in Volume II along with examples of research programs that could be carried out. Initial cost, operating staff and costs, buildings and utilities test subject logistics and downstream improvements are included in Volume III. The overall research needs that can be met uniquely by such a research evaluator facility are presented along with a schedule for design, procurement, delivery and installation of such a simulator.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Hulbert, S Wheeler, J Dompe, R Witham, C Csanky, L  
MB Associates, (MN-R-77/25) Final Rpt. FRA/ORD-77/47, II, Sept.  
1977, 258 pp, Figs., Tabs., Refs., 3 App.

Contract DOT-FR-64260

ACKNOWLEDGMENT: FRA  
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PB-276365/AS, DOTL NTIS



07 170069

**TRAIN HANDLING EVALUATOR--CONCEPT 2. VOLUME  
I--SPECIFICATIONS**

This report contains the specification for a Research Locomotive and Train Handling Evaluator. Incorporated in this report are the definitions of the terminology of the various phases used for Project Implementation, Milestone Schedules, Management Control and Documentation necessary for the successful completion of the defined task. A functional description of the Evaluator is provided. This description is broken down into the ten major subsystems. The greater portion of this report is dedicated to the Detailed Performance Requirements. In this portion of the report all of the major systems and each subsystem thereof is described in detail. The discussion in this portion of the report clearly defines the capability requirements necessary to perform the tasks that were identified in Report No. FRA/ORD-77/55.

Prepared in conjunction with Grumman Aerospace Corporation and Transmark for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Turpin Systems Company, (TSC-J270-1) Final Rpt. FRA/ORD-77/56.I, Sept. 1977, 49 pp

Contract Dot-FR-64192

ACKNOWLEDGMENT: FRA

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PB-276492/AS, DOTL NTIS

07 170070

**RESEARCH LOCOMOTIVE AND TRAIN HANDLING  
EVALUATOR DEFINITION--CONCEPT 2. VOLUME  
II--ESTIMATED COSTS**

This report contains the cost estimated for a Research Locomotive and Train Handling Evaluator. The costs contained herein are given in summary form and also broken out according to major components of the Evaluator. Major item material lists are included for each major Evaluator component.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Turpin Systems Company, (TSC-J279-2) Final Rpt. FRA/ORD-77/56. II, Sept. 1977, 29 pp

Contract DOT-FR-64192

ACKNOWLEDGMENT: FRA

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PB-276493/AS, DOTL NTIS

08 163046

**EFFECTIVENESS OF AUTOMATIC WARNING DEVICES IN REDUCING ACCIDENTS AT GRADE CROSSINGS**

In the last 17 years, California has experienced more than 17,000 vehicle-train accidents, which have claimed more than 550 lives. The California Public Utilities Commission and the California State Legislature have attempted to reduce the continuing human and economic loss by promoting the installation of flashing light signals and automatic crossing gates. This study is intended to gauge the effect of automatic warning devices on the frequency of vehicle-train accidents and to examine specific crossing locations to appraise the capabilities of automatic warning devices in reducing the number and severity of vehicle-train accidents. To determine the effectiveness of automatic warning devices under varying conditions, the before-and-after accident histories at 1552 grade crossings where automatic devices were installed between 1960 and 1970 were compared on a crossing-year basis and segregated by type of warning device, rural versus urban conditions, and the number of railroad tracks. While some limitations and adverse side effects do exist, the results indicate that the installation of automatic gates can be expected, on the average, to reduce vehicle-train accidents by approximately 70 percent per crossing-year and to reduce related deaths and injuries by 89 and 83 percent per year respectively. In addition, it would appear that the use of automatic gates eliminates many of those accidents that represent the greatest potential severity, since there were 64 percent fewer deaths per accident, 43 percent fewer per accident, and 36 percent fewer deaths per injury. The data obtained on vehicle-train accidents and their severity were combined with average installation, maintenance, and operation costs for flashing lights and automatic gates to provide a brief economic analysis of the most cost-effective alternative. /Author/

This article appeared in Transportation Research Record No. 611, Railroad-Highway Crossings, Visibility, and Human Factors.

Schulte, WR (California Public Utilities Commission) *Transportation Research Record* No. 611, 1976, pp 49-57, 15 Tab., 6 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

08 163047

**PASSIVE CONTROL AT RAILROAD-HIGHWAY GRADE CROSSINGS (ABRIDGEMENT)**

This study of designs for passive control established 3 basic objectives. The first phase of this project developed field techniques to measure the effectiveness of passive designs. Four measures were formulated and tested in 3 pilot studies. The studies showed that the standard deviation of the spot speeds on the crossing was high in relation to the variation of spot speeds on approach. Head movements of motorists looking down the tracks were found to be virtually nonexistent. Brake lights were applied on the approach to the rail crossing in only 7.6 percent of the vehicles, even though over 60 percent of the motorists claimed to slow down. Two combinations of experimental advance and cross-bulk signs were developed and evaluated. Before and after studies were compared and an increased motorists awareness was noted at 6 sites. The increases in percentage of motorists observed applying brakes and increases in average spot speed reductions at the track, and the decrease in percentage of motorists responding to the question of slowing down, indicate a more pronounced slowing with experimental signs than with conventional signs.

This article appeared in Transportation Research Record No. 611, Railroad-Highway Crossings, Visibility, and Human Factors.

Dommasch, IN Hollinger, RL Reilly, EF *Transportation Research Record* No. 611, 1976, pp 58-59

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DOTL JC

08 163048

**INVESTIGATION OF ACCIDENT DATA FOR RAILROAD-HIGHWAY GRADE CROSSINGS**

This paper discusses some of the results of investigations of railroad-highway accidents and accident-related inventory information that was collected from 15 states and three railroad companies. Statistical techniques were applied to tabulated data to obtain prediction equations for accident frequency and severity of various grade-crossing situations. The results of the analysis and the uses of prediction equations for the development of warrants for safety improvements are also discussed. /Author/

This article appeared in Transportation Research Record No. 611,

Railroad-Highway Crossings, Visibility, and Human Factors.

Coleman, J Stewart, GR (Federal Highway Administration) *Transportation Research Record* No. 611, 1976, pp 60-67, 4 Fig., 6 Tab., 13 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

08 163049

**DRIVER REACTION TO IMPROVED WARNING DEVICES AT A RURAL GRADE CROSSING (ABRIDGEMENT)**

Research is reported which analyzed the effect on motorists of improving the warning devices at a rural grade crossing with a high accident rate, by replacing 20.3-cm (8-in) flashers on automatic gates with 30.5-cm (12-in) flashers activated by a Marquardt speed predictor and supplemented by additional strobe lights. The study also evaluated and analyzed suitable parameters, studied before and after conditions and motorists reaction to the system, and evaluated the data collection system itself. Most drivers approached a grade crossing safely. It was found that the Percentage of reduction in speed of the fastest vehicles, along with observation of individual speeding vehicles, provides a better measure of improved effectiveness than do mean speeds and deceleration. Further conclusions are presented regarding: mean entry speeds, vehicle approach speed profiles; deceleration speeds; and the use of deceleration rate as a parameter for determining the effectiveness of new signals.

This article appeared in Transportation Research Record No. 611, Railroad-Highway Crossings, Visibility, and Human Factors.

Russell, ER (Kansas State University); Michael, HL (Purdue and Indiana State Highway Commission JHRP); Butcher, TA *Transportation Research Record* No. 611, 1976, p 68

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08 163781

**SUMMARY STATISTICS OF THE NATIONAL RAILROAD-HIGHWAY CROSSING INVENTORY FOR PUBLIC AT-GRADE CROSSINGS**

In response to the Federal Railroad Safety Act of 1970, a joint government-/industry effort to compile a national inventory of railroad-highway crossings was initiated in 1972 and completed in 1976. The inventory contains data on the physical and operational characteristics of all 402,000 railroad-highway crossings in the United States of which 219,000 are public at-grade, 142,000 are private, 37,500 are public grade separated and 3,500 are pedestrian. This report presents comprehensive statistical summaries of the characteristics for all public at-grade crossings reported in the inventory as a August 1976. This information will be useful at the Federal, state, and local levels for determining effective allocation of crossing improvement funds and developing R&D, legislative, information and education programs aimed at improving safety at crossings.

Sponsored by th FRA/U.S. DOT, Office of Policy and Program Development.

Hitz, JS

Transportation Systems Center, Federal Railroad Administration, (DOT-TSC-FRA-77-10) Final Rpt. FRA-OPPD-77-8, June 1977, 160 pp, Figs., Tabs., 4 App.

ACKNOWLEDGMENT: FRA, NTIS

ORDER FROM: NTIS, GPO

PB-271334/AS, DOTL NTIS, S/N-050-000-00131-8

08 167399

**INNOVATIVE CONCEPTS AND TECHNOLOGY FOR RAILROAD-HIGHWAY GRADE CROSSING MOTORIST WARNING SYSTEMS. VOLUME I. OVERVIEW AND CONCEPT GENERATION AND ANALYSIS**

The document includes a general review of innovative conceptual and technical approaches to train-activated motorist warning systems for use at railroad-highway grade crossings, and also contains a specific report describing a study directed toward the generation, analysis and evaluation of innovative concepts. The review includes a discussion of communication-link systems, radar train detection, locomotive-mounted transmitters and several other concepts. The basic application constraints of safety, reliability, resistance to serve environments and low cost are used as the basis for evaluating the merits of the alternative concepts. The special study reported here explores the communication-link concept in detail, with

particular emphasis on train-detection techniques. The use of microprocessor technology is advocated; along with substantial changes in motorist warnings.

Raab, FH Brooker, MC Ryan, TE Waechter, JR  
Cincinnati Electronics Corporation, Transportation Systems Center,  
Federal Railroad Administration Final Rpt. DOT-TSC-FRA-76-19.I,  
FRA/ORD-77/37.I, Sept. 1977, 209 pp

Contract DOT-TSC-841-1

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-273354/1ST

08 167400

## INNOVATIVE CONCEPTS AND TECHNOLOGY FOR RAILROAD-HIGHWAY GRADE CROSSING MOTORIST WARNING SYSTEMS. VOLUME II. THE GENERATION AND ANALYSIS OF ALTERNATIVE CONCEPTS

The report describes the results of a study directed toward the generation, analysis and evaluation of innovative conceptual and technical approaches to train-activated motorist warning systems for use at railroad-highway grade crossings. Particular attention is given to the use of the track as a transmission line in a guided reflection (radar-like) technique operating at audio frequencies. Attention is also given to improve special road surfaces in advance of the crossing, and to optically programmed traffic lights.

See also Volume 1, PB-273 354.

Peterson, DD Boyer, DS  
Tracor Jitco, Incorporated, Transportation Systems Center, Federal  
Railroad Administration Final Rpt. DOT-TSC-FRA-76-19.II, FRA-  
/ORD-77/37.II, Sept. 1977, 98 pp

Contract DOT-TSC-842-2

ACKNOWLEDGMENT: NTIS  
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PB-273355/8ST

08 167600

## AT-GRADE CROSSINGS OF LIGHT RAIL TRANSIT. ABRIDGMENT

The purpose of this paper is to provide a methodology for analyzing and estimating the effect of semiexclusive LRT line on motor-vehicle traffic. Four major concerns are identified: The expected level of impact on traffic; the improvements required in terms of added lanes; And, the minimum grade separation requirements. This type of analysis may provide the transportation planner with the tool by which the grade separation requirement could be minimized, or staged to some future year for the cases in which the motor vehicle flow was estimated at the time of the analysis would exceed the capacity, the additional ROW for crossing improvement was unavailable or too costly, or totally grade-separated intersections must be considered. The results of this analysis indicate that the deployment of LRT semiexclusive lines in fringe areas is a feasible alternative to transit lines that are totally grade-separated, fixed guideways. This analysis also indicates that, for LRT systems planned for multicar operations at high service frequencies, locating transit stops at grade crossing is desirable to reduce traffic impact.

From TRB Record 627, Rail Transit.

Morag, D (De Leuw, Cather and Company) *Transportation Research Record* No. 627, 1977, pp 7-10, 3 Fig., 1, Tab, 2 Ref.

ORDER FROM: TRB Publications Off

08 168075

## GRADE-CROSSING WARNING-SYSTEM TECHNOLOGY

This paper reviews the objectives, content, and results of a large number of research projects sponsored by the Federal Railroad Administration and related to possible improvement concepts associated with motorist-warning systems at railroad-highway grade crossings. The benefits sought included increased effectiveness, reduced cost, and elimination of institutional constraints. The subjects that were investigated include the application of modularization concepts and alternative components in warning-control logic systems, cost reduction in automatic gate equipment, flashing lights using xenon flashlamp technology, functional requirements and the relevant equipment for lightning protection and standby power, and studies of alternative or novel warning system concepts. The potential for meaningful advances is found to be limited and is severely constrained by the technically challenging nature of the functional and safety requirements. /Author/

This article appeared in *Transportation Research Record* No. 628; Lighting, Visibility, and Railroad-Highway Grade Crossings.

Hopkins, JB (Transportation Systems Center) *Transportation Research Record* No. 628, 1977, pp 1-6, 15 Ref.

ORDER FROM: TRB Publications Off

08 168076

## TRAFFIC-CONTROL MEASURES AT HIGHWAY-RAILWAY GRADE CROSSINGS WITH PROVISIONS FOR LIGHT RAIL TRANSIT

Railway rights-of-way in cities are attractive alternatives for transit corridors, but, for modes that are not fully grade-separated, such as light rail transit systems, there may be problems with combined railway and transit crossings of arterial streets. This situation has been studied in Edmonton, Alberta, where a light rail transit line is under construction. The surface portion of this line is along the railway right-of-way, and as a result, the operation of its eight grade crossings is regulated by railway authorities. The short headways of light rail transit could cause frequent disturbances to the road traffic that operates at a saturation during peak hours. This paper illustrates the method used for the analysis of the problem and discusses the surveys conducted. The basic principles governing the solutions to the grade-crossing problem are (a) the coordination of adjacent signalized intersections in such a way that the impact of the crossing closure is minimized and the system recovers shortly after the closure, (b) the integration of light rail transit scheduling and control with traffic control, i.e., restricting the closures to the periods of minimum impact on road traffic, and (c) the use of special features to increase safety. /Author/

This article appeared in *Transportation Research Record* No. 628; Lighting, Visibility, and Railroad-Highway Grade Crossings.

Schnabegger, J (Edmonton Transportation Planning Branch, Canada);  
Teply, S (Alberta University, Canada) *Transportation Research Record*  
No. 628, 1977, pp 6011, 9 Fig., 9 Ref.

ORDER FROM: TRB Publications Off

08 168077

## DEVELOPMENT AND APPLICATION OF A RAILROAD-HIGHWAY ACCIDENT-PREDICTION EQUATION

This paper reports the development of an accident-prediction equation for train-vehicle collisions at railroad-highway grade crossings that can be used as the basis for the establishment of a priority order for signal improvements. Most of the quantitative and physical factors in the grade-crossing environment were included. Of the 6000 public grade crossings in Florida, 1140 on state roads were used as the study base. The accident-prediction model was developed by the use of a stepwise regression analysis and three unconventional statistical techniques: (a) the analysis of the plots of the residuals, which indicated that a transformation was required (with the transformation of the dependent variable to a logarithmic form, the plot of the residuals was reasonably symmetric); (b) the observed interaction between the independent variables, which resulted in the use of dummy variables, particularly those for active (warning devices) times daily traffic and number of trains; and (c) a bias in the accident prediction that was introduced by the use of logarithms and eliminated by use of a nonlinear least squares adjustment. The accident-prediction model had a multiple correlation of 0.43. The independent variables in the model were the traffic, number of trains, vehicle speeds, train speeds, number of lanes, and presence of warning devices. The accuracy of the accident-prediction equation was demonstrated by comparisons of actual accidents to predicted accidents. The actual number of train-vehicle accidents in 1975 was 70 percent of the number predicted by the model. In 1975, the total number of accidents remained unchanged from that in 1974, but the number of train-vehicle accidents decreased 22 percent. /Author/

This article appeared in *Transportation Research Record* No. 628; Lighting, Visibility, and Railroad-Highway Grade Crossings.

Lavette, RA (Florida Department of Transportation) *Transportation Research Record* No. 628, 1977, pp 12-19, 2 Tab., 8 Ref.

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09 154909

**DESIGN CURVES FOR STRUCTURAL RESPONSE DUE TO IMPACT LOADING**

A method is developed to produce a design curve for predicting the response of a given type of structure to impact loading. This curve gives the maximum strain in the structure, which may have various size and material properties, due to impacts involving different masses and velocities. An example of a simply supported beam under central impact is presented in detail. Both experimental results and numerical calculations were used in establishing the design curve. This curve implies that, for large impactor masses, the controlling parameter is the ratio of structural to impactor mass; the strain is linearly proportional to impact velocity and inversely proportional to the square root of the mass ratio. (Author)

Chou, PC Flis, WJ  
Drexel University Final Rpt. NADC-76380-30, Oct. 1976, 74 pp  
Contract N62269-75-C-0425

ACKNOWLEDGMENT: NTIS  
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AD-A037011/4ST, DOTL NTIS

09 155055

**QUALITY ASSURANCE PROGRAM GUIDELINES FOR APPLICATION TO AND USE BY MANUFACTURERS OF RAIL/GUIDEWAY VEHICLES, BUSES, AUTOMATIC TRAIN CONTROL SYSTEMS, AND THEIR MAJOR SUBSYSTEMS**

Guidelines are presented for a quality assurance system to be implemented by the manufacturer in support of designing, developing, fabricating, assembling, inspecting, testing, handling, and delivery of equipment being procured for use in public urban mass transit systems. The guidelines apply to this equipment when being procured for: (1) use in revenue service; (2) demonstration of systems that will be revenue producing or used by the public; (3) use as a prototype for follow-on operational/revenue producing equipment procurements; and (4) qualification tests.

Witkin, SA  
Jet Propulsion Laboratory NASA-CR-149558, Aug. 1976, 33 pp

ACKNOWLEDGMENT: NTIS  
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N77-16955/5ST, DOTL NTIS

09 158492

**FRACTURE MECHANICS DESIGN HANDBOOK [Technical rept]**

This design manual is directed toward the needs of practicing engineers and stress analysts. Basic information on the history, philosophy, and theory of fracture mechanics including such topics as common definitions, elastic solutions, plastic zone effects, and both plane strain and plane stress fracture toughness testing are included. However, the major emphasis is placed on applications. A large number of the most applicable solutions presently available for use in fracture mechanics are documented with details covering their application and accuracy. (Author)

Smith, DG Mullinix, BR  
Army Missile Research Development & Eng Lab Tech Rpt. RL-77-5, Dec. 1976, 238 pp

ACKNOWLEDGMENT: NTIS  
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AD-A038457/8ST, DOTL NTIS

09 158617

**PRELIMINARY EVALUATION OF FIBER COMPOSITE REINFORCEMENT OF TRUCK FRAME RAILS**

The use of graphite fiber/resin matrix composite to effectively reinforce a standard steel truck frame rail is studied. A preliminary design was made and it was determined that the reinforcement weight could be reduced by a factor of 10 when compared to a steel reinforcement. A section of a 1/3 scale reinforced rail was fabricated to demonstrate low cost manufacturing techniques. The scale rail section was then tested and increased stiffness was confirmed. No evidence of composite fatigue was found after 500,000 cycles to a fiber stress of 34,000 psi. The test specimen failed in bending in a static test at a load 50 percent greater than that predicted for a non-reinforced rail. Static deflection, cyclic stress fatigue, and bending test were performed on 1/3 scale steel rail sections reinforced by graphite/resin caps for increased stiffness and buckling load capability; the variables include frame rail design parameters, reinforcement weight, graphite composite thickness, fiber

modulus, moment of inertia, load deflection, and crack location and propagation; 6 figures and two tables include numeric data.

Conf-Presented at the Congr. And Exposition Sponsored by the Soc. Of Automotive Engineers, Detroit, 28 Feb.-4 Mar. 1977.

Faddoul, JR  
National Aeronautics and Space Administration NASA-TM-X-73582, 1977, 22 pp

ACKNOWLEDGMENT: NTIS  
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N77-17167/6ST, DOTL NTIS

09 159583

**METAL CORROSION TESTING OF SELECTED CHEMICALS AND SOLUTIONS**

Nineteen solutions/materials were tested in accordance with NACE Standard TM-01-69, modified to represent the requirements of code of Federal Regulations, Title 49-Transportation, Section 173.240(a)(2). Corrosion rates were determined on hot-rolled 1020 steel alloy and 7075-T5 aluminum alloy.

Prepared for U.S. Department of Transportation, Materials Transportation Bureau, Office of Hazardous Materials.

Harton, EE, Jr Rawl, RR (Department of Transportation)  
Ocean City Research Corporation Final Rpt. DOT/MTB/OH-MO-76/1, Apr. 1976, 11 pp

Contract DOT-OS-30078

ACKNOWLEDGMENT: DOT  
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DOTL RP

09 163304

**STRUCTURAL ASPECTS OF FRACTURE TOUGHNESS OF STRUCTURAL STEELS**

Critical stress intensity coefficients are physically based quantitative characteristics of the crack resistance of alloys and are regarded as a measure of resistance to fracture. The authors discuss the effect of structural factors on the fracture toughness (parameter  $K_{Ic}$ ) of structural steels and indicate the principal problems requiring further research.

Presented at the All-Union Conference on Structure and Strength of Steels and Alloys, Kiev, Ukrainian SSR, Sept. 21-23, 1976.

Romaniv, ON (Ukrainian Academy of Sciences, USSR); Tkach, AN Zima, YV *Metal Science and Heat Treatment* Conf Paper Vol. 18 No. 7/8, July 1976, pp 676-681, 23 Ref.

ACKNOWLEDGMENT: EI  
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09 163305

**EFFECT OF STRUCTURE AND CHEMICAL COMPOSITION ON THE LIFE OF STEEL**

The authors conducted a systematic investigation of the effect of structural parameters (size of ferrite and austenite grains, dispersity, number, and shape of carbides) and also the chemical composition of the steel (amounts of carbon, nickel, and silicon) on the life. Among the numerous elements used for alloying of steels, nickel and silicon were selected because they have opposite effects on susceptibility to brittle fracture. Comparison of the structural characteristics, the effect of stress relaxation, and the mechanical properties with different types of loads and the life of the steel indicates no single-valued relationship between the life and the stress relaxation effect. This also holds true for other mechanical properties.

Presented to the All-Union Conference on Structure and Strength of Steels and Alloys, Kiev, Ukrainian SSR, Sept. 21-23, 1976.

Shur, EA (All-Union Sci-Res Inst of Railroad Transp, USSR); Kiseleva, TN *Metal Science and Heat Treatment* Conf Paper Vol. 18 No. 7/8, July 1976, pp 703-709, 17 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 164413

**DYNAMIC INITIATION OF BRITTLE FRACTURE IN STATICALLY LOADED MILD STEEL WELDED STRUCTURES**

Dynamic fracture mechanics can be used not only for impact loading but also for static (slow) loading. Dynamic initiation can occur in slow loading

when an embrittled area cracks, either by direct propagation into surrounding material or by a latter initiation from a part of the crack, still situated in the embrittled area. The tip of a sharp flaw can be embrittled after its occurrence by thermal strain ageing by later weld passes. The basic probabilistic fracture mechanics approach is introduced and the probable occurrence of embrittled zones and external impact loadings are discussed in examples also involving fatigue loading and different consequences of a fracture. In a special investigation, a crack in a probably embrittled zone could be allowed to remain in the structure if dynamic fracture toughness data prove the arresting capability of the parent material in the as-welded state, and of all zones in a welded joint in a stress-relieved or high heat input welded structure. The dynamic approach makes fracture mechanics applicable in practical situations involving narrow zones and cracking.

Dynamic Fracture Toughness, International Conference, Volume 1; Conference was held in London, England, July 5-7, 1976.

Ekvall, BO (Royal Institute of Technology, Sweden)  
Welding Institute Conf Paper Paper 2, 1977, pp 21-29, 15 Ref.

ACKNOWLEDGMENT: FI  
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09 164418

#### MIG/MAG APPLICATION, DEVELOPMENTS AND ECONOMIC ASPECTS

In comparison to metal arc welding, the high deposition rate is the reason for universal use. It is now possible to weld in all positions and on all material thicknesses ranging from sheet metal to heavy plate metal in the short-arc and spray-arc range. Consumable costs are saved by the use of two or a maximum of three wire sizes and a high efficiency of 95%. Electricity costs are lowered nearly 50%. In addition, various welding processes are discussed by comparing the MAG with the metal arc process and the applied shielding gases.

Presented at the IIW Public Session and Metals Technology Conference, in Sydney, Australia, August 21-28, 1976.

Pomaska, HU  
International Institute of Welding Conf Paper BSession 16, Paper 2, 1976, 16 pp, 14 Ref.

ACKNOWLEDGMENT: EI  
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09 165047

#### COMPARISON BETWEEN THE CHARACTERISTICS OF RAILS MADE OF OXYGEN CONVERTER STEEL AND THOSE MADE OF OPEN HEARTH STEEL [Sravnitel'nye issledovaniya kvestva rel'sov iz kislorodno-konverternoj i martenovskoj stalej]

Study of steel produced by 130 tonne oxygen converters. A study was made of hot rolled rails, quenched in oil or heated along their surface only by a high frequency current. The results illustrate that these rails have the same characteristics as those made of open hearth steel as far as yield strength and fatigue resistance are concerned.

Velikanov, AV *Vestnik Vniizt* No. 5, 1977, pp 33-36, 2 Fig., 4 Tab., 4 Ref.

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

09 166014

#### ON STRESS CONCENTRATION FACTOR AND DEFINITIONS OF A CRACK AND STRESS INTENSITY FACTOR

The common assumption that the stress is infinite at the tip of an in-plane crack is inconsistent with the basic historical solutions for stress for cases from which crack formulae have been evolved. The latter formulae do not satisfy boundary conditions. An appropriate definition of a crack, as does one presented here, should make it obvious that such conditions are to be fulfilled and when they are, the meaning of stress intensity factor as the coefficient of a  $1/(\text{square root of } r)$  singularity is altered. It no longer represents an infinity of stress and its connection with actual failure stress through a stress concentration factor leads to a fixed, rather than experimental, connection between Modes I and II stress intensity factors. Further discussion of appropriate representations of cracks for shear and normal stress loading is warranted, as well as of toughness definition consistent with failure mechanisms and with elastic-plastic solutions for stress. (Author)

Beeuwkes, RJ  
Army Materials and Mechanics Research Center, (1T161102AH42) Final Rpt. AMMRC-MS-77-3, Feb. 1977, 29 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

AD-A040679/3ST, DOTL NTIS

09 166152

#### FINITE ELEMENTS IN STRUCTURAL ANALYSIS (A BIBLIOGRAPHY WITH ABSTRACTS)

Finite element analysis as applied to dynamic and static problems are analyzed, as well as linear and nonlinear problems. Some computer programs for finite element analysis are also presented, but for a more complete listing of software developed for structural problems, see NTIS/PS-76/0436, Structural Mechanics Software. Vol. 1. March, 1971-April, 1975 and NTIS/PS-76/0437, Structural Mechanics Software. Vol. 2. May, 1975-May, 1976. (This updated bibliography contains 244 abstracts, 78 of which are new entries to the previous edition.)

Supersedes NTIS/PS-76/0525, and NTIS/PS-75/496.

Grooms, DW  
National Technical Information Service July 1977, 249 pp

ACKNOWLEDGMENT: NTIS  
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NTIS/PS-77/0569/2ST, DOTL NTIS

09 166157

#### CONCRETE POLYMER COMPOSITES (CITATIONS FROM THE NTIS DATA BASE)

These Federally-sponsored research reports cover the production, hardening, uses, and properties of concrete polymer composites. Major potential applications include piping, building panels, bridge decking, distillation vessels, and tunnel supports. Both polymer aggregate concretes and polymer impregnated portland cement concretes are cited. (This updated bibliography contains 160 abstracts, 41 of which are new entries to the previous edition.)

Supersedes COM-74-11535, NTIS/PS-75/475, and NTIS/PS-76/0523. See also NTIS/PS-77/0589.

Smith, MF  
National Technical Information Service July 1977, 165 pp

ACKNOWLEDGMENT: NTIS  
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NTIS/PS-77/0588/2ST, DOTL NTIS

09 166158

#### CONCRETE POLYMER COMPOSITES (CITATIONS FROM THE ENGINEERING INDEX DATA BASE)

The citations cover worldwide research on concrete polymer composites including both polymer aggregate concretes as well as polymer impregnated portland cement concretes. The reports discuss their production, hardening, uses, and properties. Also cited are studies on applications such as piping, building panels, bridge decking, tunnel supports, and highway pavements. (This updated bibliography contains 125 abstracts, 29 of which are new entries to the previous edition.)

Supersedes NTIS/PS-76/0524. See also NTIS/PS-77/0588.

Smith, MF  
National Technical Information Service July 1977, 132 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-77/0589/0ST, DOTL NTIS

09 166174

#### MATHEMATICAL ANALYSIS OF STRESS CRACKS. VOLUME 2. 1974-JUNE 1977 (A BIBLIOGRAPHY WITH ABSTRACTS)

Stress cracks are analyzed by mathematical methods, including extensive use of finite element analysis. Various materials, including metals, wood, composites, and rock are investigated. (This updated bibliography contains 299 abstracts, 135 of which are new entries to the previous edition.) See also NTIS/PS-75/466, Mathematical Analysis of Stress Cracks. Vol. 1. 1964-1973.

Supersedes NTIS/PS-76/0554, NTIS/PS-75/467, and COM-74-10242.

Habercom, GE, Jr  
National Technical Information Service Aug. 1977, 304 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-77/0645/0ST, DOTL NTIS

09 167497

#### STRUCTURAL FOAM IN THE TRANSPORTATION INDUSTRY

A brief comparison in history of the steel and plastic industries is presented, outlining the rapid progress that has been made since the first discovery of plastic to the present. The current applications in the automotive and transportation industries are discussed. The current volume users of structural foam are reviewed, pointing at the business machine and related fields where a majority of the development work has been done. An investigation of the potential expansion of use of the structural foam materials in the transportation industry, as a whole, is presented where lower investment levels and substantial cost and weight savings are obtainable.

LaVoie, FJ (Jeep Corporation) *Journal of Cellular Plastics* Vol. 12 No. 6, Nov. 1976, 3 pp, 10 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 167537

#### WELDING IN ALUMINIUM TRANSPORTATION EQUIPMENT

This paper establishes the position of welded aluminium in transportation applications and offers examples which confirm its viability for this use. The author deals with the important technical factors in welding and design for welding that lead to successful construction of aluminium transportation equipment. Processes and process innovations such as the use of shielding gases other than argon are emphasized.

Intl Inst of Weld, Public Sessions and Met Technol Conference, Sydney, Australia, August 21-28, 1976.

Hirschfield, JA (Aluminum Company of Canada, Limited)  
International Institute of Welding Proceeding Vol A Sess 5 Pap 1, 1976, 9 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 167560

#### NATURE OF DELAYED FRACTURE OF QUENCHED STEEL

The fracture of steel quenched to martensite under the influence of static stress is called delayed fracture. It is often the reason for premature failure of quenched steel machine parts, the formation of cracks in welds, steel bars, etc. The authors investigated the reasons for the formation and growth of cracks during delayed fracture of steels 40Kh2N5SM (0.39% C, 0.95% Si, 0.05% Mn, 5.1% Ni, 2.1% Cr, 1.2% Mo) and 18KhNVA (0.19%C, 0.52% Mn, 1.61% Cr, 4.47% Ni, and 0.84% W).

Sarrak, VI (Bardin (I.P.) Center, Sci-Res Inst of Ferrous Meta);  
Filippov, GA *Metal Science and Heat Treatment* Vol. 18 No. 11-1, Nov. 1976, 5 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 167938

#### APPLICATION OF SYSTEMS TECHNIQUES TO THE STUDY OF WEAR

Systems theory analyses a system in terms of its structure, i.e., a set of elements, the relations between the elements and their properties. The relations between elements of a mechanical system are transactions of work, entropy, material and information, where the first three quantities are of prime concern in the tribological processes of friction and wear. Tribological processes can be displayed schematically on a tribo-process diagram representing the transactions in friction wear. This is an aid to a rational organization of the basic concepts and mechanisms which is discussed with particular reference to wear.

Int Conf on Wear of Mater, St. Louis, Mo. April 25-28, 1977.

Molgaard, J (Newfoundland Memorial University, Canada); Czichos, H  
American Society of Mechanical Engineers 1977, pp 30-35, 20 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ASME

09 167940

#### MRD-72 MAGNETOFERROPROBE RAIL DEFECTOSCOPE

The construction of the horizontal and lateral ferroprobe converters and the electrical operating circuit of the MRD-72 magnetoferroprobe rail defectoscope are described. The technical characteristics of the defectoscope are presented.

Khvatov, LA (Scientific-Research Institute of Introscopy, USSR);  
Simonova, EY Dmitriev, AA Kalinin, YS *Soviet Journal of Nondestructive Testing* Vol. 12 No. 5, Oct. 1976, pp 516-520, 3 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 167942

#### INVESTIGATION OF THE FRONTAL RESOLUTION OF AN ECHO-TYPE FLAW DETECTOR

An analysis is made of the resolution for an echo-type flaw detector when inspecting with straight, combination probes. A formula is derived for the variation of the echo-signal amplitudes from two flaws located at the same depth which have different reflection areas. A program was written for the MIR digital computer, and the variation of the echo signal was calculated and confirmed experimentally for a wide range of dimensionless parameters both along a line connecting the two flaws and at an angle to it.

Ermolov, IN (Central Sci-Res Inst of Technol and Mach Constr);  
Karlov, DF *Soviet Journal of Nondestructive Testing* Vol. 12 No. 4, Aug. 1976, pp 393-398, 3 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 167994

#### EFFECT OF DEOXIDIZING METHOD ON QUALITY OF RAIL STEEL

Contact fatigue cracks are the main type of failure in rails. The large streak inclusions of alumina formed as a result of deoxidizing the steel in the ladle with aluminum are dangerous as regards formation of fatigue defects. These harmful inclusions can be eliminated only by altering the method of final deoxidizing. Deoxidizing the steel in the ladle with SK-15 brand calcium-silicon (3.0-3.5 kg/ton) is a more favorable variant. Addition of vanadium, titanium, or some other inoculant is required to reduce grain size. Deoxidizing rail steel with calcium-silicon, with vanadium inoculation at a rate sufficient to produce 0.03-0.07% V in the metal, has been the subject of the most detailed testing and study. The vanadium is added as ferrovanadium containing 45% V or as ferrosilicovanadium containing 8-14% V, 10-20% Si, 4-8% Mn, 1-4% Cr, and 0.5-2.0% Ti. Experimental through-hardened rails made from steel deoxidized with the combined deoxidizers FeSiCa and FeSiV (FeV) have been supplied to various sectors of railroad. The possibility of alloying titanium with rail steel is being studied. Satisfactory results have been obtained. The extent of contamination by streak inclusions in steel from heats deoxidized with FeSiCa and FeTi is much less than when aluminum is used.

Vinokurov, IY Rabinovich, DM Syreishchikova, VI Kolosova, EL Evdokimov, AV Baranova, VA *Metallurgist (USSR)* Vol. 20 No. 9-10, 1976, pp 617-618

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 168022

#### THE COMPATIBILITY OF STRUCTURAL MATERIALS WITH OXYGEN

To provide necessary technical input so that DOT could establish regulations governing the safe transportation of oxygen, a state-of-the-art survey was conducted and a research program proposed. The assessment is limited to structural materials in liquid or gaseous oxygen, identifying causes of ignition and combustion during transport.

Clark, AF (National Bureau of Standards)  
Department of Transportation Intrm Rpt. No. 275.05-71-2, Oct. 1971, 16 pp, 33 Ref.

ACKNOWLEDGMENT: DOT  
ORDER FROM: DOT

DOT-AS-10059, DOTL RP

09 168871

**PHOTOELASTIC STUDIES OF CRACK PROPAGATION AND CRACK ARREST**

This report describes the third-year effort on research programs dealing with the characterization of dynamic aspects of fracture. The results included in this report are as follows: (1) verification of BCL one-dimensional computer code; (2) determination of a-K relationship from modified compact-tension specimen; (3) verification of the MRL procedure for K(Ia) measurement with machine-loaded C-DCB specimen; (4) fracture behavior in duplex specimens; (5) crack propagation in a thermally stressed ring specimen; and (6) development of a two-dimensional code.

Irwin, G Dally, JW Kobayashi, T Fournery, WL Etheridge, JM  
Maryland University, College Park, Nuclear Regulatory Commission  
NUREG-0342, Oct. 1977, 283 pp

Contract AT(49-24)-0172

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-272645/3ST

09 169991

**EFFECT OF SUBCRITICAL QUENCHING ON THE FATIGUE LIMITS FOR CRACK INITIATION AND FOR FAILURE OF PRESS FITTED PARTS OF AXLES**

To improve the fatigue limits of press fitted parts of axles by subcritical quenching, that is, water quenching from the temperature just below the Asubcl point, the effect of heat treatment on the effects of the heat treatment conditions on microstructure, hardness, residual stress distribution, and rotating bending fatigue limits for crack initiation and for failure were examined. Unnotched, notched, and 50 mm diam fitted specimens of 0.35, 0.45, and 0.40% C unalloyed steels, respectively, were used in the investigations. Results are reproduced and discussed. [Japanese]

Takahashi, R (Railway Technical Research Institute JNR, Japan);  
Saito, H Yoshimura, T Iijima, K *Iron and Steel Institute of Japan Journal* Vol. 63 No. 8, July 1977, p 1312, 14 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 169992

**USE OF STEEL 55PP FOR DIESEL LOCOMOTIVE DRIVE GEARS**

At the present time drive gears are manufactured from Cr-Ni steels: 12KhN3A, 12Kh2N4A, 20KhN3A, and 20Kh2N4A. The gears are carburized (30 h), which substantially increases their fatigue and contact strength with proper heat treatment. Structurally free cementite in the form of a network in the grain boundaries may be formed when the treatment is not strictly followed, which sharply reduces the fatigue and contact strength. Experimental groups of heavy drive gears were manufactured from the low-hardenability steel adopted in the automobile industry--55PP. This work concerns attempts to use this steel for drive gears of electric and diesel locomotives, with use of bulk-surface hardening.

Gladysrevskaya, SA (All-Union Sci-Res Inst of Railroad Transp, USSR);  
Dontsova, LI Salina, AD Kucheryavaya, TI *Metal Science and Heat Treatment* Vol. 19 No. 1-2, Jan. 1977, pp 42-45, 1 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

09 170088

**METALLURGICAL EVALUATION OF GERMAN RAIL STEELS**

The Association of American Railroads obtained samples of 121 lb/yd (UIC 60 Section 60 Kg/m) from three German rail mills as part of its ongoing

investigation of domestic and foreign rail. These rails were of particular interest in view of the unconventional practice of bottom pouring ingots topped with insulating side boards. In addition, the rails are not control cooled. This practice is justified by the German steel makers in that they preheat all scrap and ingot molds and use a hot ladle which has been previously used for pouring steel of another heat.

Fleming, LD Stone, DH  
Association of American Railroads Technical Center Res Rpt. R-266,  
Apr. 1977, 40 pp, 22 Fig., 5 Tab.

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

DOTL RP

09 170422

**ULTRASONIC PULSE PROPAGATION IN THE COLD-WORKED LAYER OF RAILROAD RAIL**

Ultrasonic pulses propagating along the rolling surface of used railroad rail were observed to have two distinct arrivals. One arrival corresponded to the expected Rayleigh wave. The other, travelling just ahead of the Rayleigh wave, could not be identified as either a pure shear or dilatational wave. An analysis of the material properties in the rail head showed some significant differences to exist between the cold-worked layer on top of the rail and the underlying structure. The observed condition of a low-velocity layer over a high-velocity substructure was found to satisfy the requirements for the propagation of the M2 (Sezawa) shear wave mode. Experimental data and solutions to the governing wave equation showed that the early arrival was the M2 mode. The cause of the shear wave velocity reduction in the cold-worked zone was investigated. The results of these investigations showed that a material texture having the (531) crystallographic plane parallel to the rolling plane and the (112) crystallographic direction parallel to the rail axis was the most probable cause of the velocity reduction.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Oklahoma University Final Rpt. FRA/ORD-77/34.II, Jan. 1978, 142  
pp, Figs., 13 Tab., 61 Ref., 2 App.

Contract DOT-OS-40091

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS

09 170464

**MECHANISMS OF DRY ADHESION WEAR OF STEELS: INTERPRETATION OF EXPERIMENTAL RESULTS [Meccanismi di usura adesiva a secco degli acciai: interpretazione di risultati sperimentali]**

Some dry adhesion wear tests were conducted by using a ping-ring type geometry and by coupling various steel grades, making it possible to determine the influence of both operational parameters (load and speed) and metallurgical ones (structure and toughness) on the wear process of steels destined for the manufacture of railroad wheels and rails. The transition phenomenon--mild wear/severe wear and vice versa--are explained in terms of structural transformations and superficial oxidation which were observed during microscopic examination and X-ray testing of the wear debris. [Italian]

*Metallurgic Italiana* Vol. 69 No. 5, May 1977, pp 197-212, 3 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

10 053236

**ACCEPTANCE TESTING AND MAINTENANCE OF DIESEL ENGINES. ATMOSPHERIC POLLUTION BY EXHAUST GASES**  
A method to determine the pollution levels of railway diesel engines is defined in this report.

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

International Union of Railways B 13/RP 21, Apr. 1977, 30 pp, 7 Fig.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

10 151721

**JOINT EPA/UMTA/FEA STRATEGY FOR URBAN TRANSPORTATION AND AIR QUALITY. VOLUME 2. PUBLIC-PRIVATE URBAN TRANSPORTATION MODAL MIXES**

The objective of this four-volume study is to formulate a basis for the design of a joint interagency action program which would simultaneously improve urban mobility and air quality and conserve petroleum resources. This second volume presents an algorithm for calculating the impacts on transportation energy use and pollutant emissions of alternative urban transportation mixes. The algorithm is used to compare the change in national urban energy use and pollutant emissions implied by the maximum conceivable diversion of 1990 urban auto travel to bus, rail and para-transit compared to the no-diversion case. This exercise is supported by appendices showing the derivation of the methodology and of the database. The volume also includes a discussion of issues, tradeoffs, and methodologies relevant to the local determination of a balanced modal mix in an individual metropolitan area.

See also Volume 1, PB-244473. Prepared in cooperation with Environmental Protection Agency.

Krzyszczkowski, R Dei Rossi, JA Henneman, SS Putnam, ES Usowicz, TW

Interplan Corporation, Naval Underwater Systems Center, Urban Mass Transportation Administration, Environmental Protection Agency  
UMTA-RI-06-0005-74-1, 7346-R-Vol-2, Dec. 1974, 92 pp

Contract N00140-74-C-6026

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-263841/9ST, DOTL NTIS

10 151766

**TRANSPORTATION FACILITY PROXIMITY IMPACT ASSESSMENT**

This study provides techniques for the assessment of proximity impacts related to transportation facilities. The examination of proximity impacts included those related to highways and freeways, busways, and special operational improvements, transit, and new modes of transit. Proximity impacts are those direct and indirect effects which represent a significant change from existing or future community conditions. A two-stage evaluation was developed for the assessment of the following impact indicators: noise, air quality, traffic volume and accident experience, parking availability, pedestrian safety, land use, local fiscal effects, aesthetics, access/barrier, and neighborhood/community disruption. The report also includes an illustrative application of the assessment procedures to a candidate transportation project.

Booz-Allen and Hamilton, Incorporated, Gruen Associates, Incorporated, Bolt, Beranek and Newman, Incorporated, California Department of Transportation, Federal Highway Administration Final Rpt. BAH-GA-BBN-76-01, Mar. 1976, 296 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264160/3ST, DOTL NTIS

10 163250

**THE S6 CONSTRUCTION SECTION FOR THE RHINE/MAIN S-BAHN. A PARTICULAR CHARACTERISTIC OF THE FRANKFURT DOWNTOWN [Das Baulos S6 der S-Bahn Rhein-Main eine Besonderheit im Frankfurter Raum]**

A certain section of the line on the "Rhine-Main" S-Bahn network in a tunnel between Frankfurt Central Station and the town centre, has been fitted with special composite insulation. The use of this method, that is new

to the DB, offers advantages but also gives rise to many practical problems. [German]

Ludes, K *Eisenbahningenieur* Vol. 28 No. 2-4, Feb. 1977, 22 pp, 6 Fig., 6 Phot.

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

10 163267

**COMBUSTION RANDOMNESS AND DIESEL ENGINE NOISE: THEORY AND INITIAL EXPERIMENTS**

Theoretical reasoning and preliminary experimental results show that the cycle variations in the turbulent combustion process in a Diesel engine are responsible for a substantial amount of noise radiated from the engine. A two-time variable procedure is used to construct a theory of the three dimensional, unsteady Diesel engine combustion chamber pressure development. This theory is used to extract the spectral behavior of the chamber pressure when the heat release rate contains both periodic and random components. It is then theoretically shown that the randomness can be expected to dominate the periodic part of the pressure-time trace above some lower frequency bound of the order of 1000 Hz.

Strahle, WC (Georgia Institute of Technology) *Combustion and Flame* Vol. 28 No. 3, 1977, pp 279-290, 13 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

10 163294

**RAIL TRAFFIC NOISE [Schienenverkehrsgerauesche]**

A survey is given of the results of noise measurement of rail vehicles of all kinds. They are drawn from the researches made by the author and his co-workers during his time with the German state Railway as well as from the literature on the subject up to 1975. Up to date findings are stated on the origin of the rail traffic noise, the exterior noise, its maximum level, the energy equivalent of the working sound level, the noise of the environment, the inside noise, the excitation of body noise through the rail vehicles and the possibilities of lessening the rail traffic noise are dealt with in detail. [German]

Stueber, C *Acustica* Vol. 36 No. 3, Nov. 1976, pp 192-202, 37 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

10 163295

**INVESTIGATION OF THE NOISE PRODUCED DURING THE PASSAGE OF RAILWAY TRAINS [Untersuchung des Vorbeifahrgerauesches von Eisenbahnzuegen]**

The noise from passing trains is investigated and some of its characteristic values are determined. The statistical distribution is given of this noise during 24 hours measuring time. The dependence of the peak level, mean energy level, frequency spectrum and acoustical passage time on the distance to the railway track is also investigated. [German]

Louden, M *Acustica* Vol. 36 No. 3, Nov. 1976, pp 228-232, 4 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

10 163800

**DYNAMIC CHARACTERISTIC OF WHEEL AND WHEEL/RAIL NOISE**

The noise and vibration characteristics produced on a 2/5ths scale wheel-rail simulator device and by axial excitation of a wheel, not otherwise supported, produced similar results. Theoretical study was then made of the excitation of the wheel rim from its hub and was seen adequate for studies of noise suppression of wheels. This report indicates the method of analysis and describes essential details clarified by numerical computation.

Arai, H Hayashi, S Mouri, B Sato, S Zenda, Y *Railway Technical Research Inst Quarterly Reports* Vol. 18 No. 2, June 1977, pp 55-61, 14 Fig., 3 Ref.

ACKNOWLEDGMENT: Japanese National Railways



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

DOTL JC

10 166254

#### ENVIRONMENTAL IMPACT ASSESSMENT

The book examines the function of environmental impact statements as an aspect of policy implementation, and explores a variety of analytical and decision-making techniques that are applicable to their preparation. The outline of topics and the contents of the majority of chapters are the product of a conference sponsored by the Engineering Foundation. Each chapter addresses the role of impact statements in assessing environmental quality: Chapter 1 examines the impact statement as a means of forecasting alternative actions; Chapters 2 and 3 deal with legal questions; Chapters 4, 5, 6, 7, and 8 focus on selected aspects of implementation; Chapters 9, 10, and 11 examine analytical techniques as they apply to environmental impact statements; and Chapters 12 and 13 cover the role of public intervention in impact assessment. Chapter 14 takes a close look at the impact statement as an instrument of land use planning.

Blissett, M

Texas University, Austin, National Science Foundation NSF/RA-760500, 1975, 268 pp

Grant NSF-GI-38068

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-267268/1ST, DOTL NTIS

10 166792

#### CHEMICAL CHARACTERIZATION OF DIESEL EXHAUST PARTICULATES

High resolution mass spectrometry was used to analyze the organic material associated with diesel exhaust particulates in order to detect hazardous compounds. Diesel fuels and respirable coal mine dusts were also surveyed. Mass spectra were obtained on approximately 50 samples of particulates from diesel engine tests. The tests involved precombustion-chamber and direct injection engines operating in different modes of speed and load and using three grades of diesel fuel. Distribution of hydrocarbons changed in a characteristic manner as the speed and loading of the engines increased from idle to rated speed and full load. The composition profiles were little affected by engine or fuel type. The composition of diesel particulates was investigated as a function of particle size from less than 0.2 to greater than or approximately equal to 3.0  $\mu$ m. Formulas of the polynuclear aromatics customarily found in exhaust particulates were identified. More oxidation occurred in the less than 0.2  $\mu$ m fraction than in the larger size material. Mass spectra of respirable coal dust sampled in areas of a mine where diesel and electrical haulage of coal were used, were compared with spectra of uncontaminated coal dust from the same mine. Respirable dusts from the diesel haulage entry had numerous saturated aliphatics not found in the electrical haulage samples, and this is attributed to combustion of diesel fuel. Differences in composition between respirable mine dust and uncontaminated dust prepared from lump coal reflected contamination of respirable dust by hydraulic oils and lubricants. The mass spectral data of all samples were screened for toxic compounds. Formulas of possible toxic compounds in diesel particulates included saturated aliphatic hydrocarbons, oxygenates, and polynuclear aromatics. (ERA citation 02:033128)

Mentser, M Sharkey, AG

Energy Research and Development Administration Mar. 1977, 53 pp, 21 Fig., 7 Tab.

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PERC/RI-77/5

10 167115

#### STRUCTURAL VIBRATION NOISE ABATEMENT OF A LARGE DIESEL ENGINE

This report presents a vibration-noise investigation and a redesign of the top deck and the hand hole covers of GM 645E series railroad diesel engine for reduction of vibration and radiated noise. This was achieved by incorporating in the redesigned components, isolation, stiffening and damping. For damping, the solid friction, constrained layer and viscous air damping approaches were utilized. Experimental results on vibration and noise of the original and redesigned covers were obtained. It was found that a composite

design with channel stiffened constrained layer outer panel and a fiberglass filled inner cavity offered the best solution. On-engine tests at full load showed acceleration reductions of 2-40 dB for the redesigned composite top deck cover and 2-16 dB for the redesigned constrained layer hand hole cover. The composite design is recommended for both covers.

See also PB-232 626.

Varma, PK Kumar, S

Illinois Institute of Technology, General Motors Corporation, Association of American Railroads, Federal Railroad Administration Intrm Rpt. FRA/ORD-76/273, IIT-TRANS-74-1, July 1976, 100 pp

Contract DOT-OS-40103

ACKNOWLEDGMENT: NTIS

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PB-271503/5ST, DOTL NTIS

10 167136

#### ASSESSMENT OF RAILROAD FUEL USE AND EMISSIONS FOR THE REGIONAL AIR POLLUTION STUDY

A methodology has been developed for calculating and reporting fuel use and air pollutant emissions from railroad locomotive activity. The procedure uses automated techniques to report rail activity on a variable-sized grid system. Separate methodologies were developed for the two major types of rail activity-road or line-haul operation and activity within switch yards. The methodology for road locomotives uses a line source concept and synthesizes the rail network by a series of links connecting a system of node points within the study area. The methodology for switch yard operation uses an area source concept. Both methodologies use as a basic unit locomotive horsepower-hours and were programmed to provide an analysis of fuel use and emissions for five criteria pollutants on a grid-by-grid basis as well as for the entire study area.

See report dated May 74, PB-235 736.

Wiltsee, KW Khanna, SB Hanson, JC

Abcor, Incorporated, Environmental Protection Agency, Transportation Systems Center EPA/450/3-77/025, Apr. 1977, 95 pp

Contract EPA-68-02-1895

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-271887/2ST, DOTL NTIS

10 167323

#### IN-SERVICE PERFORMANCE AND COSTS OF METHODS TO CONTROL URBAN RAIL SYSTEM NOISE. TEST AND EVALUATION PLAN

This interim report is the test and evaluation plan, the second report of a study to investigate the effectiveness of four techniques for reducing wheel/rail noise in rail rapid-transit systems (resilient wheels, damped wheels, wheel truing, and rail grinding). The previous report covered experimental design. The ultimate goal is to provide sufficient information to allow a transit system with given track and car conditions and budgetary constraints to determine the mix of the available methods of control of wheel/rail noise which will result in the greatest overall benefit. The purpose of this report is to detail the methods and equipment that will be used to collect, manage, and reduce the data on both acoustic performance and costs of the four noise control methods.

Prepared in cooperation with Wilson, Ihrig and Associates, Inc., Oakland, Calif. and De Leuw, Cather and Co., Philadelphia, Pa. See also report dated May 76, PB-257 200.

Saurenman, HJ Holowaty, MC

Transportation Systems Center, Wilson, Ihrig and Associates, Incorporated, De Leuw, Cather and Company, Urban Mass Transportation Administration Intrm Rpt., 0 DOT-TSC-UMTA-76-17, UMTA-MA-06-0025-77-1, Apr. 1977, 67 pp

Contract DOT-TSC-1053

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-272521/6ST

10 167547

#### TRAINS AND TRAVIATA WON'T MIX--NOW

The track design described includes spring steel fasteners called Pandrol clips which are used overseas for their vibration control characteristics. Tests

indicated the new underground tracks would generate about 5 decibels greater ground vibration than the existing city loop track. To reduce this, modified tracks were recommended for the 73m stretch beneath the theater.

Eden, D *Institution of Engineers (Australia) Journal* Nov. 1976, pp 19-20

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

#### 10 167559

### SYSTEMWIDE IMPACT ASSESSMENT OF THE NORTHEAST CORRIDOR IMPROVEMENT PROJECT--AIR QUALITY CONSIDERATIONS

The Northeast Corridor Improvement Project (NECIP) is designed to establish regular scheduled and dependable intercity rail passenger service between Boston and New York, and between New York and Washington on regular schedules. To achieve this goal, the Federal Railroad Administration has embarked on an extensive improvement project which encompasses such programs as track work, bridge and tunnel rehabilitation, new fencing, grade crossing, new electrification, signaling and communications, station and service facilities improvement, and new rolling stock. In support of NECIP, procedural requirements and appropriate methodologies for identifying and analyzing those areas of NECIP which may have a potential impact on the environment are being developed. The resultant methods are then used to develop a systemwide assessment of NECIP. This paper addresses only the air quality portion of the impact assessment.

Inst of Environ Sci 23rd Ann Tech Meet. Proceeding, Environ Technol 77, Los Angeles, California, April 25-27, 1977. Also available from the Institute of Environmental Sciences.

Chng, KM (Bolt, Beranek and Newman, Incorporated); Hanson, CE Barnes, JD  
Institute of Environmental Sciences Proceeding 1977, pp 10-15, 64 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

#### 10 167934

### FINAL ENVIRONMENTAL IMPACT STATEMENT

Chicago, South Shore and South Bend Railroad discontinuance of all passenger train service Chicago, South Shore and South Bend Railroad abandonment of line over Illinois Central Gulf Railroad between Randolph Street and 115th Street (Kensington) in Cook County, Illinois.

Interstate Commerce Commission IC 1.32:C43, 1977, 215 pp, Figs.

ACKNOWLEDGMENT: Interstate Commerce Commission  
ORDER FROM: Interstate Commerce Commission, Office of Proceedings, Section of Energy and Environment, Washington, D.C., 20423

#### 10 167961

### MEASUREMENT OF NOISE CAUSED BY HIGH-SPEED TRAINS AND TRIALS OF NOISE ABATEMENT MEASURES

[Geraeuschnessungen an schnell fahrenden Eisenbahnzügen und Erprobung von Schallschutzmassnahmen]

In June 1974 the Federal Ministry for Research and Technology ordered steps of this nature to be taken. The article reviews the various means available for noise abatement. Up to speeds of 250 km/hr, the noise caused increases by 10 dB every time the speed is doubled. [German]

Hauck, G *Eisenbahntechnische Rundschau* Vol. 26 No. 7/8, July 1977, pp 503-508, 3 Fig., 3 Phot.

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

DOTL JC

#### 10 167992

### BULK LOADING HEADS MINIMIZE DUST EMISSION

The constantly increasing movement and shipment of powdery and granular bulk materials in tank-type and container vehicles requires an on-going need for dust-free loading. Modern loading systems are keyed to very short loading periods, i.e., high loading outputs. Systems having loading outputs of 300-400 cubic meters per hour are in use. For a tank-type transporter with a 20 cu.m. capacity, this would correspond to a theoretical loading period of about four minutes. Because of shortages of personnel, the loading system is frequently arranged for operation by the equipment driver. Various methods are available for loading bulk materials into tank trucks, freight cars and ships.

Beumer, BJ (Beumer Maschinenfabr, West Germany); Kaldewey, F *Pit and Quarry* Vol. 70 No. 1, July 1977, pp 89-91

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

#### 10 168086

### NOISE LEVELS ASSOCIATED WITH METROPOLITAN RAILWAYS OR URBAN RAPID TRANSPORT SYSTEMS. VDI-SPECIFICATION 2716 [Geraeuschnissituationen bei Stadtbahnen. VID-Richtlinie 2716]

The purpose of the specification is to provide a basis for determining the noise levels under various local operating conditions and track alignments, for use in the planning of metropolitan railway systems. The terms are first defined: metropolitan railway sound level: maximum and minimum sound levels. Both the maximum sound level for the passage of a train at a distance of 7.5 M from the track centre line under normal conditions and also the influences on the maximum level of variations in the measurements specified in the specification are described to illustrate the problems of external noise from metropolitan railway vehicles (or rapid transit vehicles) on elevated stretches. The influences covered include: speed; acceleration and braking noises; elevated construction, wheel, tires or rims; wheel construction; rails; layout of stretch; the relationship of the direction of the noise waves to the vertical plane; building development at the side of the track; acoustic screens and curves in the track. The problem of internal noise is also treated and the influences on the internal noise level caused by deviations from the specified measurement conditions of several parameters are covered: speed; tunnels; elevated construction; coach occupancy; wheel, tire or rims; construction of wheels and rails. Other factors covered are the problems of noise at underground stations, both for incoming and departing trains, the noise from moving trains in tunnels, in sections directly underneath the tracks as well as in houses near stretches of tunnel. Finally, in an appendix, mathematical formulae are developed for the calculation of maximum and median noise levels. [German]

Verein Deutscher Ingenieure Zeitschrift Monograph No. 2716, July 1975, 8 pp, 1 Fig., 5 Tab., 23 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-304182), Federal Institute of Road Research, West Germany  
ORDER FROM: VDI-Verlag GmbH, Postfach 1139, Graf-Recke-Strasse 84, 4 Dusseldorf 1, West Germany

#### 10 168645

### AIR POLLUTION ECONOMICS. VOLUME 2. 1975-SEPTEMBER 1977 (A BIBLIOGRAPHY WITH ABSTRACTS)

The citations cover studies on the economics of air pollution control and management, including the economics involved with industrial waste treatment, urban planning, government planning, and automobile and mass transportation. Specific cost studies have been excluded, unless they apply to an industry or entire region. (This updated bibliography contains 205 abstracts, 133 of which are new entries to the previous edition.) See also NTIS/PS-76/0663, Air Pollution Economics. Vol. 1. 1964-1974.

Supersedes NTIS/PS-76/0664, NTIS/PS-75/535, and NTIS/PS-74/091.

Cavagnaro, DM  
National Technical Information Service Sept. 1977, 210 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-77/0781/3ST

#### 10 169968

### CONTROL OF SHINKANSEN RAILWAY VIBRATIONS

The Japanese Government has decided to take measures on the control of vibrations transmitted through the ground, particularly those caused by trains. The article defines the permissible vibration standards adopted, measuring units, and guidelines for trouble-shooting measures on the Shinkansen; it also gives some results of the measures, and general recommendations laid down for vibration control.

Sakai, T *Permanent Way* Vol. 18 No. 1-2, Feb. 1977, pp 1-10, 3 Fig., 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Japan Railway Civil Engineering Association, 1-18-7 Higa-shiueno, Taito-ku, Tokyo-110, Japan

DOTL JC

10 169969

**DEVELOPMENT OF SHINKANSEN VIBRATION-ISOLATION TECHNIQUES**

A record of the very numerous surveys and measurements carried out since 1975 on a wide variety of ground types and foundations, with a study of the mechanism of vibration production and propagation: train-caused vibrations in the track, on bridges and viaducts, in tunnels, and a description of the various vibration isolation techniques.

Morii, T *Permanent Way* Vol. 18 No. 1-2, Feb. 1977, pp 11-37, 19 Fig., 5 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Japan Railway Civil Engineering Association, 1-18-7 Higashi-ueno, Taito-ku, Tokyo-110, Japan

10 170018

**COMMUNITY NOISE STUDY FOR RAILROAD RELOCATION**

A procedure is developed that can be utilized to predict the noise impact of passing freight train cars. The technique is based upon free-field measurements as corrected by the relative elevation of the track and the attenuation by structures in the sound path. Although any train speed and desired noise level can be accommodated by the prediction method, a case study is presented which examines the location of the 65-dBA isobar created by 40-mph (66-km/hr) trains passing through an urban area. The noise analysis formed a crucial part of the environmental statement exploring the impact of relocating train tracks from the heart of the city to a corridor along the river. A sophisticated data acquisition and analysis procedure is presented. Ambient background noise levels throughout the city were determined and compared against the current 65-dBA train contours. The freight train noise prediction method permitted the probable 65-dBA isobar resulting from the relocated tracks to be estimated.

Jacko, RB (Purdue University); Hall, DL *ASCE Journal of Transportation Engineering* Vol. 103 No. 6, Nov. 1977, pp 693-701, 5 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

10 170020

**INVESTIGATION INTO THE NOISE EMISSION OF OVERHEAD RAILWAYS [Untersuchungen der Geräuschemission von Hochbahnen]**

The noise emission from overhead railways in the vertical plane shows a reduction of about 5 to 7 dba independent of vehicle speed compared to the highest emission levels for angles between 0 deg and 30 deg from the horizontal and a reduction of about 8 dba to the area below 45 deg from the horizontal shielded by the fly-over structure. Vehicle speed has the greatest influence upon noise, so that an increase of 10 km/hour in the 20 km/hour to 60 km/hour band effects an increase of 4 to 5 dba in the noise level. Above 60 km/hour the noise increase per 10 km/hour speed increase is 1 to 3 dba less than at the lower speeds. With a tram system using rails set in an aggregate bed there is about 3 dba noise increase per 10 km/hour speed increase—a lower increase than for the Rotterdam metro (4 to 5 dba)—in the 22 km/hour to 50 km/hour band. Where both sides of an overhead railway are built up, the noise level on the eleventh floor of adjoining property rises by 3 to 5 dba. An increase in the clearance to each side of the structure, from 10 m to 20 m reduces the level of noise on the eleventh floor by 1 to 2 dba. In open areas, however, the noise reduction by doubling the clearance up to 25 M is 4 dba, from 25 M to 50 M it is 5 dba and at great distances the metro acts as a point noise source with 6 dba noise reduction for each doubling of the clearance. Trams with unground wheels on unground track emit up to 3 dba higher noise levels than the same with ground wheels on ground track. [German]

Buchta, E (Düsseldorf University, West Germany) *Fortschritt-Berichte der VDI-Zeitschriften* Monograph No. 22, Nov. 1975, 72 pp, 45 Fig., 2 Tab., 6 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-304759), Federal Institute of Road Research, West Germany  
ORDER FROM: VDI-Verlag GmbH, Postfach 1139, Graf-Recke-Strasse 84, 4 Duesseldorf 1, West Germany

10 170107

**PREDICTION AND MEASUREMENT OF TWO-STROKE CYCLE DIESEL ENGINE PERFORMANCE AND SMOKE AT ALTITUDE**

A simplified mathematical model for predicting the altitude performance and smoke of a turbocharged two-stroke cycle Diesel engine is developed utilizing a baseline perturbation methodology. The predicted performance at altitude is compared to the actual performance of an engine obtained from test results in an altitude chamber. Considering the simplifying assumptions made in developing the model, the results are satisfactory. This paper describes the modeling and testing procedure of a turbocharged two-stroke cycle Diesel engine at altitude.

For Meeting, September 18-22, 1977.

Schmidt, W (Detroit Diesel Allison); Venhuis, D Hinkle, S  
American Society of Mechanical Engineers ASME N77-DGP-3, 1977, 12 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

10 170446

**PROCEEDINGS OF THE WORKSHOP ON RAILWAY AND TRACKED TRANSIT SYSTEM NOISE DERBY, MARCH 30-APRIL 1, 1976**

The papers are grouped under 6 sections, each one including a summary: 1. Sources and mechanisms of noise: its control; parameters influencing the noise; 2. Community response to railway noise; 3. Noise in stations; criteria for acceptability; 4. Propagation of railway noise, effect of topography, barrier design; 5. Noise inside vehicles, noise control, acceptability criteria; and 6. Noise in elevated structures; vibration propagation; vibration isolation techniques.

*Journal of Sound and Vibration* Proceeding Vol. 51 No. 3, Apr. 1977, pp 317-450

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Academic Press Incorporated, Berkeley Square House, Berkeley Square, London SW1, England

DOTL JC

10 170452

**NOISE CONTROL BY BARRIERS--2. NOISE REDUCTION BY AN ABSORPTIVE BARRIER**

This paper presents a method of estimating the excess attenuation of a noise by an absorptive barrier covered with sound-absorbing materials. The approximate theory of diffraction by the absorptive barrier is derived from rigorous theory for a hard barrier. A single chart, which may be very convenient for the rapid estimation of the effect of absorption (the increase of the excess attenuation caused by the absorbing treatment of the barrier) in the practice of noise control, is presented. The validity of the method developed in this paper is confirmed by comparing estimated with measured values.

Fujiwara, K (Kyushu Institute of Design, Japan); Ando, Y Maekawa, Z *Applied Acoustics* Vol. 10 No. 3, July 1977, pp 167-179, 17 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

10 170471

**CHARACTERIZATION OF DIESEL CRANKCASE EMISSIONS**

Methods for measurement and expression of crankcase or "blowby" emissions from diesels were developed and demonstrated on a test engine. These methods were subsequently used to characterize gas and particulate emissions from two in-service engines. Crankcase emissions were evaluated under engine operating conditions corresponding to the EPA 13-mode certification test. Substances for which analyses were conducted included regulated pollutants, sulfate, trace elements, nitrosamines, individual hydrocarbons, and aldehydes. Emissions from the diesel crankcases were compared to exhaust emissions (where possible) to assess their importance. Analysis for nitrosamines was continued beyond the original effort, utilizing another test engine.

For Meeting, September 12-15, 1977.

Hare, CT (Southwest Research Institute); Baines, TM  
Society of Automotive Engineers Preprint n 770719, 1977, 16 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

10 170472

**EFFECTS OF A BARIUM-BASED FUEL ADDITIVE ON  
PARTICULATE EMISSIONS FROM DIESEL ENGINES**

The use of barium-containing smoke suppressant diesel fuel additive was investigated. Effects on particulate reduction, other pollutant emissions, and performance were explored over a range of speed and load conditions. The particulate emissions were analysed gravimetrically and reported in terms of particle concentration and emissions index. Public health aspects of use of the additive are discussed.

For Meeting, September 26-30, 1977.

Apostolescu, ND (California University, Berkeley); Matthew,  
RD Sawyer, RF  
Society of Automotive Engineers n 770828, 1977, 12 pp, 21 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

11 151199

**DYNAMIC INTERACTIONS AND OPTIMAL DESIGN OF PRT VEHICLES ON ELEVATED GUIDEWAYS**

The report presents research completed on optimum (minimum cost) design of PRT vehicle guideway systems; analysis of periodic motions of PRT vehicles over straight flexible guideways; and continued investigations of vehicle motions over curved elastic guideways. These three areas represent essential ingredients of a mathematical study of the performance of candidate vehicle/guideway designs. The dynamics of PRT vehicles over flexible curved guideways have been investigated with the primary objective being to establish a computationally efficient method for studying this problem. A computer algorithm has been developed and tested in order to optimize its computational efficiency. The algorithm will be used to construct a test track which is made up of straight-transition-curved-transition-straight guideway segments. Candidate vehicle/guideway designs determined by the optimization algorithm will then be proof tested on this curved track in order to verify the fidelity of the system design.

Likins, PW Nelson, RB Mingori, DL  
California University, Los Angeles, Department of Transportation Final Rpt. DOT/TST-77/15, June 1976, 80 pp

Contract DOT-OS-40080

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-262973/1ST, DOTL NTIS

11 155004

**TRACKED AIR CUSHION VEHICLES AND MAGNETIC LEVITATION (CITATIONS FROM THE NTIS DATA BASE)**

The feasibility, design, and track dynamics of tracked air cushioned and magnetically levitated vehicles are investigated in these Government-sponsored research reports.

Supersedes NTIS/PS-76/0094, and NTIS/PS-75/114. See also NTIS/PS-77/0179.

Habercom, GE, Jr  
National Technical Information Service Bibliog. Apr. 1977, 125 pp, 120 Ref.

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS, ESL

NTIS/PS-77/0178/2ST, DOTL NTIS

11 155005

**TRACKED AIR CUSHION VEHICLES AND MAGNETIC LEVITATION (CITATIONS FROM THE ENGINEERING INDEX DATA BASE)**

The feasibility, design, and track dynamics of tracked air cushioned and magnetically levitated vehicles are investigated in these abstracts of reports gathered in a worldwide literature survey.

See also NTIS/PS-77/0178.

Habercom, GE, Jr  
National Technical Information Service Bibliog. Apr. 1977, 259 pp, 252 Ref.

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS, ESL

NTIS/PS-77/0179/0ST, DOTL NTIS

11 158085

**PEOPLE MOVER PROFILE**

As part of its ongoing commitment to the concept of technology sharing, the U.S. Department of Transportation has initiated a series of publications on transportation topics which focus on a variety of subject areas. This report is part of such a series. **PEOPLE MOVER PROFILE** acquaints readers with the subject of people movers in conjunction with UMTA's Downtown People Mover (DPM) Project. The project's aim is to demonstrate the benefits of fully automated people mover systems in downtown urban areas. To date, people movers, installed in controlled environments such as airports and recreation parks, have demonstrated that they are proven operational systems. The DPM Project will demonstrate the feasibility of installing a people mover system in the harsher and more demanding environment of downtown urban areas. This profile report is divided into three sections. The first, a narrative overview, briefly discusses the subject of people movers. The second section consists of detailed technical data and photographs of manufacturers and suppliers of existing people mover systems. The third

section, the supplementary material, contains a glossary of terms used in this document in addition to the aforementioned UMTA DPM Project material. Technical data in this profile report were obtained from the people mover manufacturers and suppliers who are responsible for its accuracy.

Urban Mass Transportation Administration, (MA-06-0081) Final Rpt. UMTA-MA-06-0081-77-1, May 1977, 36 pp

Contract MA-06-0081

ACKNOWLEDGMENT: UMTA, NTIS  
ORDER FROM: NTIS

PB-268335 DOTL NTIS

11 158147

**ANALYSIS OF URBAN TRANSPORTATION NEEDS WITH IMPLICATIONS FOR AGT SYSTEMS**

In this report the current and future development of urban form is illustrated and analyzed in terms of its specific implications for automated guideway systems (AGT). Five cities that are representative of the range of urban attributes in the nation are examined--Chicago, Baltimore, Kansas City, Phoenix, and Grand Rapids. To identify what transportation modes satisfy the transportation needs, seven broad modal categories, operating and economic characteristics, energy consumption and pollution levels are presented. These measures are presented in detail for seven generic modes--Rail Rapid Transit, Light Rail, Conventional Bus, Group Rapid Transit, Personal Rapid Transit, Dail-A-Ride, and Auto. Conclusions as to the ability of AGT, as well as various other possible systems of transportation, to satisfy the predicted future needs of multi-nucleated urban areas are reached through the use of models of applicable demand range, which present, at one end, capacity capability and, at the other, necessary patronage for viable fiscal operation of such systems. Performance measures are developed for line-haul and circulation systems. The line-haul measures are given in terms of the boarding per hour per mile as determined by the capacity of the system and by the fiscal and fare policies. These measures are used to illustrate an approach to developing circulation measures, which are given in terms of the demand density that can be accommodated by the systems, as a function of the system characteristics and the area covered.

Sponsored by DOT, Urban Mass Transportation Administration.

Johns Hopkins University, Baltimore, (MD-11-001) Final Rpt. UMTA-MD-11-0001-77-1, July 1975, 436 pp

ACKNOWLEDGMENT: UMTA, NTIS  
ORDER FROM: NTIS

PB-267006/5ST, DOTL NTIS

11 158594

**GUIDEWAY TRANSPORTATION (A BIBLIOGRAPHY WITH ABSTRACTS)**

The bibliography cites research on automated guideway transportation (AGT), in which passengers or freight can be transported along tubes or rails under automatic control. The carriers, termed personal rapid transit vehicles or people movers, can accommodate single individuals or small or large groups. The reports cover many aspects of technology, such as demand actuated service, networks, elevated structures, monorail, light rail, computer aided control, vehicle merging, headway safety, shuttle loops, guideway designs, magnetic levitation, suspended vehicles, and dual mode. Discussions are made of steering control, ride quality, airport services to move people or baggage, gravity assistance in accelerating and braking, test vehicles, and maintenance. Other topics are cost comparisons of AGT with conventional transit, fares, and equipment failure. Air cushion vehicles are excluded.

Adams, GH  
National Technical Information Service Bibliog. May 1977, 144p

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-77/0373/9ST, DOTL NTIS

11 163262

**CONTRIBUTION TO THE STUDY OF AN ASYNCHRONOUS LINEAR MACHINE WITH STATOR-DEPENDENT CONDUCTIVITY OF THE SECONDARY [Beitrag zur asynchronen Linearmaschine mit Ortsabhaengiger Sekundaerleitfaehigkeit]**

Linear induction machines, such as the high speed ground transportation motor with discontinuously arranged stators along the guideway and

controllable secondary on the train, further the liquid metal MHD convertor or the sector motor and make operation with reduced conductivity of the secondary outside the stator possible. The influence of the stator position-dependent conductivity of the secondary on field and current distribution and on the performance characteristics is analyzed. [German]

Andresen, E (Technical University of Darmstadt, West Germany);

Baertz, U *Archiv fuer Elektrotechnik* Vol. 59 No. 1, Mar. 1977, pp 23-37, 10 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

#### 11 163272

##### POWER COLLECTION FOR HIGH-SPEED TRAINS BY AN ELECTRIC ARC

Power collection on electric trains is achieved at present by sliding contact systems. As the train speed increases, it becomes increasingly difficult to maintain constant pressure and the loss of contact can create serious problems at high-speeds. Alternative methods of power collection without contact may thus be required in the future for speeds up to 500m/h. The most promising of all contactless methods is the electric arc method, which is advantageous in terms of the overall efficiency and its capability to transfer directly commercially available power to the vehicle. The transfer of power is achieved by conduction through an arc plasma which bridges the gap between a "collector" attached on the fast moving vehicle and a "distributor" supported from the ground, in the form of an overhead wire or a third rail positioned on the wayside.

Presented at the 4th International Conference on Gas Discharges, Swansea University, Singleton Park, Wales, September 7-10, 1976.

Klapas, D (Sheffield University, England); Hackam, R Benson, FA Institution of Electrical Engineers Conf Paper No. 143, 1976, pp 299-302, 7 Ref.

ACKNOWLEDGMENT: EI

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#### 11 163274

##### MAGNETIC LEVITATION TECHNOLOGY OF TRACKED VEHICLES PRESENT STATUS AND PROSPECTS

Various levitated systems are described. Electrodynamic levitation with superconductive magnets and with normal-conductive magnets is discussed. The present status of R & D activities related to magnetic levitation technology in Japan is reported.

Presented at the Joint Magnetism and Magnetic Materials/International Magnetism Conference (InterMag), in Pittsburgh, Pa., June 15-18, 1976.

Yamamura, S (Tokyo University, Japan) *IEEE Transactions on Magnetism* Conf Paper No. 6, Vol. MAG-12, Nov. 1976, pp 874-878, 5 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

#### 11 163275

##### COMPARISON OF LADDER AND SHEET GUIDEWAYS FOR ELECTRODYNAMIC LEVITATION OF HIGH SPEED VEHICLES

The basic properties of flat sheet and flat ladder levitation systems are compared and contrasted based on the assumption that identical quantities of material are used in their construction. It is shown that although ladder systems can produce slightly better lift-to-drag ratios, the overall performance of sheets is better, particularly where lateral destabilization must be minimized.

Presented at the Joint Magnetism and Magnetic Materials/International Magnetism Conference (Intermag) in Pittsburgh, Pa., June 15-18, 1976.

Akinbiyi, T (Toronto University, Canada); Burke, PE *IEEE Transactions on Magnetism* Conf Paper No. 6, V MAG-12, Nov. 1976, pp 879-881, 3 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

#### 11 163276

##### DESIGN OF FLAT LADDER AND COIL GUIDEWAY SYSTEMS FOR HIGH SPEED TRAINS

Flat guideways are considered ideal for supporting electrostatically levitated trains which must operate in regions where significant accumula-

tions of snow are probable. Three flat ladder and coil guideway configurations for the Canadian reference design train are discussed. The systems considered are confined to those in which magnet arrays move over parallel guideway systems comprising ladders or loops.

Presented at the Joint Magnetism and Magnetic Materials/International Magnetism Conference (Intermag) in Pittsburgh, Pa., June 15-18, 1976.

Burke, PE (Toronto University, Canada); Akinbiyi, T *IEEE Transactions on Magnetism* Conf Paper No. 6, Vol. MAG-12, Nov. 1976, pp 882-884, 2 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

#### 11 163277

##### LINEAR SYNCHRONOUS MOTOR FEEDBACK CONTROLS

The theoretical behavior of the linear synchronous motor as a propulsion means for a high speed vehicle is considered. The performance during acceleration and steady state operation is obtained from a set of state variable equations which are solved using a digital computer. The inherent performance is oscillatory with little damping. A general feedback control scheme is presented which provides damping and control of the force angle (the angle between the vehicle field and track field). Velocity and force angle errors control voltage magnitude and frequency of the power conditioner (cycloconverter). The effectiveness of the control scheme is measured in terms of its ability to have the vehicle follow a velocity profile, to maintain a constant force angle and to eliminate fast changes in the cycloconverter output voltage. The study shows that effective damping and control of the force angle can be obtained when the cycloconverter voltage and frequency are simultaneously controlled by velocity and force angle feedback signals.

Presented at the Joint Magnetism and Magnetic Materials/International Magnetism Conference (Intermag) in Pittsburgh, Pa., June 15-18, 1976.

Dawson, GE (Queen's University, Canada); Sen, PC Clarke, DJ Lakhavani, S *IEEE Transactions on Magnetism* Conf Paper No. 6, Vol. MAG-12, Nov. 1976, pp 885-888, 7 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

#### 11 163293

##### REVIVAL OF TRANSVERSE-FLUX MACHINES FOR HIGH-SPEED GROUND TRANSPORT

The development of the linear induction motor (LIM) and suspension subsystems for noncontact high-speed ground transport are briefly outlined. The core flux of the transverse-flux linear induction motor is arranged in planes perpendicular to the direction of motion thus giving it the name "transverse". The arrangement is different from that of LIMs which have their core flux arranged in planes parallel to the direction of motion. These LIMs are called axial-flux linear induction motors. The transverse-flux LIM has certain outstanding features. It also has a number of advantages over its counterpart, the axial-flux LIM. In the transverse-flux LIM, the depth of iron in the stator core and the thickness of the backing iron on the secondary side can be kept very small, for the length of the flux path in iron is short and the length of pole pitch does not affect it. Thus this design leads to a very large saving in iron required for the track and hence a correspondingly large reduction in cost in comparison with the axial-flux machine. The open ends of the axial-flux LIM give rise to the well known end effects due to the magnetic discontinuity. However, in the case of the transverse-flux LIM, the absence of magnetic discontinuity reduces these end effects. This will lead to a corresponding reduction of entry and exit edge losses. A part of the overhang winding leakage flux in the transverse-flux LIM reacts with the secondary aluminium track to produce levitation forces. These levitation forces, contrary to those in the axial-flux LIM, become attractive only at very low slips and, if there is no backing iron on the secondary member, the levitation forces may cease only at synchronous speed. Further, the overhang-winding leakage flux can be made more useful by arranging for the stack of laminations to extend over the overhang of the winding on each side. The transverse-flux LIM, when appropriately designed, produces guidance forces at each side that tend to keep the vehicle centered on the track when it is slightly displaced sideways.

Mahendra, SN (City University, London, England) *Electronic Engineering* Vol. 22 No. 10, Oct. 1976, pp 693-697, 19 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

11 163307

**SUSPENDED MONORAIL SYSTEMS IN WUPPERTAL CHANGES OVER TO ALUMINUM CARS**

The design of a new type of aluminum alloy cars adopted for the suspended monorail system operating in Wuppertal is described in detail. [German]

Kehler, WF *Schweizer Aluminium Rundschau* Vol. 26 No. 4, 1976, pp 152-156

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

11 163734

**THE PROBLEMS OF USING THE ASYNCHRONOUS LINEAR MOTOR FOR HIGH-SPEED GROUND TRANSPORT**

The author investigates the causes of deteriorating performance in linear motors at very high speeds, and methods of overcoming this. Tridimensional models of the magnetic field using the notion of vector potential are too complex, and unidimensional models have given inadequate results. He proposes an original method for calculating the physical phenomena in an actual motor, and gives numerous results of comparisons between calculated and experimental values of fields, inductors, intensities and angles of phase displacement.

Skobelev, VE *Rail International* Vol. 8 No. 6, June 1977, pp 297-308, 8 Fig., 2 Phot., 9 Ref.

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

DOTL JC

11 163758

**MAGNETICALLY LEVITATED AND WHEELED MINITRAM COMPARISON STUDY**

A programme of theoretical and experimental work has led to the successful demonstration of an electro-magnetic suspension unit for a small, driverless urban vehicle (minitrans). The report describes the designs of both magnetically levitated and wheeled vehicles and their guideways and compares them in both technical and economic terms. The system based on magnetic suspension has been shown to be technically feasible with overall costs comparable with those for the equivalent wheeled vehicle system. The authors see more likelihood of cost reductions in a second generation magnetic suspension system than for a wheeled system which is already based on proven technology. They identify the narrower, lighter guideway and lower noise levels as further possible advantages of magnetic suspension over wheels. The authors also find that the magnetic suspension vehicle should have a higher reliability and availability than the wheeled vehicle which leads to a significant difference in maintenance requirements. The major disadvantage of a magnetically suspended vehicle is that the linear motor used for propulsion and braking is inefficient and requires heavy associated control gear. On balance, magnetic suspension does not at present have any outstanding advantage over wheels for the proposed application. /TRRL/

Dobbs, DJ Linder, D Armstrong, DS  
British Railways Board Research Department Monog Rept  
TR-EDYN5, Jan. 1976, 122 pp, Figs., Tabs., 4 Phot., 10 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-227304)  
ORDER FROM: British Railways Board Research Department, Railway Technical Centre, Derby, England

11 163759

**STATE-BACKED BODIES COMPETE FOR MAG-LEV TRANSPORT PRIZE**

The major Japanese rail (JNR) and airline (JAL) companies are independently developing similar high speed, noiseless pollution-free transport systems using magnetic levitation and the linear induction motor. It is hoped that the JAL system will be operational in 1982 running from Tokyo to the airport over an elevated guideway at 300km/h. Electric power for the linear induction motor is picked up from a third rail through a carbon shoe attached to the vehicle. The JNR development is designed to be a 500km/h inter-city system to supplement the present Shinkansen network providing direct competition with domestic airlines. A linear synchronous motor creating a repulsive force is used to levitate and propel the vehicle 300mm above a concrete inverted t-shaped track. The magnets, which are superconductive, also react with a current in track mounted coils to produce the repulsive force. Because the levitation and guidance only function at speeds

above 80km/h a rail and wheel system is added for low speeds. However the JNR system has the advantages of greater gap control at high speeds and requires no "third rail" power supply. /TRRL/

*New Civil Engineer* Analytic No. 248, June 1977, pp 18-19, 2 Fig., 4 Phot.

ACKNOWLEDGMENT: TRRL (IRRD-227536)

ORDER FROM: Institution of Civil Engineers, 91-93 Farringdon Road, London EC1M 3LE, England

11 164416

**SUPERCONDUCTING LINEAR SYNCHRONOUS MOTOR TESTS**

Tests of a large superconducting linear synchronous motor designed for high-speed magnetically levitated vehicles are reported. A single superconducting magnet, from the array of 45 carried by the proposed vehicle, interacts with guideway windings mounted on the rim of a 7.6 m diameter rotating wheel. The split 3-phase "stator" windings are energized from a variable-frequency 40 kVA current-source inverter power supply. All forces and torques developed on the magnet have been monitored over the complete 360 degree cycle of force angle for a range of suspension heights, lateral displacements, and pitch, roll and yaw angles, at speeds up to 100 km/hr. Controlled starting, stopping and section entry have been demonstrated. The results are claimed to be in agreement with analysis based on mutual inductance computations and on a coupled circuit model of the machine. Highlights of the results are discussed.

Presented at the Applied Superconduction Conference, Stanford University, California, August 17-20, 1976.

Atherton, DL (Queen's University, Canada); Eastham, AR Cunningham, JA Dewan, SB Slemon, GR Turton, RA *IEEE Transactions on Magnetics* Conf Paper No. 1, Vol. MAG-13, Jan. 1977, pp 776-779, 5 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

11 164422

**MATHEMATICAL MODELING OF LINEAR ASYNCHRONOUS MOTORS [Matematicheskoe modelirovanie lineynykh asinkhronnykh dvigatelei]**

A method of modeling electromagnetic fields of a linear motor on analog computers is set forth. Results of a calculation of the magnetic field and operating characteristics of an experimental model of the linear motor as well as their comparison with experimental data are presented. [Russian]

Kopylov, IP Belyaev, EF *Izvestia Vysshikh Ucheb Zaved, Elektromekhanika* No. 1, Jan. 1977, pp 11-20

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

11 164447

**ASSESSMENT BY COMPARISON OF ELECTROMAGNETIC PROPULSION AND BRAKING SYSTEMS [Evaluation par la similitude des systemes de propulsion et freinage electromagnetiques]**

Full-scale tests on electromagnetic propulsion and braking systems can be very costly. It may be cheaper to carry out tests on reduced-scale models by applying the laws of similars. The article gives details of these laws and explains how they should be applied. It then provides examples of the research, based on these methods, carried out by the IRT. The first research project concerns the comparison of the performance of three types of linear motor on 1/3rd scale models. The second is connected with an eddy-current braking system where the currents are not created on the rail but in the wheel; the tests have been carried out with the cooperation of the SNCF on a 1/5th scale model. Compared with conventional shoe brakes, the advantage of the system lies in the fact that the eddy currents penetrate deeply into the body of the wheel and the heat stresses are consequently lower than when the braking effort is localised in the friction area. [French]

Giovachini, JL *Revue Generale des Chemins de Fer* June 1977, pp 345-352, 10 Fig., 7 Ref.

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

DOTL JC



11 165028

**EXPEDIENCY OF USING MONORAIL SUSPENDED RAILROADS WITH LOCOMOTIVE TRACTION [O****Tselesoobraznosti Primeneniya Monorel'sovnykh Podvesnykh Dorog s Lokomotivnoi Tyagol]**

The expediency of using monorail suspended railroads with locomotive traction in coal mines with complete and partial conveyor transport, and with hydraulic coal transportation, is considered. The possibility of using monorail suspended railroads in mountainous local relief to transport a mineral from the mining area to the railroad, consumption or processing center, is pointed out. A method of calculation for the selection of the most economic locomotive haulers for monorail railroads is presented. [Russian]

Surkov, LP (Sverdlovsk Mining Institute, USSR) *Izvestiya Vysshikh Ucheb Zaved Gornyi Zhurnal* No. 6, 1976, pp 108-110

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

11 165029

**COST AND PERFORMANCE RELATIONSHIPS FOR RUBBER TIRED AUTOMATED SYSTEM DESIGN**

The paper discusses the cost sensitivity of the vehicle/elevated guideway system to the important vehicle operational and performance characteristics. For the vehicle system, relationships for obtaining a first cut cost estimate of an electrically driven automated rubber tired vehicle as a function of the vehicle's physical & operating characteristics are presented. Also presented are important vehicle performance characteristics that affect the fleet size and hence the vehicle system capital cost.

Presented at the International Conference on Personal Rapid Transit, Denver, Colorado, September 16-19, 1975.

Putukian, J (Transportation Systems Center)

Colorado University, Boulder Conf Paper Vol 2, Pap 34, 1975, 18 pp, 13 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Colorado University, Boulder, Center for Urban Transportation Studies, Boulder, Colorado, 80302

11 165030

**DEVELOPMENT AND EVALUATION OF SERVICE POLICIES FOR MEDIUM-HEADWAY AUTOMATED RAPID TRANSIT SYSTEMS**

Two innovative service policies--the dynamically scheduled service and the advanced scheduled service--were developed for these systems combining the features of scheduled and demand services. These operate a large number of fixed service routes formed by connecting station groupings in the network. The level of service provided by these policies, the system operating and design requirements and the network performance characteristics were evaluated using three typical networks and a set of eight computer programs. Dynamic scheduling provided a high level of service with a low passenger waiting time at the stations and no requirement for passenger transfers. Advanced scheduling provided a marginally lower service level but resulted in higher vehicle occupancies and substantial reduction in fleet requirements.

Presented at the International Conference on Personal Rapid Transit, Denver, Colorado, September 16-19, 1975.

Thangavelu, K (De Leuw, Cather and Company)

Colorado University, Boulder Conf Paper Vol 1, Pap 20, 1975, 26 pp

ACKNOWLEDGMENT: EI

ORDER FROM: Colorado University, Boulder, Center for Urban Transportation Studies, Boulder, Colorado, 80302

11 165031

**COST ASPECTS OF ELEVATED GUIDEWAY DESIGN**

The paper presents some of the cost-saving features incorporated in current optimum guideway designs, identifies the general areas where cost-reductions may be initiated and summarizes guideway costs for the majority of present day vehicle systems. Innovative design concepts aimed at Personal Rapid Transit systems are discussed.

Presented at the International Conference on Personal Rapid Transit, Denver, Colorado, September 16-19, 1975.

Prestegaard, E (ABAM Engineering Incorporated)

Colorado University, Boulder Conf Paper Vol 2, Pap 35, 1975, 19 pp

ACKNOWLEDGMENT: EI

ORDER FROM: Colorado University, Boulder, Center for Urban Transportation Studies, Boulder, Colorado, 80302

11 165032

**CRASHWORTHINESS AND CRASH SURVIVABILITY FOR PERSONAL RAPID TRANSIT VEHICLES**

The paper proposes guidelines for the design of PRT vehicles in which the possibility of serious injury to occupants is minimized during a collision. Basic trade-offs between seating arrangements, passenger restraints, and shock absorbers are evaluated both qualitatively and quantitatively. The quantitative portion of the study is restricted to small PRT vehicles having a capacity of three to six seated passengers.

Presented at the International Conference on Personal Rapid Transit, Denver, Colorado, September 16-19, 1975.

Garrard, WL (Minnesota University, Minneapolis); Caudill,

RJ Rushfeldt, TL

Colorado University, Boulder Conf Paper Vol 2, Pap 41, 1975, 18 pp, 15 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Colorado University, Boulder, Center for Urban Transportation Studies, Boulder, Colorado, 80302

11 165050

**SIXTH SEMINAR ON MAGNETIC LEVITATION TECHNIQUES: 1977 [Statusseminar VI "Magnetschwebetechnik" 1977]**

A report on this seminar organized on 21 and 22 March 1977 at Constance under the auspices of the German Federal Ministry for Research and Technology. The article describes the progress made in studies on four existing systems, the prototypes, test equipment and the projects actually envisaged. The German Federal Ministry expects this seminar to provide the guidelines for future research to be planned in the middle of 1977. [German]

*Elektrische Bahnen* Vol. 48 No. 6, June 1977, pp 158-160

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

11 165175

**CONTROL OF LATERAL MOTIONS OF THE TERRAFOIL TRANSIT VEHICLE**

The active ride control system for the TERRAFOIL vehicle is described. The passenger compartment of this vehicle is supported above the roadway by long flexible struts, and its undercarriage is enclosed in an underground guideway. Lateral loads are imposed on the vehicle by cornering maneuvers, winds, and guideway roughness. This study shows that electrohydraulic servomechanisms designed to apply control moments at the base of the supporting struts can adequately confine the lateral motions of the passenger compartment within specified limits, even with extreme load disturbances. A dynamic model including the flexible strut shows the system to be controllable through the servovalve input signal and observable through feedback signals from the servopiston and an accelerometer mounted on the passenger compartment. Feedback control is achieved through a state estimator and an optimal control law matrix.

Furman, JE, Jr (Boeing Aerospace Company); Hartz, BJ Clark, RN *Journal of Spacecrafts and Rockets* Vol. 14 No. 2, Feb. 1977, pp 118-123, 14 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

11 166255

**REVIEW OF RUSSIAN DATA ON HYDROTRANSPORT OF COAL**

A review was made of two Russian books and a chapter from a third book dealing with pipeline transport of coal. Emphasis was placed on hydrotransport of coarse coal in underground mines or surface pipelines. The books reviewed were: 'Means of Increasing the Effectiveness of Hydrotransport,' by V. N. Pokrovskaya (1972), 'Parameters and Modes of Hydraulic Transport of Coal' by V. V. Traynis (1970), and the chapter from the book 'Hydromechanization of Opencast Workings' by G. A. Nurok (1970). The Traynis book reveals the development and results of circular wheel stand tests to simulate hydrotransport in horizontal pipes, which is a potentially outstanding contribution to slurry pipeline technology. Graphical data and equations are presented which suggest that headlosses for coarse coal can be

predicted with good accuracy for pipe sizes up to 14 inches in diameter. Wheel stands permit tests for pipe wear and lump degradation without recycling coal through pumps.

Cooley, WC Faddick, RR  
Terraspace, Incorporated, Bureau of Mines Final Rpt.  
BuMines-OFR-90-77, Dec. 1976, 52 pp

Contract J0265016

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-267269/9ST, DOTL NTIS

#### 11 166497

##### AUTOMATED SMALL VEHICLE FIXED GUIDEWAY SYSTEMS STUDY

The purpose of the study is to provide sufficient, reliable information to citizens and public officials of the Twin Cities Metropolitan Area as a basis for determination of the best form of automated fixed guideway system to satisfy needs of the area. For purposes of comparison, an overall objective of the SVS study process was to develop small vehicle alternatives which would be comparable in cost to the 57-mile Intermediate Capacity Rapid Transit (ICRT) system approved by the Twin Cities Area Metropolitan Transit Commission in December 1972, and which would offer a more demand-responsive service.

Prepared in cooperation with Bather-Ringrose-Wolsfeld, Inc., Edina, Minn., Honeywell, Inc., Minneapolis, Minn., and Twin Cities Area Metropolitan Transit Commission, St. Paul, Minn.

De Leuw, Cather and Company, Bather-Ringrose-Wolsfeld, Incorporated, Honeywell, Incorporated, Twin Cities Area Metropolitan Transit Commission, Urban Mass Transportation Administration, (UMTA-MN-09-0010) UMTA-MN-09-0010-77-1, Mar. 1975, 255 pp

ACKNOWLEDGMENT: NTIS  
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PB-270297/5ST, DOTL NTIS

#### 11 167025

##### EXPERIMENTAL DESIGN PLAN FOR THE DOWNTOWN PEOPLE MOVER DEMONSTRATION PROJECTS

Shuttle Loop Transit (SLT) is a surface form of Automated Guideway Transit (AGT) which has demonstrated itself in a number of deployments throughout the country, namely, airports, recreational/amusement parks, and similar special purpose applications. The Urban Mass Transportation Administration (UMTA) has approved federal financing of demonstration systems in four cities (Cleveland, Houston, Los Angeles, and St. Paul) to establish the viability and desirability of this technology in more demanding general downtown applications. This document presents an experimental design (ExD) Plan for the Downtown People Mover (DPM) projects planned by UMTA. This ExD Plan is a structured evaluation approach, designed to permit the objective assessment of the individual demonstration projects and development of transferable evaluation conclusions.

Rubin, RB Ellis, RH  
Peat, Marwick, Mitchell and Company, Urban Mass Transportation Administration Final Rpt. UMTA-DC-06-0162-77-1, Apr. 1977, 194 pp

Contract DOT-UT-60105T

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-270614/1ST, DOTL NTIS

#### 11 167038

##### IMPACT EVALUATION OF MORGANTOWN PRT 1975-1976 RIDERSHIP: INTERIM ANALYSIS

The Morgantown Personal Rapid Transit System (PRT) is a new type of public transportation system which was built as a research development and demonstration project. The system began passenger service in October 1975, and consists of three stations, 2.1 miles of two-lane guideway, and a 45-vehicle fleet. This report describes the Morgantown PRT system ridership levels and trends during its initial period of operation, the 1975-76 academic year. The analysis measures the impact on ridership of seven operating characteristics: fleet mileage, actual operating hours, system availability, trip reliability, vehicle availability, downtime frequency, and downtime duration. Data were obtained from West Virginia University Management reports on daily ridership, and system operation and analysis

included statistical tests of significance and multivariate statistical procedures.

Stearns, MD Schaeffer, KH  
Transportation Systems Center, Urban Mass Transportation Administration Intrm Rpt. DOT-TSC-UMTA-77-14, UMTA-MA-06-0026-77-1, June 1977, 79 pp

ACKNOWLEDGMENT: NTIS  
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PB-270916/0ST, DOTL NTIS

#### 11 167298

##### ANALYSIS OF SHORT RAMPS FOR DUAL-MODE AND PRT STATIONS

The report is the result of continuing efforts to understand the safe-headway trade-offs for Personal Rapid Transit (PRT) and dual-mode systems. It adds a new dimension to the traditional interactions among control complexity, safety, and acceleration. Analyses and computer programs are developed to determine how short it is possible to make the ramps leading into and out of off-line PRT stations. Simplified reference solutions are obtained and results are presented for state-of-the-art, improved, and advanced system parameters. Potential savings in the costs of stations are very large, due to the high construction cost of station ramps. Both point-follower and vehicle-follower control systems are considered. For point-follower control systems, the acceleration ramp can usually be eliminated. For vehicle-follower control systems, small deviations in the speed of through cars allows both acceleration ramps and deceleration ramps to be appreciably shortened.

Prepared in cooperation with Alden Self-Transit Systems Corp., Natick, Mass.

Wright, RD Whitten, RP  
Transportation Systems Center, Alden Self-Transit Systems Corporation, Urban Mass Transportation Administration, (UMTA-MA-06-0048) Final Rpt. DOT-TSC-UMTA-77-3, UMTA-MA-06-0048-77-2, July 1977, 125 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-272351/8ST

#### 11 167525

##### A MAGNETICALLY SUSPENDED VEHICLE

This report consists of two papers which were presented to the conference "advances in magnetic materials and their applications" held at the institute of electrical engineers, London during September 1976. The first paper outlines the design and testing of an experimental 50 km/h, 2.7 tonne vehicle with DC attraction magnetic suspension. The suspension, propulsion and braking and power-supply systems are described and comments are made on the test track and dynamic test rigs used and on the suspension performance, energy use and noise levels of the vehicle. The second paper discusses the suspension and guidance control system in more detail and describes the filters and transducers used. The authors suggest that the design could be extended to a bogie system with conventional or magnetic secondary suspension for use at high speeds.(a)

Linder, D Goodall, RM (British Railways Board)  
Transport and Road Research Laboratory, (0305-1315) Monograph TRRL Suppl Rpt 300, 1977, 16 pp, 4 Fig., 1 Tab., 4 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-228144)  
ORDER FROM: ESL

#### 11 167538

##### NORMAL FORCE VARIATION IN SINGLE-SIDED LINEAR INDUCTION MACHINES

A basic 1-D model having a single harmonic current sheet supported on infinitely permeable iron, an air-gap, a conducting layer and a backing region of air or iron is discussed. By making certain simplifying assumptions, two circle diagrams can be derived, one for the model with backing iron, the other without. It is shown how the idea might be extended to include normal force and machines having air-backed rotors. Simple formulae are derived for certain factors such as complex power/newton of normal force.

Institution of Electrical Engineers Conference Publication. 2nd Conference on Adv in Magn Mater and their Application, London, England, September 1-3, 1976. Also available from the Institution of Electrical Engineers.

Freeman, EM (Imperial College of Science & Technology, England);  
Lowther, DA  
Institution of Electrical Engineers Proceeding No. 142, 1976, pp  
128-130, 6 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

**11 167539**  
**ASSESSMENT OF LINEAR SUPERCONDUCTING MOTORS FOR**  
**MAGLEV**

Linear synchronous machines (LSM) and linear commutator machines (LCM) are considered and compared. Overall costs of linear machines are relatively insensitive to pole pitch, thus allowing this parameter to be chosen on other grounds. The overall costs of an LCM appear to be comparable with those of the LSM, provided that the simple machine being investigated is technically acceptable.

Institution of Electrical Engineers Conference Publication. 2nd Conference on Adv in Magn Mater and their Application, London, England, September 1-3, 1976. Also available from the Institution of Electrical Engineers.

Abel, E (University of Warwick, England); Mahtani, JL Mulhall, BE Rhodes, RG  
Institution of Electrical Engineers Proceeding No. 142, 1976, pp  
125-127, 4 Ref.

ACKNOWLEDGMENT: EI  
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**11 167540**  
**FORCES ON MAGNETICALLY LEVITATED VEHICLES ABOVE**  
**FLAT GUIDEWAYS--A MODELLING TECHNIQUE**

Split guideway using a completely flat track, with a gap down the centre that can be used to accommodate the winding of a linear synchronous motor is described. With this system, there is a need to relate the magnetic forces to the guideway dimensions, such as the track width and the centre gap width. A suitable method for calculating the forces, and the results obtained on a .44 m diameter rotating disc model are presented. Ferrite permanent magnets are used instead of coils, and the parameters that are varied include height above the sheet, pole pitch, polarity of adjacent poles, field strength, and position with respect to the disc's edge.

Institution of Electrical Engineers Conference Publication. 2nd Conference on Adv in Magn Mater and their Application, London, England, September 1-3, 1976. Also available from Institution of Electrical Engineers.

Campbell, P (Cambridge University, England); Johnson, RB  
Institution of Electrical Engineers Proceeding No. 142, 1976, pp  
121-124, 7 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

**11 167541**  
**ELECTRODYNAMIC LEVITATION OF HIGH SPEED VEHICLES**  
Outlines of a preliminary comparison of guideway geometries are given discussing magnetic drag, impedance modelling, aerodynamic drag, and controlled electromagnetic levitation. Cryogenics and the split track system are also considered.

Institution of Electrical Engineers Conference Publication. 2nd Conference on Adv in Magn Mater and their Application, London, England, September 1-3, 1976. Also available from Institution of Electrical Engineers.

Howell, JP (University of Warwick, England); Mulhall, BE Rhodes, RG  
Institution of Electrical Engineers Proceeding No. 142, 1976, pp  
117-120, 9 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

**11 167542**  
**DEVELOPMENT OF LEVITATED VEHICLES WITH**  
**SUPERCONDUCTING MAGNETS**

Experiments with repulsive electrodynamic levitation systems for mass transportation are reported. A 16 tonne test carrier is evaluated regarding propulsion, lift, guidance, cryogenics, starting, landing and dynamics characteristics.

Institution of Electrical Engineers Conference Publication. 2nd Conference on Adv in Magn Mater and their Application, London, England, September 1-3, 1976. Also available from Institution of Electrical Engineers.

Albrecht, C (Siemens, Research Laboratory)  
Institution of Electrical Engineers Proceeding No. 142, 1976, pp  
113-116, 7 Ref.

ACKNOWLEDGMENT: EI  
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**11 167543**  
**INFLUENCE OF EDDY CURRENTS ON AN**  
**ELECTROMAGNETIC LEVITATION SYSTEM**

The eddy currents which are induced in the track of a magnetically suspended and guided vehicle by its translational motion strongly affect the power consumption. They effect on the one hand a diminution of the levitation force and, on the other hand, a drag force which requires an increased capability of the propulsion system. This makes a knowledge of the parameter dependence of these effects necessary. For this purpose the eddy current effects of a test magnet and a given track material are measured and the velocity dependent permeability leading to a good agreement with these measurements is worked out. Universality of the permeability curve  $\mu$  ( $v$ ) is tested by variations of magnet and track geometries within the range of experimental setups. In the case of satisfactory agreement, the permeability curve can be used to extrapolate to the geometries of full scale vehicles.

Institution of Electrical Engineers Conference Publication. 2nd Conference on Adv in Magn Mater and their Application, London, England, September 1-3, 1976. Also available from Institution of Electrical Engineers.

Bohn, GH (Transrapid-E.M.S.)  
Institution of Electrical Engineers Proceeding No. 142, 1976, pp  
104-107, 5 Ref.

ACKNOWLEDGMENT: EI  
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**11 167544**  
**SUSPENSION AND GUIDANCE CONTROL SYSTEM FOR A DC**  
**ATTRACTION MAGLEV VEHICLE**

The theory, operation and implementation of the control system developed and built into a 2.7 tonne test vehicle are described. The vehicle has 8 magnets, mounted in pairs offset either side of the support rail at each corner of the vehicle. The magnet pairs are driven together to give vertical control and differentially to introduce damping into the lateral (guidance) mode. The design develops a control technique whereby the suspension response may be freely chosen without the control system stability requirement either dominating or confusing the choice.

Institution of Electrical Engineers Conference Publication. 2nd Conference on Adv in Magn Mater and their Application, London, England, September 1-3, 1976. Also available from Institution of Electrical Engineers.

Goodall, RM (British Railways)  
Institution of Electrical Engineers Proceeding No. 142, 1976, pp  
100-103, 3 Ref.

ACKNOWLEDGMENT: EI  
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**11 167545**  
**DESIGN AND TESTING OF A LOW SPEED MAGNETICALLY**  
**SUSPENDED VEHICLE**

Technologies of magnetic suspensions as applied to urban transport and a foundation for extension to high speed ground transport are presented. An experimental 5 place vehicle and a 100 m long test track are in the process of being tested on a dynamic laboratory rig. The test track incorporates a minimum radius lateral curve and a transition from a 1 in 20 rising gradient to a 1 in 20 falling gradient. Suspension performance and energy consump-

tion are evaluated, and test results show technical viability of the principle.

Institution of Electrical Engineers Conference Publication. 2nd Conference on Adv in Magn Mater and their Application, London, England, September 1-3, 1976. Also available from Institution of Electrical Engineers.

Linder, D (British Railways Board)

Institution of Electrical Engineers Proceeding No. 142, 1976, pp 96-99, 4 Ref.

ACKNOWLEDGMENT: EI

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DOTL JC

11 167546

#### PASSENGER CARRYING VEHICLES USING CONTROLLED D.C. AND CONTROLLED PERMANENT MAGNETS

Development and operation of a vehicle weighing 1000 Kg, using controlled d.c. electromagnets, capable of carrying four passengers and operating on a 30 m track are discussed. The vehicle utilizes an electromagnetic method with magnetic flux loop or force transducers and position and velocity transducers. Computational aspects of unusual magnets geometries and propulsion requirements are considered.

Institution of Electrical Engineers Conference Publication. 2nd Conference on Adv in Magn Mater and their Application, London, England, September 1-3, 1976. Also available from Institution of Electrical Engineers.

Jayawant, BV (University of Sussex, England)

Institution of Electrical Engineers Proceeding No. 142, 1976, pp 92-95, 6 Ref.

ACKNOWLEDGMENT: EI

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DOTL JC

11 167552

#### DYNAMIC BEHAVIOR OF STRINGS OF AUTOMATED TRANSIT VEHICLES

This paper examines the effects of spacing policy and control system design on the dynamic response of strings of automated transit vehicles operating under vehicle-follower control. Constant-separation, constant-time-headway and constant-safety-factor spacing policies are implemented and their operational implications are discussed. The dynamic response of a string of five vehicles during speed changing, merging, emergency stopping, and failed-vehicle pushing is examined.

From SAE Meeting, February 28-March 4, 1977.

Garrard, WL (Minnesota University, Minneapolis); Caudill, RJ  
Society of Automotive Engineers Preprint SAE 770288, 1977, 15 pp, 15 Ref.

ACKNOWLEDGMENT: EI

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11 167553

#### NEW DEVELOPMENTS IN MAGNETIC SUSPENSION AND PROPULSION FOR TRANSPORTATION

This paper describes the most recent accomplishments in the on-going development of the magnetically levitated and propelled ROMAG transportation vehicle.

From SAE Meeting, February 28-March 4, 1977.

Holt, WJ (Rohr Industries, Incorporated); Ross, JA  
Society of Automotive Engineers Preprint SAE 770428, 1977, 7 pp

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

11 167562

#### DEVELOPMENT OF 1-TON MAGNETICALLY SUSPENDED VEHICLE USING CONTROLLED DC ELECTROMAGNETS

Several methods of supporting passenger-carrying vehicles by electromagnetic suspension are being proposed. The University of Sussex has developed a 1-ton 4-passenger vehicle with controlled dc electromagnets, operating on a 30 m track, Britain's first. Apart from the effort devoted to developing special amplifiers, transducers, magnets and other components, an analytical base for the design of such vehicles has also been established. Different strategies for the control systems allied to new transducers, effects of interaction between control systems of magnets at each corner of a chassis and possible ways of eliminating such interaction, new magnetic geometries

and their influence on route changing capability and in turn reliability of such vehicles are discussed in the paper. Vehicles using controlled dc electromagnets for suspension show promise of vehicle systems possessing the high reliability necessary for high-frequency operation. The paper may be of wider application to frictionless bearings and instrument suspension and to other aspects of control and electrical-engineering science.

Jayawant, BV (Sussex University, England); Sinha, PK; Wheeler, AR; Whorlow, RJ; Willsher, J  
*Institution of Electrical Engineers, Proceedings* Vol. 123 No. 9, Sept. 1976, pp 941-948, 19 Ref.

ACKNOWLEDGMENT: EI

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DOTL JC

11 167563

#### DESIGN, ANALYSIS AND TEST RESULTS FOR A SUPERCONDUCTING LINEAR SYNCHRONOUS MOTOR

A linear synchronous motor has been designed to propel a 480 km/h magnetically levitated passenger vehicle. The paper describes the motor and presents results of tests which have been performed on essentially full-scale components of the motor using a 7.6 m-diameter test-wheel facility. Controlled starting, acceleration, cruising, deceleration and transient operation have been demonstrated. A 6-component force balance has been used to measure the three forces and three moments acting on a single stationary superconducting magnet due to its interaction with the split 3-phase windings mounted on the rim of the test wheel and energized by a variable-frequency current-controlled inverter power supply. Measured forces and terminal characteristics over complete cycles of force angle are claimed to be in agreement with analysis based on a coupled circuit model of the machine and mutual inductance computations. Moments were measured to be small under all operating conditions. Two modes of control have been demonstrated. The alpha-scheme, proposed for a full-scale system, maintains the angle between induced voltage and phase current at a value which optimizes the motor characteristics, i.e. inverter Mva rating, etc. beta-control, which may be required for starting, uses vehicle position detectors to fire the inverter thyristors at appropriate times.

Atherton, DL (Queen's University, Canada); Cunningham, JA; Dewan, SB; Eastham, AR; Slemon, GR; Turton, RA  
*Institution of Electrical Engineers, Proceedings* Vol. 124 No. 4, Apr. 1977, pp 363-372, 18 Ref.

ACKNOWLEDGMENT: EI

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DOTL JC

11 167568

#### ANALYSIS OF A MECHANICAL METHOD FOR DYNAMIC STABILIZATION OF TUNED CIRCUIT LEVITATORS

The paper describes recent developments in the field of tuned circuit levitators. Static stability is attained in such levitators by employing a suspension electromagnet which is the inductive part of a resonant circuit. However, it is already well known that a tuned circuit electromagnet on its own is usually not sufficient to maintain levitation for long periods of time, and the suspended object tends to be dynamically unstable. The dynamic instability is prevented in the work described here by adding an auxiliary electromagnet in parallel with the main suspension electromagnet. Mechanically damping vibrations of an aluminum plate in the field of the auxiliary electromagnet serves to prevent the system as a whole from performing coupled oscillations. This new process of stabilization has been briefly described in a recent paper, and it is now investigated both experimentally and analytically. The approximation of slowly varying quantities is used for the analysis, and the dynamic behavior of the complicated nonlinear electromechanical system is successfully interpreted.

Kaplan, BZ (Ben-Gurion University of the Negev, Israel) *Electric Machines and Electromechanics* Vol. 1 No. 2, Jan. 1977, pp 151-162, 12 Ref.

ACKNOWLEDGMENT: EI

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11 167937

#### ELEVATED GUIDEWAY COST-RIDE QUALITY STUDIES

Automated transit system simple and continuous span concrete elevated guideway structures are analyzed to determine the influence of structural design properties and construction tolerances on vehicle ride-quality and guideway cost. Ride quality has been determined as a function of guideway

rigidity, span surface roughness, span vertical misalignment, span camber and pier misalignment as well as vehicle speed and suspension properties. Guideway costs have been computed as a function of span length, cross-section shape, method of construction, degree of continuity and overall construction tolerances.

Second Annu ASCE Eng Mech Div Spec Conf. Adv in Civ Eng Through Eng Mech, N.C. State Univ, Raleigh, May 23-25, 1977.

Wormley, DN (Massachusetts Institute of Technology); Hedrick, JK Eglitis, L Costanza, DW  
American Society of Civil Engineers Proceeding 1977, pp 150-153

ACKNOWLEDGMENT: EI  
ORDER FROM: ASCE

#### 11 167972

##### MODEL EXPERIMENTS OF CABLE-STAYED GUIDEWAYS

With the advent of electrically driven and computer controlled rapid transit vehicles for mass intraurban use, it has become necessary to investigate the dynamic efficiency of different types of elevated spans for these vehicles. In previous work involving moving point forces on continuous span bridges with hard piers, dynamic moments of nearly five times the static response of its simple span counterpart were measured. This paper looks to the alternative of a continuous cable-stayed bridge for a reduction in the moment amplification. Energy is expected to be distributed in more vibrational modes and partially absorbed by the cable supports.

2nd Annu ASCE Eng Mech Div Spec Conf. Adv in Civ Eng through Eng Mech, NC State Univ, Raleigh, May 23-25 1977.

Hunt-Atwater, KM (Duke University); Wilson, JF  
American Society of Civil Engineers Proceeding 1977, pp 142-145

ACKNOWLEDGMENT: EI  
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#### 11 167976

##### DYNAMICS ANALYSIS OF A FLEXIBLE VEHICLE-FLEXIBLE GUIDEWAY SYSTEM WITH RANDOM GUIDEWAY ROUGHNESS INPUT

A technique is developed for analyzing the coupled dynamics of a two-dimensional high speed guided ground vehicle system consisting of a flexible vehicle propelled along a single-span, flexible guideway. Both vehicle and guideway are treated as Bernoulli-Euler beams, the former in free-free configuration and the latter with simple, rigid end supports. A modal analysis technique is implemented to calculate their respective transverse flexural motions. The analysis provides for the incorporation of any number of transverse, flexural modes for the vehicle and guideway. Vehicle aerodynamic drag force is also included in the system model. The vehicle features symmetric front and rear suspensions with linear, active control systems sensitive to vehicle-guideway separation magnitude and separation rate.

Cherchas, DB (Toronto University, Canada); Jackson, JD *High Speed Ground Transportation Journal* Vol. 11 No. 1, Apr. 1977, pp 19-51, 13 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

#### 11 167977

##### CURRENT COLLECTION FOR HIGH-SPEED TRANSIT SYSTEMS

In the design of electrically propelled high-speed ground transport, the problem of power pick-up is of fundamental importance. If a vehicle is running on a fixed track, and if power can be picked up from a stationary rail, then the transit system concept can be simplified, particularly if the vehicle is levitated. The removal of power-producing equipment from the vehicle reduces noise and weight, and also eliminates the need to carry fuel on board. The adoption of a viable current collection system will therefore improve performance, comfort and safety on board the vehicle, while reducing environmental pollution and noise. This report shows that a current collection system operating at a speed in excess of 350 km/h with copper pick-up rails is definitely feasible for use with high speed ground transportation. A brush capable of transferring 500 A with a projected life in excess of 7000 kilometres at 430 km/h has been tested using a test facility.

Appleton, AD (International Research & Development Company, Ltd); Bartram, TC Macmichael, DB Fletcher, G *INCRA Research Report* No. 242A, Feb. 1977, 20 pp, 1 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

#### 11 167987

##### REDUCTION OF THE TRANSVERSE EDGE EFFECT IN LINEAR MACHINES WITH HOMOGENEOUS SECONDARY ARMATURE BY CHANGING THE AIR GAP CONFIGURATION

The effect of the gradual increase of the air gap in the transversal direction, from the middle to the bounds, on the force of the linear motor is studied for the same cross section of the secondary armature. The transversal redistribution of the primary magnetic field and of the induced currents, as well as the increase of the electromagnetic force on the secondary armature are evidenced as compared to that of the rectangular air gap configuration.

Text is also published in French, German and Russian.

Fireteanu, V (Polytechnic University of Bucharest, Romania) *Revue Roumaine Sci Tech Serie Electrotech-Energ* Vol. 22 No. 2, 77, pp 209-215

ACKNOWLEDGMENT: EI  
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#### 11 167989

##### IRON-CORED LINEAR SYNCHRONOUS MACHINES

Iron-cored linear synchronous motors have sufficient promise to justify dynamic testing of the system. Practical comparisons between the homopolar inductor and the heteropolar types are being made on a rotating rig at Aberdeen University, in addition to the heteropolar work at Nottingham University and Brush Electrical Machines. The main points of interest will clearly be the stability of the machines and the entry and exit effects. The adoption of the machines will, however, always depend on what is a system consideration, i.e., whether a linear induction motor with a simple controller is preferred, probably at the expense of reduced motor performance, to a system using a much more complex control method.

Eastham, JF (Aberdeen University, Scotland) *Electronics and Power* Vol. 23 No. 3, Mar. 1977, pp 239-242

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

#### 11 167991

##### STANDARDIZATION REQUIREMENTS FOR THE IMPLEMENTATION OF AGT SYSTEMS

The development of Automated Guideway Transit Systems has already followed the classical patterns exhibited by other transit technologies in the early stages of their development. It is important for AGT systems, and in particular for PRT that this evolutionary process should be condensed into as short a time frame as possible consistent with a full investigation of all practical options in technology. The object of this paper is to discuss those elements of AGT systems which are susceptible to standardization and to propose a course of action which would rationalize the wide range of hardware and software presently under development. The nature of this paper is necessarily philosophical; however, it is intended to produce a catalytic effect which will stimulate thought rather than present an analytical solution.

Preprint for meeting, February 23-27, 1976.

MacDonald, R (De Leuw, Cather and Company)  
Society of Automotive Engineers Preprints SAE 760359, 1976, 7 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

#### 11 167996

##### CALCULATION OF THE ENGINE THRUST REQUIRED TO MOVE A CAR IN A TUBE [Raschet tyagi dvigatelya, neobkhodimoi dlya dvizheniya vagona v trube]

The motion of a car in an infinite tube under the effect of a turbojet engine is considered. A solution is obtained for the problem of unsteady gas flow arising when a car moves along at a constant velocity. The value of drag and the thrust force necessary for the motion are determined. A formula is found to determine the asymptotic value of the force. [Russian]

Lure, MV *Izvestia Vysshikh Uchebnykh Zavedenii, Mashinostr* No. 4, 1977, pp 119-122

ACKNOWLEDGMENT: EI  
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11 167999

**MAGNETICALLY SUSPENDED VEHICLES FOR URBAN TRANSPORT SYSTEMS**

Of the five different levitation technologies, two are likely to be applicable to low-speed operation. One system using controlled dc electromagnets to suspend large weights such as passenger carrying vehicles has become progressively more feasible technically, owing to advances in solid-state electronics. It is largely through these that a 1 t 4-passenger vehicle operating on a 30 m track has been built in the Applied Science Laboratories of the University of Sussex and has been demonstrated publicly. The operating experience of this vehicle has shown clearly that the controlled electromagnetic suspension is capable of providing a transport system that possesses passenger-attraction potential. This is meant to be a system that provides a frequent and thus highly reliable operation; for city-center or urban application it must be noiseless, and, if it is fully automatic and operating on segregated tracks, the guideway structure must be visually nonintrusive. Although the principal aim of eliminating physical contact is not so much to save energy as to obtain very high reliability, it is worth noting that a vehicle carrying eight passengers at 30 mile/h and using controlled dc electromagnets for suspension is likely to require less power than that wasted in the transmission unit of a car.

Jayawant, BV (University of Sussex, England) *Electronics and Power* Vol. 23 No. 3, Mar. 1977, pp 235-238

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

11 168000

**IMPROVEMENT OF CYCLOCONVERTER POWER FACTOR VIA UNSYMMETRIC TRIGGERING METHOD**

Since the cycloconverter is naturally commutated, it is possible to manufacture a unit of capacity as large as the rectifier. In fact, a cycloconverter of capacity exceeding 100 MVA may be used to drive linear motors for high-speed railway use. Such a large-capacity converter could not be realized by the conventional inverter. It is reported that the price of the cycloconverter is about half that of inverters if the capacity is larger than 10 MVA. This paper proposes a gate control scheme to maximize the input power factor without increasing harmonic contents of input and output currents. Its features can be summarized as follows. (1) The fundamental input power factor is 1.2 to 2 times as high as that of the conventional cycloconverter. (2) The fundamental input power factor is higher than the power factor of the load when the latter is low. (3) Input and output waveforms are better than those of the conventional cycloconverter.

Takahashi, I (Utsunomiya University, Japan); Akagi, H Miyairi, S *Electrical Engineering in Japan* Vol. 96 No. 1, Jan. 1976, pp 88-94, 9 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

11 168002

**TRACTIVE PROPERTIES OF DC LINEAR MOTORS UNDER CONSTANT CURRENT DRIVE**

In operating the dc linear motor by a constant current source, the voltage to be applied at current switching must not exceed the maximum allowable voltage and therefore, the current waveform must have certain rise and fall times. In this paper, it is assumed that a trapezoidal current flows in the coil. The dc linear motor with the maximum allowable voltage 20 V and the maximum allowable emf 40 kAT which do not cause a saturation of the onboard magnetic poles (the pole gap a/m, and the field flux density 0.5 Wb/sq m) can produce the 500 km/h propulsion force. However, no levitation force is generated because this force is limited when the coil current exceeds the maximum allowable current. The power factor and efficiency increase as the feeding length decreases. The power factor is about 40% when the feeding length is 2 km. This value is not practical. This paper has dealt with an ideal case. In practice, the efficiency and power factor must be lowered further.

Aiba, S (Kanagawa Institute of Technology, Japan); Amemiya, Y *Electrical Engineering in Japan* Vol. 96 No. 2, Mar. 1976, pp 23-29, 3 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

11 168021

**ADVANCED SYSTEMS AND ADVANCED TECHNOLOGY**

This summary of information presented in Report FRA/ORD-77/27 traces the decade of development of unconventional high-speed ground transporta-

tion vehicles. The section on Advanced Systems discusses system engineering, tracked air cushion vehicles, tube vehicles, suspended vehicles and multimodal concepts involving passenger service. The section on Advanced Technology describes work with linear electric motors, guideways, power conditioning, controls, obstacle detection and communications. An Appendix explains current FRA advanced systems and advanced technology research programs.

A summary of Ten Years of Advanced Research and Development by the Federal Railroad Administration.

Federal Railroad Administration FRA/ORD-77/27, Oct. 1977, 33 pp, 15 Fig., 1 App.

ACKNOWLEDGMENT: FRA  
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DOTL RP

11 168088

**ADVANCED GROUND TRANSPORT**

This white paper sets out the views of the government on the second report of the select committee on science and technology for the session 1975-76, which was published in September 1976, on the subject of advanced ground transport. After introducing the subject, the paper continues with the government's comments on the main issues involved in assessing the profitability of research and development projects. Mention is made of the fundamental research which has been undertaken so far and the advances made in connection with advanced ground transport. The role of the science research council in this respect is considered and government views on current commercial prospects noted. Particular mention is made of the UK and overseas markets for high-speed and urban transport systems. Comments are included on the need for co-ordinating machinery for efficient decision-making regarding research and research policy.

Her Majesty's Stationery Office Monograph No. 6825, May 1977, 12 pp

ACKNOWLEDGMENT: TRRL (IRRD-227795)  
ORDER FROM: Pendragon House, Incorporated, P.O. Box 255, Old Mystic, Connecticut, 06372

11 168094

**JAPAN AIR LINES' HIGH SPEED SURFACE TRANSPORT**

Japan air lines plan to use a linear induction motor powered high speed surface transport (hsst) to provide a 14 minute journey over the 65 km between the new international airport at Nasita and central Tokyo. Aerospace technology has been used to give low drag and weight, good stability and reliability. The power consumption at cruising speed is 5 kw per passenger and it is thought that the system cost would be returned in the first five years of operation. Although the Japanese system caters for a captive market and is not suitable for the transport of heavy freight, it could be adapted for general urban mass transportation. The concept has very good environmental impact, producing little noise, exhaust and vibration. Attractive electro-magnets are used for levitation and guidance. The magnetic field created is similar to that of a normal electric train motor.

Cole, RA *Hovering Craft and Hydrofoil Analytic* Vol. 16 No. 9/10, 1977, p 14, 4 Phot.

ACKNOWLEDGMENT: TRRL (IRRD-229041)  
ORDER FROM: ESL

DOTL JC

11 168118

**ON RESEARCH AND DEVELOPMENT OF LEVITATION RAILWAY**

A short article by the Project Director reviews progress in this research, and introduces a series of 7 articles dealing with: the main alternative types of guideway considered for the 7-km Miyazaki Test Track, for a 13-tonne vehicle moving at 500 km/h, the superconductive magnetic levitation system, the propulsion by linear synchronous motor, the dynamic property of the guideway girder, motion characteristics of a magnetically levitated vehicle, and the power supply and control system for linear synchronous motor traction.

Hobara, T *Railway Technical Research Inst Quarterly Reports* Vol. 17 No. 4, Dec. 1976, pp 144-181, 56 Fig., 2 Ref.

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

DOTL JC

11 169998

**THRUST AND LEVITATION FORCE OF LINEAR SYNCHRONOUS MOTORS FOR PROPULSION AND LEVITATION USE**

A generalized analytic model has been proposed for the vertical ground-coil-type linear synchronous motor for propulsion and levitation use. Mathematical expressions have been derived for calculating its thrust and levitation force characteristics. The thrust and levitation force characteristics of the motor have been analyzed assuming various waveforms of ground coil current and magnetic flux. As a result of this analysis, it has been made clear that the waveforms of magnetic flux and ground coil current have a great effect on the thrust and levitation force characteristics. Waveforms of ground-coil current and magnetic flux should be determined taking into account many factors, such as the electric power supply scheme, power conversion scheme, running characteristics of train, etc. The proposed linear synchronous motor is more suited for high-speed trains than for the low-speed trains. In the low-speed region, it is recommended to drive and suspend the train by means of different devices.

Saijo, T (Japanese National Railways) *Electrical Engineering in Japan* Vol. 96 No. 4, July 1976, pp 67-74, 8 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

11 169999

**MAXIMUM ENERGY EFFICIENCY AND DRIVING FORCE OF LINEAR INDUCTION MOTOR IN ACCELERATING PERIOD**

A linear induction motor used for high-speed trains requires a long accelerating time and a large quantity of accelerating energy. In addition, its starting torque must be sufficiently large. Linear motors used for purposes other than high-speed railway are usually started and stopped very quickly and frequently. Therefore, the operating characteristics (thrust, energy efficiency, etc.) of the linear induction motor in accelerating condition are very important from practical viewpoints. This paper analyzes the effect of secondary resistance on the input and output energy, accelerating energy efficiency, accelerating thrust, accelerating time, etc. The authors also derive the theoretical formula for the secondary resistance which maximizes accelerating energy efficiency, accelerating thrust or minimizes the accelerating time. As a result of this analysis, it is shown that if the exciting reactance is small, both the accelerating thrust and the accelerating energy efficiency can be maximized almost simultaneously by assigning an appropriate value to the secondary resistance. The validity of the theoretical analysis is confirmed in part by experimental study.

Hirasa, T (Osaka University Prefect, Japan); Ishikawa, S *Electrical Engineering in Japan* Vol. 96 No. 4, July 1976, pp 29-36, 10 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

11 170015

**CONTROL AND SPEED-CHARACTERISTICS OF MAGNETICALLY LEVITATED VEHICLES OF ATTRACTING-MAGNET TYPE**

A design procedure for the suspension device suited for the magnetically levitated vehicle of attracting-magnet type is proposed. In this study, the roughness of the guideway surface is represented by power spectral density and the response characteristics of the levitation control system are analyzed theoretically and experimentally. The design procedure proposed is applicable to electromagnets of any dimensions. The authors have also confirmed by numerical calculation for the 5-ton model vehicle that the model car is able to run at 100 to 200 Km/h without using a secondary suspension device and three times as fast if a secondary suspension device is used. Power consumption characteristics and the required capacity of the power source have also been clarified.

Yamamura, S (Tokyo University, Japan); Abe, S *Electrical Engineering in Japan* Vol. 96 No. 3, May 1976, pp 41-49, 24 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

11 170062

**COMPARISON OF EXPERIMENTAL AND THEORETICAL REACTION RAIL CURRENTS, RAIL VOLTAGES, AND AIR GAP FIELDS FOR THE LINEAR INDUCTION MOTOR RESEARCH VEHICLE**

Measurements of reaction rail currents, reaction rail voltages, and airgap magnetic fields in tests of the Linear Induction Motor Research Vehicle (LIMRV) were compared with theoretical calculations from the mesh/matrix theory. It was found that the rail currents and magnetic fields predicted by the theory are within 20 percent of the measured currents and fields at most motor locations in most of the runs, but differ by as much as a factor of two in some cases. The most consistent difference is a higher experimental than theoretical magnetic field near the entrance of the motor and a lower experimental than theoretical magnetic field near the exit. The observed differences between the theoretical and experimental magnetic fields and currents do not account for the differences of as much as 26 percent between the theoretical and experimental thrusts.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Elliott, DG  
Jet Propulsion Laboratory, (77-36) Final Rpt. FRA/ORD-77-33, July 1977, 63 pp, 61 Figs., 5 Tab., 5 Ref.

Contract NASA Task No. Rd 152

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS

11 170063

**LINEAR INDUCTION MOTOR RESEARCH VEHICLE REACTION RAIL CURRENT AND AIRGAP FLUX DISTRIBUTION TEST**

Special instrumentation was installed on the LIMRV reaction rail at the Pueblo, Colorado, Transportation Test Center and vehicle test runs were made to acquire and record information on secondary currents, airgap flux, and sidebar voltages. The data thus obtained is shown in the form of oscillographic tracings. Medium-speed (approx 85 mph) and high-speed (approx 190 mph) passes over the instrumented section of reaction rail were executed. Test findings are presented in a form suitable for detailed study and evaluation by interested analysts.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Powell, RB McConville, JH  
AiResearch Manufacturing Company, (75-11965) Final Rpt. FRA-/ORD 77-40, June 1977, 80 pp, Figs., Tabs., 5 Apps.

Contract DOT-FR-40016

ACKNOWLEDGMENT: FRA  
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DOTL NTIS

11 170280

**DESIGN, DEVELOPMENT, FABRICATION, AND TESTING OF A SYNCHRONOUS CONDENSER FOR A HIGH-POWER THREE-PHASE TRACTION DRIVE**

This report documents the synchronous machine, referred to as a synchronous condenser, which, in the tracked levitated research vehicle (TLRV), provides line commutation for the inverter and power factor correction for the linear induction motor. The machine also incorporates features permitting its use as a synchronous alternator or motor in a wide range of conventional and advanced ground transportation applications. The machine provides a very high specific power density (1.7 kVA/lb) and voltage rating (7150 V, line-to-line, RMS), principally through the use of direct liquid cooling of both the stator and rotor windings and other elements of the machine (i.e., bearings, brushes, sliprings, etc.). Deionized water is used as the cooling liquid.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Brown, TE Grahl, RF  
AiResearch Manufacturing Company, (74-10243, Rev 1) Final Rpt. FRA/ORD 76-266, Dec. 1976, 100 pp, Figs., 6 Tab., 2 Ref.

Contract DOT-FR-00029

ACKNOWLEDGMENT: FRA



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DOTL NTIS

**11 170286****FEASIBILITY STUDY OF A 15,000-KVA CAPACITOR-ASSISTED POWER UNIT FOR INDUCTION MOTOR PROPULSION**

This report describes results of a technical study to identify and describe feasible linear induction motor propulsion system (LIMPS) alternatives for attaining desired maximum vehicle speed within a given guideway length. The study deals with an original concept of two identical LIMPS modules and whether this concept remains the most effective means to produce thrust for a 300-mph vehicle, as well as 11 other candidate concepts, all subject to the fixed design constraints of limited vehicle space, 8-kV electrical power supply, and fixed vehicle, guideway, and reaction rail interfaces. The following factors were among those identified as having significant influence on the comparative results: 1. Thrust degradation at high speeds (end effects) has the same result on performance as LIM operation at a lower slip value. Since the maximum frequency of the voltage applied to the LIM is limited by the present SC design, a longer LIM pole pitch is the only practical method of reducing the impact of end effects. 2. A change in the effective LIM operating point shifts both real and reactive power demands. 3. The power ratings of new, recently developed thyristors make possible the design and manufacture of a single dc-link converter that will supply all the real power required by the LIM, resulting in substantially lower converter weight and volume. 4. Static capacitors can replace part of the power factor correcting function of the synchronous condenser at a fraction of the cost.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Powell, RB Kaman, GP

AiResearch Manufacturing Company Study Rpt. FRA/ORD-77/43, Jan. 1977, 173 pp, Figs., 10 Tab., 5 App.

ACKNOWLEDGMENT: FRA

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**11 170459****DUAL LINEAR SYNCHRONOUS MOTOR FOR MAGLEV VEHICLES**

The reference design for the Canadian electrodynamically-levitated Maglev system makes use of a single-stator linear synchronous motor (LSM) and provides lateral stabilization by the use of figure-eight null flux loops. This paper presents an alternative approach using two independently-controlled linear synchronous motors with lateral stabilization provided by a simple null flux ladder. Some of the advantages of this approach are (1) a stiffer lateral stabilization is provided with much less material in the guidance loops, (2) active damping of roll and yaw moments can be provided by the dual LSM as well as the heave and surge damping which is available from a single LSM, and (3) the magnetic field in the passenger compartment is reduced.

Presented at INTERMAG (Intl Magn) Conf, Los Angeles, California, June 6-9, 1977.

Burke, PE Kuntz, S Slemon, GR *IEEE Transactions on Magnetics* Vol MAG-13 N5, Sept. 1977, 3 pp, 4 Ref.

ACKNOWLEDGMENT: EI

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**11 170460****HOMOPOLAR LINEAR SYNCHRONOUS MOTOR**

The homopolar linear synchronous motor (LSM) is analyzed using the dynamic circuit theory approach. The finite length stator core, the transverse and longitudinal flux paths associated with C-cores, the supply from controlled inverter sources, are considered in the analysis.

Presented at INTERMAG (Intl Magn) Conference, Los Angeles, California, June 6-9, 1977.

Ooi, B (McGill University, Canada) *IEEE Transactions on Magnetics* Vol MAG-13 N5, Sept. 1977, 3 pp, 4 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

**11 170466****NEW TRANSIT TECHNOLOGIES AND CONTROL OPTIONS**

Automated guideway transit systems feature vehicles which are capable of fully automatic operation under computer control on separated running surfaces (guideways). While just emerging on the urban transit scene such systems offer the potential for improved service and cost effectiveness. Paramount to the successful implementation of automated transit are the control algorithms required to operate the vehicles. A description is given of some of the features of near term deployment configurations and applicable vehicle control options.

Proc of the JT Autom Control Conf, San Francisco, California, June 22-24, 1977.

MacKinnon, D (Urban Mass Transportation Administration)

Institute of Electrical and Electronics Engineers Proceeding Vol. 1 N77CH 1220-3CS, 1977, pp 388-394, 25 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: IEEE

**11 170467****EFFECTS OF PARAMETER VARIATIONS AND SENSOR NOISE ON THE LONGITUDINAL DYNAMIC RESPONSE OF AUTOMATED GUIDEWAY TRANSIT VEHICLES**

Experience with existing automated guideway transit (AGT) vehicles has shown that variations in vehicle parameters can significantly affect dynamic response. A study is presented of the magnitude of headway errors resulting from variations in parameters such as mass, tire radius, and propulsion and control system gains. In addition, the effects of sensor bias and noise on dynamic response is determined. A typical rubber-tired, electrically-powered AGT vehicle operating at moderate speeds (15 m/s) and headways (15 s) is modeled for the purpose of establishing numerical estimates of headway errors. This vehicle model is based on the Morgantown, West Virginia AGT system.

Proc of the JT Autom Control Conf, San Francisco, California, June 22-24, 1977.

Gerrard, WL (Minnesota University, Minneapolis)

Institute of Electrical and Electronics Engineers Proceeding Vol. 1 N 77CH 1220-3CS, 1977, pp 395-400, 8 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: IEEE

**11 170468****STEERING CONTROLLER DESIGN FOR AUTOMATED GUIDEWAY TRANSIT VEHICLES**

The fundamental lateral performance capabilities of rubber-tired automated guideway transit (AGT) vehicles operating under automatic steering control on exclusive guideways are discussed. Control is achieved by steering the front wheels in response to signals derived from the position errors between the vehicle and a guideway-based reference containing random irregularities. Optimal control techniques are used to synthesize controllers which minimize a performance index consisting of mean square lateral acceleration and tracking error, defining a frontier which limits the performance of steering controllers. Simple single-sensor proportional steering controllers are found to offer performance comparable to the optimum for a typical AGT vehicle. The degradations in performance arising from dynamic lags in the steering actuator and operation at off-design speeds are shown.

Proc of the Jt Autom Control Conf, San Francisco, California, June 22-24, 1977.

Shladover, SE (Massachusetts Institute of Technology); Wormley,

DN Richardson, HH Fish, R

Institute of Electrical and Electronics Engineers Proceeding Vol. 1 N 77CH 1220-3CS, 1977, pp 408-414, 14 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: IEEE

**11 170585****ENERGY EFFICIENCY OF AUTOMATED GUIDEWAY TRANSIT SYSTEMS**

A computer program is developed for estimation of the rate of Energy Consumption for Automated Guideway Transit Systems under variable service, design, and trip characteristics. Aspects to be considered include examinations and evaluation of impacts of suspension systems (rubber tire, air cushion, pneumatic tire, foam filled tires), propulsion systems (linear

induction motor, rotary motors) vehicle design, (number of seats, weight), and quality of service (waiting time, distance to station, average speed, line speed). The impact of trip characteristics (length of trip, number of trips, modal split) on energy efficiency is also examined and documented. The components of energy consumption (rolling friction, aerodynamic drag, auxiliary power) under various design and operating conditions were studied. The effect of empty vehicle shuttling on the energy efficiency index is also documented.

Eff of Energy Constraints on Transp Syst, Proc of the 3rd Natl Conf, Union College, Schenectady, New York, August 2-6, 1976.

Mittal, RK (Union College)  
Energy Research and Development Administration      Proceeding  
CONF-760895, 1977, pp 51-80

ACKNOWLEDGMENT: EI  
ORDER FROM: GPO

#### 11 170587 ON THE AUTOMATIC LONGITUDINAL CONTROL OF INDIVIDUAL GROUND VEHICLES

The achievement of safe and efficient longitudinal control is probably the most significant technical problem associated with individual-vehicle, automated ground transport systems such as automated guideway transit and the automatic highway. Four essential aspects of such control are considered: a) Sector-level operations; b) Communications between each controlled vehicle and the sector computer; c) The development of techniques for obtaining accurate estimates of a vehicle's state; and d) The control of each individual vehicle. Recent advances, pertaining to the design, development and testing of these facets will be described in the context of achieving safe and efficient operations under high-speed (to 93 ft/sec), small time-headway (1-2 sec) conditions.

Proc of the JT Autom Control Conf, San Francisco, California, June 22-24, 1977.

Takasaki, GM (Ohio State University); Fenton, RE Olson, KW  
Institute of Electrical and Electronics Engineers      Proceeding Vol. 1 No.  
77CH 1220-3CS, 1977, pp 415-420

ACKNOWLEDGMENT: EI  
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#### 11 170588 ACTIVITY CENTER CIRCULATION: THE COMPETITION BETWEEN AUTOMATED GUIDEWAY TRANSIT AND PEDESTRIANIZATION

This paper demonstrates why automated guideway transit (AGT) circulation systems should only be installed in those activity centers which are extensive enough that a large proportion of their internal trips will be too long to be covered on foot, even when pedestrian amenities are provided. Following a review of the essential characteristics of the various types of AGT, the significance of walking as a mode of transportation within compact activity centers is discussed, with emphasis on the competition walking can offer to AGT circulation systems. An analysis which compares the distributions of trip times for walking and AGT trips between the same set of activity center origins and destinations is described and some of the implications of its results for the planning of activity center circulation systems are explained.

Shladover, SE (Massachusetts Institute of Technology)      *Transportation Research* Vol. 11 No. 4, Aug. 1977, pp 265-278, 36 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

12 093805

**TRANSPORTATION ENVIRONMENT DATA BANK INDEX**

In an effort to determine operating conditions under which shipping containers will be exposed, a "Data Bank" of environmental information has been established by Sandia Laboratories, Division 1542, for the ERDA Division of Waste Management and Transportation. This document is an index which can be used to request data of interest.

Davidson, CA Foley, JT  
Sandia Laboratories June 1975, 37 pp

Contract AT(29-1)-789

ACKNOWLEDGMENT: NTIS  
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SAND-75-0248

12 154554

**RISK OF TRANSPORTING PLUTONIUM DIOXIDE AND LIQUID PLUTONIUM NITRATE BY TRUCK AND RAIL**

Results are summarized of the risk assessments of shipping PuO sub 2 powder and liquid Pu nitrate by truck and rail in the U.S. In the analysis method used, the system is described, potential release sequences are identified and evaluated (fault tree used), and the system risk is assessed. It is concluded that: there is little difference in risk in shipping PuO sub 2 by rail and by truck; there also is little change in risk in shipping PuO sub 2 by rail and by truck; there also is little change in risk for liquid shipment; the vermiculite loss is somewhat less important in rail shipment; and the response of the L-10 container to crush is more important in rail transport. (ERA citation 02:009235)

Symposium on the design, construction and testing of packaging for the safe transport of radioactive materials, Vienna, Austria, 23 Aug 1976.

Williams, LD Hall, RJ  
Battelle Memorial Institute/Pacific Northwest Labs, Energy Research and Development Administration CONF-760813-15, July 1976, 18 pp  
Contract E(45-1)-1830

ACKNOWLEDGMENT: NTIS  
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BNWL-SA-5743, DOTL NTIS

12 155412

**A SECOND APPRAISAL OF METHODS FOR ESTIMATING SELF-REACTION HAZARDS**

A literature survey was carried out to collect and evaluate test methods and test data on hazardous materials which undergo self-decomposition. Some thermal tests are regarded as valuable because they give quantitative data indicating the limit of thermal stability for specified materials. With the assistance of the CHETAH predictive scheme, a hazard evaluation was conducted on a selected group of compounds normally considered safe. Results showed a tendency to identify these safe materials as hazardous so as not to err in evaluating a truly hazardous compound. In a study of accidental polymerization of bulk chemicals, free radical polymerization involving olefins was considered the polymerization process most likely to occur inadvertently during transport. A calorimetric test procedure appeared to offer the promise of yielding data from which an unambiguous reactivity scale could be developed. The test procedure should have a firm relationship to the theory of thermal explosion.

See also report dated June 1974, COM-74-11658.

Domalski, ES  
National Bureau of Standards, Department of Transportation Final Rpt.  
NBSIR-76-1149, DOT/MTB/OHMO-76/6, Mar. 1977, 160 pp

ACKNOWLEDGMENT: NTIS  
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PB-266925/7ST, DOTL NTIS

12 158565

**USEFULNESS OF THE RISK ASSESSMENT TECHNIQUE IN SOLVING TRANSPORTATION PROBLEMS**

The purpose was to develop and use a model to assess the risk associated with the shipment of nuclear and non-nuclear hazardous energy-related materials. The analysis method comprises the steps of describing the system, identifying the release sequence, evaluating the sequence, and calculating and assessing the risk. Plutonium shipment is used as an example. Uses of this method to improve transportation safety are discussed. (ERA citation 02:021787)

National Transportation Safety Board meeting, Washington, District of Columbia, United States of America (USA), 24 Jan 1977.

Johnson, JF Hall, RJ  
Battelle Memorial Institute/Pacific Northwest Labs CONF-770104-1,  
Aug. 1976, 21 pp, 12 Fig.

Contract E(45-1)-1830

ACKNOWLEDGMENT: NTIS  
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BNWL-SA-5947, DOTL NTIS

12 159337

**TRANSPORTATION SAFETY INFORMATION REPORT. JANUARY, FEBRUARY, AND MARCH 1977 QUARTERLY HIGHLIGHTS**

Contents: Summary statistics of transportation safety; Intermodal safety affairs; Statistics, problems and safety program highlights for major modes of transportation (Highway and traffic, Rail and guided pathway, Aviation, Marine--Waterborne transport and Recreational boating, Materials transportation--Pipelines and Hazardous materials); Feature of the quarter (Pedestrian safety).

Gay, WF  
Transportation Systems Center, Department of Transportation Final Rpt.  
DOT-TSC-TES-77-1, June 1977, 74 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTISUB/C/244-001, DOTL NTIS

12 159948

**PERFORMANCE OF PLASTIC PACKAGING FOR HAZARDOUS MATERIALS TRANSPORTATION: PART I MECHANICAL PROPERTIES**

This report, prepared for the U. S. Department of Transportation, contains background information useful in evaluating the performance of plastic packagings for hazardous materials transportation, insofar as mechanical properties are concerned. Current DOT regulations and test methods are reviewed, as well as testing procedures from other organizations and countries. Also included are recommendations to modify current DOT regulations to make test methods more quantitative. Finally, experimental data are presented which represent the initial stage of a study it is hoped will ultimately lead to the establishment of criteria upon which the long time behavior of plastic containers can be predicted based on short time tests.

Crissman, JM Guttman, CM Zapas, LJ  
National Bureau of Standards, (NBSIR 76-1168 (R)) Final Rpt.  
DOT/MTB/OHMO-76/4, Oct. 1976, 45 pp, 5 Ref.

Contract DOT-AS-50074

ACKNOWLEDGMENT: DOT  
ORDER FROM: NTIS

PB-270290/0ST, DOTL RP

12 159949

**PERFORMANCE OF PLASTIC PACKAGINGS FOR HAZARDOUS MATERIALS TRANSPORTATION PART II-PERMEATION**

Permeation as a mode of failure for plastics packagings is discussed. The materials properties which determine permeation performance are defined. Measurement methods aimed at determining values for the materials properties are surveyed. A "matrix" scheme is introduced for evaluating the risks associated with the permeation failure of a package containing a hazardous materials lading. Permeation factors influencing reuse of plastic containers are described. Laboratory data from an evaluation of a simple method of test for estimating the intrinsic property of a lading to permeate polyethylene is presented.

Barnes, JD Martin, GM  
National Bureau of Standards, (NBSIR 76-1163 (R)) Final Rpt.  
DOT/MTB/OHMO-76/5, Oct. 1976, 26 pp, 15 Ref.

Contract DOT AS-50074

ACKNOWLEDGMENT: DOT  
ORDER FROM: NTIS

PB-270386/6ST, DOTL RP

12 162954

**WARNING SIGNALS AND NOISE. AUDIBILITY OF WARNING SIGNALS DURING WORK WITH NOISY MACHINES AND EQUIPMENT IN DANGER ZONES ON TRACKS** [Warnsignal und Laerm. Hoerbarkeit von Warnsignalen bei Arbeiten mit Laermzeugenden Baumaschinen und Geraeten im Gefahrenbereich der Gleise]

No Abstract. [German]

Wunderlich, V *Signal und Schiene* Vol. 21 No. 2, Feb. 1977, pp 41-45, 7 Fig., 10 Ref.

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

12 163722

**PROBLEMS AND TRENDS IN DESIGNING TAIL LIGHTS FOR TRAINS** [Probleme und Tendenzen bei der konstruktiven Gestaltung von transportablen Zugschlussleuchten]

No Abstract. [German]

Hemann, M *Eisenbahnpraxis* Vol. 21 No. 5, May 1977, pp 167-170, 1 Fig., 1 Tab., 1 Phot., 6 Ref.

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

12 163760

**AN OSHA GUIDE TO EVALUATING YOUR FIRM'S INJURY AND ILLNESS EXPERIENCE, 1974: TRANSPORTATION AND PUBLIC UTILITIES INDUSTRIES**

No Abstract.

Department of Labor 1976, 12 pp

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO (L2.71:476)  
ORDER FROM: Department of Labor, Bureau of Labor Statistics, Washington, D.C., 20010

12 163786

**KEYNOTE ADDRESS, 13TH RAILROAD ENGINEERING CONFERENCE, OPENING SESSION**

Comments and illustrations are given about the effects of traffic density, inflation and other factors on the apparently increasing trends for railroad accidents and casualties. The need for improved reporting systems and the role for cooperative safety programs involving government, industry and labor are discussed.

Presented at the 13th Annual Railroad Engineering Conference, Pueblo, Colorado, October 12-13, and included in the Conference Proceedings, "Railroading Challenges in America's Third Century--Improved Reliability and Safety," sponsored by the FRA's Office of Research and Development, U.S. DOT.

Harris, WJ, Jr (Association of American Railroads)  
Federal Railroad Administration Conf Paper FRA/ORD-77/13, July 1977, pp 1-6, 13 Fig.

ACKNOWLEDGMENT: FRA  
ORDER FROM: NTIS

DOTL NTIS

12 163804

**TEST OF AUTOMATIC EXTINGUISHER FOR NEW TYPE DIESEL CAR**

A fire extinguishing installation for rail cars powered with under-floor diesel engines is designed to be effective in winds developed by the moving vehicles. Automatic sensors activate the extinguishers.

Kida, H Nishizumi, M *Railway Technical Research Inst Quarterly Reports* Vol. 18 No. 2, June 1977, pp 95-96, 4 Fig.

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

DOTL JC

12 165039

**RESEARCH ON PREVENTION OF TRAIN FIRE**

Survey of research carried out on Japanese National Railways. The author gives a detailed description of a large number of tests carried out on the causes, propagation and effects of fires, both in the open air and in tunnels on old or fireproof equipment both stationary and in motion. Conclusions include the following: if a fire occurs in a tunnel, the train should proceed, in long tunnels, special arrangements have been made for first aid and evacuation of passengers, and fire-proofing techniques have definite advantages and would benefit from further research.

Takita, T *Rail International* Vol. 8 No. 7/8, July 1977, pp 395-406, 2 Fig., 7 Tab., 8 Phot.

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

DOTL JC

12 165787

**TRANSPORT OF RADIOACTIVE MATERIALS IN THE UNITED STATES**

In 1975 the Nuclear Regulatory Commission sponsored a survey of shipments of radioactive materials in the United States. The survey was conducted by Battelle Pacific Northwest Laboratories. Of over 15,000 licenses, 2275 were sent questionnaires, and 59% of the recipients responded. On the basis of the responses, it is estimated that the total number of packages transported in the United States is on the order of 2.5 million packages per year. About one-third of the packages contain only small quantities of radioactive materials and are exempt from packaging and labeling requirements of Department of Transportation regulations.

*Nuclear Safety* Vol. 18 No. 3, 1977, pp 291-297, 5 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

12 166113

**ASSESSMENT OF THE RISK OF TRANSPORTING PLUTONIUM DIOXIDE AND LIQUID PLUTONIUM NITRATE BY TRAIN**

The risk analysis model is applied to the assessment of the risk of Pu releases due to transportation accidents and package misclosure and degradation. The transport system and accident environment are described and release sequences postulated. Results are related to the early 1980s, when Pu shipments are expected to be more frequent (18 metric tons Pu shipped by rail per year, average shipment distance of 1530 miles, regulations and shipping systems same as in 1974, PuO sub 2 shipped in 6M containers and liquid Pu(NO sub 3) sub 4 in L-10 containers, with 230 kg in a 90-container 6M shipment and 136 kg in a 68-container L-10 shipment). It is estimated that PuO sub 2 shipments will be involved in an accident every 6 years and Pu(NO sub 3) sub 4 shipments every 3.5 years. Consequences are expressed as risk spectra. Loss of thermal insulation followed by exposure to a fire was found to be the most significant risk contributor for the liquid shipments. Risk in rail shipment of Pu was found to be similar to that in truck shipment, although for the liquid shipments, there is a difference in the importance of factors contributing to the risk. (ERA citation 02:035852)

Davis, DK Heaberlin, SW Johnson, JF Peterson, PL  
Battelle Memorial Institute/Pacific Northwest Labs, Energy Research and Development Administration Feb. 1977, 231 pp

Contract EY-76-C-06-1830

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

BNWL-1996, DOTL NTIS

12 166398

**REGULATORY AND OTHER RESPONSIBILITIES AS RELATED TO TRANSPORTATION ACCIDENTS**

This report discusses the functional responsibilities of the different parties involved in dealing with transportation accidents. The views presented are based on present practices, existing regulations, discussions with many of the groups involved, and available formal opinions. The report is intended to encourage consideration of the programs and procedures necessary to deal with those few transportation accidents involving radioactive materials that may be expected to occur each year. For purposes of this report, a transportation accident is divided into four phases—an initial phase, a containment phase, a cleanup phase, and a cost recovery phase.

Barker, RF  
Nuclear Regulatory Commission NUREG-0179, June 1977, 16 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-269625/0ST, DOTL NTIS

#### 12 166402

##### DETERMINATION OF PERFORMANCE CRITERIA FOR HIGH-LEVEL SOLIDIFIED NUCLEAR WASTE

A systems analysis model was developed to identify potential release points and release mechanisms for radioactive materials contained in solidified high level radioactive waste. The model considers both normal operation and potential untoward events during the handling, storage, transportation, and storage of high level wastes. The effect of varying the waste form characteristics on the probability of a release occurring, the magnitude of potential releases, and the consequences of potential releases were evaluated for each of the above operational phases of waste management in order to identify the points in the high level waste management cycle most sensitive to the waste form characteristics with regard to protecting the public health and safety. The study results will be considered by the NRC in establishing codification requirements for high level wastes.

Cohen, JJ  
California University, Livermore, Nuclear Regulatory Commission Tech Rpt. NUREG-0279, July 1977, 227 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-269857/9ST, DOTL NTIS

#### 12 166622

##### SPENT FUEL SHIPPING CASK ACCIDENT EVALUATION

Mathematical models have been developed to simulate the dynamic behavior, following a hypothetical accident and fire, of typical casks designed for the rail shipment of spent fuel from nuclear reactors, and to determine the extent of radioactive releases under postulated conditions. The casks modeled were the IF-300, designed by the General Electric Company for the shipment of spent LWR fuel, and a cask designed by the Aerojet Manufacturing Company for the shipment of spent LMFBF fuel. (ERA citation 02:035845)

Fields, SR  
Hanford Engineering Development Laboratory, Energy Research and Development Administration Dec. 1975, 374 pp

Contract EY-76-C-14-2170

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

HEDL-TME-75-138

#### 12 167050

##### TOXICOLOGICAL TESTING OF SELECTED HAZARDOUS MATERIALS FOR TRANSPORTATION PURPOSES

A number of organic chemicals was subjected to selected toxicological tests prescribed for classification purposes in the Department of Transportation Hazardous Materials regulations. Some of these materials were also examined for skin corrosivity. Aqueous solutions of several common inorganic acids and bases were tested to establish dividing line between corrosive and non-corrosive concentrations. Test results are reported.

Back, KC Thomas, AA MacEwen, JD  
California University, Irvine, Aerospace Medical Research Laboratory, Department of Transportation Intrm Rpt. DOT/MTB/OHMO-76/3, Apr. 1976, 70 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-270991/3ST, DOTL NTIS

#### 12 167080

##### WAYSIDE DERAILMENT INSPECTION REQUIREMENTS STUDY FOR RAILROAD VEHICLE EQUIPMENT

An analysis of the causes of railroad equipment derailments was made. Data reported to the FRA was the primary source of derailment information, however, data from other sources were also available. Individual cause codes were consolidated into groups that had a common characteristic that might be used to detect the presence of the defect. Seven consolidated cause code

groupings were identified that accounted for over 80 percent of the cost of equipment caused derailments. Existing wayside inspection systems were evaluated. Developmental wayside inspection systems were identified. A method was developed that assigns a purchase cost number for possible wayside detection schemes that is based on the cost of derailment and effectiveness of the system. A recommendation is made that FRA set up Wayside Inspection Station(s) as a means of evaluating improvement to present systems and new wayside inspection methods.

Frarey, JL Smith, RL Krauter, AI  
Shaker Research Corporation, Federal Railroad Administration, Transportation Systems Center Final Rpt. FRA/ORD-77/18, May 1977, 148 pp

Contract DOT-TSC-1029

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-271244/6ST, DOTL NTIS

#### 12 167112

##### CARGO TANK BOTTOM LOADING OF FLAMMABLE LIQUIDS. VOLUME I. REVIEW AND ANALYSIS OF MECHANICAL SYSTEMS ON CARGO TANK TRUCKS USED IN BOTTOM LOADING WITH REGARD TO IMPACT PROTECTION

The overall purpose of the program was to develop performance criteria for (1) protecting bottom loading tank systems in underride accidents and (2) for safe and reliable operation of liquid level sensors (Sensor study reported in Volume II). The program commenced with an industry survey to obtain state-of-the-art technology in bottom loading system manufacturing and carrier operations and a survey of pertinent literature. An effort to obtain underride accident data was maintained throughout the program, and the statistical probability of tanker involvement in accidents was postulated. A systems analysis was conducted to define the impact vulnerability of the system after establishing component functions and interrelationships. Emphasis was placed on shear section performance, protection guards and loading line location, product evacuation, etc., during the analysis. The performance criteria stress the need for primary and secondary system protection which are realizable with several crashworthiness concepts presented in the report.

See also Volume 2, PB-271 430.

Tyndall, LH Anderson, RL  
Dynamic Science Corporation, Federal Highway Administration Final Rpt. 3978-77-60, DOT-FH-11-9091-Vol-1, June 1977, 117 pp

Contract DOT-FH-11-9091

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-271429/3ST, DOTL NTIS

#### 12 167113

##### CARGO TANKS, BOTTOM LOADING OF FLAMMABLE LIQUIDS. VOLUME II. REVIEW AND ANALYSIS OF LIQUID LEVEL CONTROL SYSTEMS USED IN BOTTOM LOADING OF FLAMMABLE LIQUIDS INTO CARGO TANKS

Bottom loading systems of flammable liquids into cargo tanks are investigated with two overall objectives: (1) Review the mechanical aspects of bottom loading of cargo tanks with regard to devices or procedures for removing liquid products from loading lines under tanks and protection of loading lines from underride accidents; (2) Review liquid level sensing systems presently available, with special emphasis placed on: safety characteristics, compatibility and adaptability of systems used as they differ from tank vehicle to loading terminal, failsafe features built into the systems, and longevity of these systems with a view to possible retest criteria. The volume summarizes the work performed on the second objective. This includes a review of available design, an analysis of the safety features of each design, a review of existing standards and recommended procedures, and recommended performance criteria.

See also Volume 1, PB-271 429.

Johnson, NB Tyndall, LH Anderson, RL  
Dynamic Science Corporation, Federal Highway Administration Final Rpt. DOT-FH-11-9091-V2, 3978-77-27, June 1977, 79 pp

Contract DOT-FH-11-9091

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-271430/1ST, DOTL NTIS

12 167266

**TRANSPORTATION SAFETY INFORMATION REPORT. APRIL, MAY, AND JUNE 1977 QUARTERLY HIGHLIGHTS**

The quarterly report is a compendium of selected national-level transportation safety statistics for all modes of transportation. Each quarterly report presents and compares transportation fatalities, accidents, and injuries on a monthly and quarterly basis for the current and preceding years. In addition, it provides an overview of modal safety hazards, safety programs, and related accident prevention information. Featured in this quarterly report is a discussion on Automobile Occupant Restraint Systems and an Intermodal Safety Affairs article on Occupant Restraint Systems in various other modes.

See also NTISUB/C/244-001. Paper copy also available on subscription, North American Continent price \$30.00/year; all others write for quote.

Transportation Systems Center Final Rpt. DOT-TSC-TES-77-2, Sept. 1977, 70 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

NTISUB/C/224-002, DOTL NTIS

12 167495

**RAILROAD ACCIDENT REPORTS-FORMAT, ISSUE NUMBER 2--1976**

This publication contains briefs of 119 selected railroad accidents, occurring in U.S. railroad operations from April through July 1976. The brief format presents basic facts, conditions, circumstances and probable causes in each instance. Additional statistical information is tabulated by types of accidents, and casualties related to types of accidents, carriers involved, and causal factors.

National Transportation Safety Board NTSB-RAB-77-1, Sept. 1977, 130 pp

ACKNOWLEDGMENT: National Transportation Safety Board

ORDER FROM: NTIS

DOTL RP

12 168095

**JAPANESE GOVERNMENT WHITE PAPER ON TRANSPORTATION SAFETY**

This report is divided into two parts. Book 1 describes the traffic accident situation and contains statistics covering 1964-75. Separate chapters deal with (1) road traffic accidents, (2) railway accidents, (3) disasters at sea, and (4) aircraft accidents. Book 2 deals with traffic safety measures and contains three parts referring to: (1) measures related to land (road and railway) traffic safety, (2) measures relating to marine traffic safety, and (3) measures related to air traffic safety.

International Assoc of Traffic & Safety Sciences Monograph 1976, 235 pp, Figs., Tabs.

ACKNOWLEDGMENT: TRRL (IRRD-228456)

ORDER FROM: International Assoc of Traffic & Safety Sciences, Prime Minister's Office, No 5, 5-Chome, Yaesu, Chuoku, Tokyo, Japan

12 168635

**UNITED STATES EXPERIENCE IN THE TRANSPORTATION OF RADIOACTIVE MATERIALS**

The transport of radioactive material forms a vital link in the nuclear fuel cycle in the United States. Actual U.S. experience and practice with such systems for the packaging and transport of uranium ore concentrates, uranium hexafluoride, fresh fuel, irradiated fuel, non-high-level waste, and plutonium with low heat generation rates are described. Specific shipping systems in current use for these services are illustrated. A comparison will be made of shipping requirements for nuclear parks versus dispersed facilities. Shipping systems for other fuel cycle materials (e.g., high-level waste and cladding hulls) have not been developed because there has been no need to transport these materials commercially. However, conceptual designs for packaging and transport of such materials have been developed. Selected systems are reviewed and summarized. Transport safety in the U.S. is regulated by the U.S. Department of Transportation and the Nuclear Regulatory Commission. Key regulations defining packaging requirements, allowable radiation dose rates, and handling procedures are reviewed. Although the radioactive material shipping industry has an outstanding safety record, opposition to nuclear fuel cycle shipments has surfaced in several areas. The U.S. congressional ban on the shipment of plutonium by air, the actions of New York City to prohibit certain shipments within the

city limits, and the requirement of U.S. railroads to ship spent fuel casks only in dedicated trains are reviewed. (Atomindex citation 08:303984)

Available in microfiche only. International conference on nuclear power and its fuel cycles, Salzburg, Austria, 2 May 1977, 3.3-T.1./08. U.S. Sales Only.

Platt, AM Rhoads, RE Hall, RJ Williams, LD Brobst, WA  
International Atomic Energy Agency CONF-770505-346, 1977, 10 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

IAEA-CN-36/563

12 168724

**HEALTH HAZARD EVALUATION/TOXICITY DETERMINATION REPORT 75-117-372, KOPPERS COMPANY, INCORPORATED, NORTH LITTLE ROCK, ARKANSAS**

Acting on a request received from an authorized representative of employees regarding their concern over the exposure of workers to creosote and pentachlorophenol, a health hazard evaluation was conducted by NIOSH at the wood treating operation of Koppers Company. The results of air sampling revealed that the workers were exposed to potentially toxic polynuclear aromatic hydrocarbons, while exposures to airborne concentrations of pentachlorophenol were not toxic at the levels encountered. Interviews of 9 of the 11 affected workers disclosed an episode of eye irritation and 4 cases of skin discoloration. Examination of the workers skin revealed 2 cases of mild oil folliculitis and 3 workers with pitch warts, both conditions probably due to creosote exposures. About 45% of the workers interviewed and examined had either elevated or borderline elevated blood pressure levels, although definite conclusions could not be drawn regarding the relationship of the pressor phenomena to occupational exposures. Recommendations are made for improving the existing working conditions and for the application of an occupational medical program.

Markel, HL Ligo, RN Lucas, JB

National Institute for Occupational Safety & Health NIOSH-TR-75-117-372, Mar. 1977, 19 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-270860/OST

12 168782

**A SUMMARY OF ACCIDENTS RELATED TO NON-NUCLEAR ENERGY**

This report summarizes the accidents and unscheduled events which may occur during the extraction, production, transportation, and utilization of non-nuclear energy technologies.

See also report dated Feb 77, PB-265 398.

Krickenberg, K Clifford, P

Mitre Corporation, Environmental Protection Agency Exec Rpt. M76-88, EPA/600/9-77/012, May 1977, 19 pp

Contract EPA-68-01-3188

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-271506/8ST

12 168897

**SUMMARY OF LNG SAFETY RESEARCH: SUPPLEMENT-TASK III**

Results from major published research programs related to assessment and alleviation of potential LNG hazards are described. Topics covered include: vaporization and dispersion from LNG spills, boiling heat transfer rates for LNG on water, superheat 'explosions,' tank stratification and rollover, thermal radiation from LNG pool fires, detonation conditions, pool spread and thermal radiation from ignited LNG releases on water, deflagration of natural gas-air vapor clouds, and LNG fire control and suppression research. In addition to descriptive material, an extensive bibliography is included and future research needs are suggested.

See also Final rept., PB-241 048.

Atallah, S Drake, E Reid, R

Little (Arthur D), Incorporated, Department of Transportation ADL-C-76971-3, Dec. 1974, 208 pp

Contract DOT-OS-40171

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-273378/OST

12 170073

**RAILROAD ACCIDENT REPORT: REAR END COLLISION OF TWO GREATER CLEVELAND REGIONAL TRANSIT**

**AUTHORITY TRAINS, CLEVELAND, OHIO, AUGUST 18, 1976**

About 11:35 a.m., on August 18, 1976, Greater Cleveland Regional Transit Authority train No. 461 struck the rear of train No. 409 which was standing near the East 79th Street Station in Cleveland, Ohio. Twenty persons were injured and property damage was estimated to be \$61,000. The National Transportation Safety Board determines that the probable cause of the accident was the failure of the operator of train No. 461 to comply with the mandatory stop signal indication and to apply the brakes in emergency promptly after the train ahead had been sighted, and operation of the train at an excessive speed. Contributing to the probable cause was the lack of an effective operator training program and the ineffectiveness of the protective devices and procedures to prevent a following train from entering an occupied block. As a result of its investigation of the accident, the National Transportation Safety Board made four recommendations to the Greater Cleveland Regional Transit Authority concerning the operation of the system, and one to the Federal Railroad Administration.

National Transportation Safety Board NTSB-RAR-77-5, Aug. 1977, 20 pp, 5 Fig.

ACKNOWLEDGMENT: National Transportation Safety Board  
ORDER FROM: NTIS

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12 170074

**RAILROAD ACCIDENT REPORT: HEAD-ON COLLISION OF TWO NORFOLK & WESTERN RAILWAY COMPANY FREIGHT TRAINS, NEW HAVEN, INDIANA, OCTOBER 19, 1976**

About 9:15 p.m., on October 19, 1976, at New Haven, Indiana, Norfolk & Western Railway Company (N&W) freight train Extra 1376 West collided head-on with N&W yard locomotive unit No. 3363, which was pulling 55 freight cars. One locomotive unit, a caboose, and one car of Extra 1376 West, and the yard locomotive and one car were derailed. The brakeman on the locomotive of Extra 1276 West was killed and four crewmembers were injured. The estimated cost of damages was \$168,400. The National Transportation Safety Board determines that the probable cause of this accident was the failure of the crewmembers of Extra 1276 West to couple the airbrake hoses between the fifth and sixth cars from the rear, and to test the brakes as required by N&W rules and the Federal Power Brake Law of 1958. As a result of its investigation, the Safety Board submitted one recommendation to the Norfolk and Western Railway Company.

National Transportation Safety Board NTSB-RAR-77-6, Aug. 1977, 19 pp, 1 Fig., 4 App.

ACKNOWLEDGMENT: National Transportation Safety Board  
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DOTL NTIS

12 170075

**RAILROAD ACCIDENT REPORT: DERAILMENT OF A BURLINGTON NORTHERN FREIGHT TRAIN AT BELT, MONTANA, NOVEMBER 26, 1976**

About 2:55 p.m. on November 26, 1976, 24 cars of Burlington Northern freight train Extra 5743 East derailed at Belt, Montana. Twenty-two persons were injured as a result of the accident and two persons are missing. About 200 people were evacuated because of subsequent fires and explosions. Five houses, a Farmers Union Cooperative Facility, and several other buildings were destroyed or damaged. Nineteen motor vehicles were destroyed and Belt Creek was contaminated. Damage was estimated to be \$4,540,000. The National Transportation Safety Board determines that the probable cause of the accident was the failure of an overloaded rail section which originated in an undetected transverse fissure.

National Transportation Safety Board NTSB-RAR-77-7, Sept. 1977, 19 pp, 5 Fig., 1 App.

ACKNOWLEDGMENT: National Transportation Safety Board  
ORDER FROM: NTIS

DOTL NTIS

12 170076

**RAILROAD ACCIDENT REPORT: DERAILMENT OF AMTRAK TRAIN ON BURLINGTON NORTHERN RAILROAD NEAR RALSTON, NEBRASKA, DECEMBER 16, 1976**

About 2:45 a.m., on December 16, 1976, 1 SDP-40F locomotive unit and 11 cars of Amtrak train No. 6 derailed when leaving a 2 degrees 30' curve on the Burlington Northern track near Ralston, Nebraska. Forty-eight of the 178 passengers, and 15 of the 19 crewmembers on the train were injured. Property damage was estimated to be \$816,000. The National Transportation Safety Board determines that the probable cause of this accident was the lateral movement of the high rail and widening of track gage when the deteriorated crossties were unable to withstand the lateral forces generated by the locomotive while the train was traveling at a speed of 53 mph. Contributing factors were the weakened crosstie spikehole condition and the existing wide gage that conformed to the Federal Track Safety Standards for Class 4 track. As a result of its investigation of the accident the National Transportation Safety Board submitted four recommendations to the Federal Railroad Administration concerning its track safety standards.

National Transportation Safety Board NTSB-RATR-77-8, Oct. 1977, 25 pp, 1 Fig., 2 App.

ACKNOWLEDGMENT: National Transportation Safety Board  
ORDER FROM: NTIS

DOTL NTIS

12 170077

**RAILROAD ACCIDENT REPORT: DERAILMENT OF AMTRAK TRAIN ON LOUISVILLE AND NASHVILLE RAILROAD, NEW CASTLE, ALABAMA, JANUARY 16, 1977**

About 4:15 a.m., on January 16, 1977, 1 locomotive unit and 12 cars of Amtrak train No. 315 derailed on the Louisville and Nashville Railroad Company's track near New Castle, Alabama. Seventy-six of the 129 persons on board the train were injured. Property and equipment damage was estimated to be \$578,000. The National Transportation Safety Board determines that the probable cause of this accident was the tipping of the east rail which caused the track gage to widen. The gage widened because the track structure was not able to withstand the lateral forces generated by oscillations of the locomotive trucks as the train moved around a 5 degrees curve. The oscillations were generated by variations in track alignment and superelevation that complied with Federal Track Safety Standards for Class 3 track and by the ineffectiveness of a vertical snubbing device on the second locomotive unit. As a result of the investigation of the accident, the National Transportation Safety Board submitted two recommendations to the Federal Railroad Administration regarding operation of SDP-40-F locomotives, and one recommendation to the National Railroad Passenger Corporation.

National Transportation Safety Board NTSB-RAR-77-9, Oct. 1977, 17 pp, 3 Fig., 2 App.

ACKNOWLEDGMENT: National Transportation Safety Board  
ORDER FROM: NTIS

DOTL NTIS

12 170078

**THE ACCIDENT PROCESS, A SYSTEM MODEL [Het ongevalsproces, een systeem-model]**

An accident is a disfunction of the system resulting in bodily damage and/or material damage. Via this definition the author comes to a model of the accident process within a certain system of an activity. Careful behaviour and prevention find their places in this model too. [Dutch]

Van Wijk, GLM *Veiligheid* Vol. 53 No. 10, 1977, pp 433-436, Figs., Refs.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Veiligheidsinstituut, Hobbemastraat 22, Hobbemastraat 22, Netherlands

12 170100

**FRA GUIDES FOR PREPARING INCIDENT REPORTS**

No Abstract.

Federal Railroad Administration 1974, 128 pp, Photos., Apps.

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO  
ORDER FROM: FRA

DOTL HE1779.U75



12 170451

**TRANSPORTATION OF RADIOACTIVE MATERIALS BY RAIL**

No Abstract.

Interstate Commerce Commission 1977, 190 pp

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications,  
GPO

ORDER FROM: Interstate Commerce Commission, Office of Proceedings,  
Section of Energy and Environment, Washington, D.C., 20423

13 053242

## HIGH-SPEED TESTS OF DB ON THE GUTERSLOH-NEUBECKUM SECTION OF LINE FOR RESEARCH INTO COMPONENTS OF THE OVERHEAD CONTACT SYSTEM/PANTOGRAPH SYSTEM

Tests made by DB for research into the components of the overhead contact system/pantograph system are explained in this technical document. Such tests had been made by DB on the Rheda-Oelde section of high-speed line at speeds up to 250 km/h in 1974. These had served chiefly to test four variants of the overhead contact system for their suitability of being passed at those speeds. The variants of the overhead contact system tested had been of the light type of overhead equipment only, consisting of catenary wire, contact wire and stitch wire, the essential parameters of which (length of span, contact wire tension and catenary wire tension) had been varied.

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

Bauer, KH

International Union of Railways DT 62 (A129), June 1977, 27 pp, 19 Fig., 2 Tab., 21 App.

ACKNOWLEDGMENT: UIC

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DOTL RP

13 162951

## THE ERA OF THREE-PHASE TRACTION IN ITALY IS OVER [Il ciclo della trazione trifase in Italia si è concluso]

The article gives the background to the use of three-phase traction in Italy (the first country to have adopted this system) and explains the different stages of its replacement by direct-current traction. [Italian]

Cantutti, U *Ingegneria Ferroviaria* No. 7/8, July 1976, pp 7-14, 7 Fig., 1 Tab., 16 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

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13 163223

## A STUDY ON THE MOTION OF OVERHEAD CONTACT WIRE AT CROSSING

A pantograph is unlikely to wedge at a crossing of contact wires even if there is some variation in the heights of the two wires above the track. This study considered the force between the wire and the pantograph horn, the bending strain on the horn, and the limit of variations in contact wire heights which can be traversed successfully.

Yoshizawa, T *Railway Technical Research Inst Quarterly Reports* Vol. 18 No. 1, Mar. 1977, 6 pp, 9 Fig., 1 Ref.

ACKNOWLEDGMENT: Japanese National Railways

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

DOTL JC

13 163232

## AUTOMATED MEASURING OF THE THICKNESS OF CATENARY CONTACT WIRES [Automatisation de la mesure de l'épaisseur du fil de contact des catenaires]

Various systems have already been proposed for measuring in an automatic and continuous manner the thickness, that is to say the wear, of the contact wire. They had various drawbacks: speed too slow, errors or interruptions in the measurements, reading head in contact with the wire and therefore under current. The device described in the article overcomes these difficulties: measurements are taken from a distance by illuminating the wire contact surface and obtaining a picture on a series of photodiodes; the signal is processed and recorded. A prototype has taken measurements at 50 km/h on the straight and on curves with a radius of over 1,500 m to an accuracy of 0.4 mm of the value of wire thickness remaining. The operational device now being built will enable measurements to be taken at 70 km/h on the straight and 50 km/h on curves with a radius of more than 400 m. Examples of the recordings obtained are given.

Mathieu, H (Montpellier University, France); Dandonneau, JM (INSAT, France); Rouan, G *Revue Generale des Chemins de Fer* May 1977, pp 284-288, 6 Fig., 3 Ref.

ACKNOWLEDGMENT: Revue Generale des Chemins de Fer

ORDER FROM: ESL

DOTL JC

13 163269

## FUTURE OF ELECTRIC POWER SUPPLY OF THE SWISS RAILROADS [Die Zukunft der Energieversorgung der Schweizerischen Bundesbahnen]

The Swiss railroad system operates 99.5% of its entire network with single phase current. Therefore a reliable and electric power supply which is also guaranteed in the future is of great importance inasmuch as more than 25 railroad companies are fed by the railroad's power supply network. The development of the power supply network is considered. The individual factors of planning and the future projects until 1990 are explained. [German]

Schaaf, P *Elektrische Bahnen* Vol. 48 No. 1, Jan. 1977, pp 22-26

ACKNOWLEDGMENT: EI

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DOTL JC

13 163279

## PROBLEM OF EMERGENCY POWER SUPPLY ON METROPOLITAN RAILWAYS. DESCRIPTION OF THE POSSIBLE SOLUTIONS [Il problema della alimentazione di emergenza nelle ferrovie metropolitane. Descrizione delle soluzioni possibili]

The problem of the continuity of power supply on the underground metropolitan railways is considered. A review of the various possible solutions is given, bringing out, in particular, two systems based, respectively, on the adoption of inverters or direct current motors coupled with synchronous generators), very similar in principle, but very different from the point of view of technical realization. The technological content of these systems is, however, so high that both are in a position to guarantee an extremely high level of trustworthiness. [Italian]

Rizzo, M *Ingegneria Ferroviaria* Vol. 32 No. 2, Feb. 1977, pp 94-100

ACKNOWLEDGMENT: EI

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DOTL JC

13 163288

## VIBRATIONS OF CATENARY OVERHEAD WIRE

This study has been made to solve some problems about the vibration of catenary overhead wire, and asserts that the behavior of a string with both ends fixed on which constant force travels has good agreement with the actual case. Vibration of catenary overhead wire after the pantograph passed and vibrations of crossed catenary overhead wires are analyzed. The mathematical models to analyze the behavior are presented.

Oda, O Ooura, Y *Railway Technical Research Inst Quarterly Reports* Vol. 17 No. 3, 1976, 3 pp

ACKNOWLEDGMENT: EI

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

DOTL JC

13 163729

## MODERN CATENARY CONSTRUCTION [Moderner Fahrleitungsbau]

Work sequence of the mechanized construction of a catenary and description of the vehicles, machines and tools employed. [German]

Bauermeister, K *Elektrische Bahnen* Vol. 48 No. 5, No Date, pp 119-122, 7 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

13 163733

## IMPROVEMENT OF PANTOGRAPHS AND CATENARIES AND METHOD OF CALCULATING THEIR MUTUAL INTERACTIONS AT HIGH SPEEDS

The articles presents a wide general survey of parameters and variables occurring in the movement of catenaries, and quality criteria for current collection, including a general economic criterion expressing the operational

cost of the system, including capital investment. Descriptions are given of mathematical methods dealing with the problem. The authors then describe an improved pantograph, the TS-6M, an improved suspension catenary, and the results of operational tests with an ER 200 multiple unit train.

Belyaev, IA *Rail International* Vol. 8 No. 6, June 1977, pp 309-328, 12 Fig., 4 Tab., 5 Phot., 12 Ref.

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

DOTL JC

## 13 163770

**SISHEN TO SALDANHA: FIRST MAJOR 50 KV SCHEME**

Electrification of South African Railways' 860-km Sishen-Saldanha ore route, scheduled for completion in 1978, will be the first long-haul 50 kV installation in the world. Choice of 50 kV is ideal for the isolated open country through which the line runs and low transmission losses mean that only six substations are necessary along the route. Catenary design varies to suit different geographical conditions and includes 2.5 km tensioned sections and synthetic insulators.

Siemens, WH (International Engineering Company, Incorporated) *Railway Gazette International* Vol. 133 No. 9, Sept. 1977, pp 333-335, 2 Fig., 8 Phot.

ORDER FROM: ESL

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## 13 163772

**ACCURATE PREDICTION OF OVERHEAD LINE BEHAVIOUR**

Various attempts to model the dynamics of current collection from an overhead line have failed because theoretical predictions were not adequately supported by experimental data. Using scaled-down catenary, British Railway's research team has been able to obtain good agreement with computer prediction of dynamic behavior, at the same time keeping the complexity of calculations within bounds by identifying variables such as contact wire bending stiffness that have little practical effect on current collection. Improved pantograph designs for use with existing equipment may be followed by cheaper electrification of low-speed freight and urban passenger lines.

Hobbs, AEW (British Railways) *Railway Gazette International* Vol. 133 No. 9, Sept. 1977, pp 339-343, 3 Fig., 3 Phot., 5 Ref.

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## 13 164415

**REMOTE CONTROL OF ELECTRIC POWER SUPPLY IN THE MUNICIPAL RAPID TRANSIT SYSTEM. HISTORICAL DEVELOPMENT OF THIS TECHNOLOGY IN BERLIN, GERMANY, FROM 1930 TO 1975--ON THE OCCASION OF THE 75TH ANNIVERSARY SINCE THE ESTABLISHMENT OF THIS UNDERGROUND SYSTEM [Fernsteuerung der Stromversorgung im Stadtbahnschnellverkehr. Historische Entwicklung dieser Technik in Berlin von 1930 bis 1975--Aus Anlass des Fuenfundsiebzigjaehrigen Bestehens dieser U-Bahn]**

The operational network of the Berlin underground railroad lines has been extended to 100 km within 75 years. Growing power and energy demand of the multiple units called for an increasingly higher installed power level in substations with smaller distances. The economical and operational use as well as staff problems required the development of automation and remote control. A description is given, from the historical, technical and economical point of view, of the development from the very beginning of remote control to the operating control center installed according to the most modern technical aspects. [German]

Hoehn, H Hiedrich, G *Elektrische Bahnen* Vol. 48 No. 2, Feb. 1977, pp 37-46, 7 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

## 13 165042

**IMPROVEMENTS IN THE CURRENT CAPTING AND TRACTION SYSTEMS ON ELECTRIFIED LINES FOR SPEEDS OF UP TO 200 KM/H [Vervollkommnung des Fahrleitungsnetzes und der Stromabnahme auf elektrifizierten Eisenbahnstrecken bei Geschwindigkeiten bis 200 km/h]**

Report of research carried out under the auspices of the 8th Committee of the OSJD by Bulgarian, Hungarian, GDR, Polish, Soviet and Czech railways. Recommendations refer manufacture and metallurgical composition of contact wires, pantograph slippers, design of catenaries and pantographs, measurement of the pantograph contact pressure and wear of contact wires. [German]

Goroskov, J *Zeitschrift der OSSHd* Vol. 20 No. 3, 1977, pp 6-12, 3 Fig., 4 Tab., 1 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Organization for the Collaboration of Railways, Hoza 63/67, Warsaw, Poland

## 13 165051

**CATENARY AND PANTOGRAPH SYSTEMS FOR HIGH SPEED OPERATION [Kettenwerk und Stromabnehmer bei hohen Zuggeschwindigkeiten]**

Description of the AEG-Telefunken catenary/pantograph system and computer aids. The article includes illustrations of the catenary structure. Computer programs provide information on catenary displacement, the forces exerted by the pantograph, breaks in contact with the catenary and the length of these breaks. Diagrams show the results obtained for a specific example with speeds ranging from 40 m/s to 160 m/s. [German]

Fischer, W *Glaser's Annalen ZEV* Vol. 101 No. 5, May 1977, pp 142-148, 11 Fig., 3 Phot., 16 Ref.

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

DOTL JC

## 13 165056

**INCREASING THE LOADING STRENGTH OF COPPER OVERHEAD CONTACT WIRES [Erhoehung der Belastbarkeit von Kupferfahrdrachten]**

A report on laboratory tests on contact wires for an electric traction supply. The purpose was to carry out prolonged testing (1600 hours) to determine damage to their mechanical properties caused by temperature conditions and the tension to which they were subjected. The document gives a detailed account of the very complex statistical analysis by regression and correlation of test results. [German]

Szepek, B Schmidt, P *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 24 No. 1, 1977, pp 159-171, 9 Fig., 5 Tab., 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Hochschule fuer Verkehrswesen Friedrich List, Friedrich List Platz 1, Dresden 801, East Germany

## 13 167513

**CURRENT COLLECTION WITH TWO-STAGE PANTOGRAPHS ON THE NEW PARIS-LYON LINE**

Testing has shown that power can be collected from a catenary at 300 km/h but the Paris South East high-speed route presents special problems because the TGV trainsets must draw power from a heavy 1.5 kV dc catenary at both ends at 200 km/h and from a 25 kV ac catenary at 260 km/h on the new line. A two-stage pantograph will be used for the 25 kV-ac line, combining rapid response of the collector at very high speed with the large variations of contact wire height on existing lines.

Boissonnade, P Dupont, R (French National Railways) *Railway Gazette International* Vol. 133 No. 10, Oct. 1977, pp 392-395, 3 Fig., 4 Phot.

ACKNOWLEDGMENT: Railway Gazette International  
ORDER FROM: ESL

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## 13 167564

**OPERATIONAL EXPERIENCE WITH BRITISH RAILWAYS FIXED EQUIPMENT EMPLOYED ON THE WEST COAST MAIN LINE FROM WEAVER JUNCTION TO GLASGOW**

The West Coast Main Line Electrification between London and Glasgow was commenced under the modernization plan of 1955 and progressed in

sections to completion in 1974. The designs for the overhead contact system and power supply equipment during this period are described together with the experience gained. Overhead contact systems of the 25 kv 50 Hz type are explained for speeds up to 90 km/h, together with high speed systems up to 160 km/h, and proposed modifications for speeds up to 210 km/h. Savings achieved in the cost of construction and maintenance are specified.

Bläke, DC *Elektrische Bahnen* Vol. 48 No. 3, Mar. 1977, pp 72-77

ACKNOWLEDGMENT: EI  
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DOTL JC

13 167567

## GENERATION OF TRACTION CURRENT FOR THE FIRST TIME IN A NUCLEAR POWER PLANT: THE JOINT NUCLEAR POWER PLANT

A 158-Mw railroad-owned 16-2/3 Hz turboset installed beside a three phase current generator in the joint nuclear power plant Neckar is for the first time generating traction current from nuclear energy. The article gives a survey on the layout and interaction of the most important components of the plant which is equipped with a pressurized water reactor (PWR). The operational possibilities of the power plant are described. [German]

Lisson, P (German Federal Railway) *Elektrische Bahnen* Vol. 48 No. 3, Mar. 1977, pp 58-66, 8 Ref.

ACKNOWLEDGMENT: EI  
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13 167936

## A.C. TRACTION COMES OF AGE

Although British Rail adopted 50 Hz a.c. traction 21 years ago, questions about whether the choice is right are still asked. Despite successes like the West Coast main line, electrification still goes in fits and starts. The author examines some of the technical and policy problems in ensuring a policy of continuity.

Cooper, B *Electrical Review* Vol. 201 No. 5, July 1977, p 16, 1 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: IPC Electrical-Electronic Press Limited, Dorset House, Stamford Street, London SE1 9LU, England

13 167944

## PROBLEMS IN THE ELECTRIFICATION OF RAILROADS

An historical analysis is given of the development of the idea of railroad electrification. The question is raised of the necessity of increasing the voltage of the network supplying the electric locomotive.

Kostenko, MP Voronin, AV Portselan, AA Tamazov, AI *Power Engineering (USSR Translation)* Vol. 14 No. 3, 1976, pp 44-48

ACKNOWLEDGMENT: EI  
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13 167997

## ANALYSIS OF ELECTRIFIED GROUND TRANSPORTATION NETWORKS

The analysis of a transportation network presents two special problems: the positions of its electrical loads are continually changing; and some or all of it may operate at dc while the parent network in which it is imbedded and from which it draws its power, operates at 60 Hz. When confronted with these problems conventional power system analysis procedures become either inapplicable or inconvenient to use. This paper presents alternative methods and computer algorithms that are better suited to the analysis of transportation networks.

Talukdar, SN (Carnegie-Mellon University); Koo, RL *IEEE Transactions on Power Apparatus and Systems* Vol. PAS No. 1, Jan. 1977, pp 240-247

ACKNOWLEDGMENT: EI  
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DOTL JC

13 169957

## CATENARY RENEWAL

After 13 years and with 138 trains now operating in each direction daily, the Japanese National Railways is planning to replace the original catenary of

the New Tokaido Line with an installation of greater size and strength. This tensioned, compound catenary will be replaced without interfering with traffic. This article describes the large-scale renovation plan and explains the methods and equipment used for the work.

Shiina, K *Japanese Railway Engineering* Vol. 17 No. 2, 1977, pp 10-11, 2 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Japan Railway Engineers' Association, 2-5-18 Otemachi, Chiyoda-ku, Tokyo, Japan

DOTL JC

13 169984

## OVERVOLTAGE SURGE PHENOMENA ON THE 3 KV DC OVERHEAD TRACK EQUIPMENT OF THE SOUTH AFRICAN RAILWAYS

In an effort to clarify certain problems being experienced on the electrified sections of the South African Railways, an automatic surge recording station was installed at Olifantsfontein on the main line between Pretoria and Johannesburg. The station served to measure and record any transient overvoltages in the section and to correlate these with lightning activity in the area. Data was accumulated over a three-year period of measurement and the results presented in the paper are considered to be representative of what might be anticipated in a severe lightning season. Although the resultant analysis indicates that the system may be adequately protected as far as overvoltages are concerned, the observed oscillatory nature of the surges could be a potential hazard to the system insulation.

Eriksson, AJ (Council for Scientific & Indust Res, South Africa); Gay, R *South African Inst of Electrical Eng's Transactions* Vol. 68 No. 7, July 1977, pp 159-171, 5 Ref.

ACKNOWLEDGMENT: EI  
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13 169993

## WILL ELECTRICITY POWER TOMORROW'S TRAINS?

The electric locomotive offers long term cost and performance advantages despite the high initial cost of converting from diesel power. Amtrak is going ahead with an electrification program in the Northeast Corridor and Conrail is considering several other projects. Rising fuel oil costs plus predicted continued inflation may spur an even stronger move to electric.

Aronson, RB *Machine Design* Vol. 49 No. 8, Apr. 1977, 5 pp

ACKNOWLEDGMENT: EI  
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13 170110

## RAILROAD ELECTRIFICATION: THE ISSUES

This publication contains the presentations at the TRB Conference on Railroad Electrification: The Issues in June 1977 and at the TRB Annual Meeting in January 1977. The following papers are included: The Advantages of Electrifying the Nation's Railroads; Amtrak's View of Railroad Electrification; An Examination of some Economic Obstacles to Electrification; Electrification and Railroad Organization and Operations; Financial Considerations of Railroad Electrification; Implementing an Electrification Program: The Northeast Corridor Improvement Project; Utility Service to Electrified Railroads; Canadian Railway Electrification Study: Phase 1; Locomotive Costs: A Railroad Electrification Issue; Maintenance and Capital Costs of Locomotives; Maintenance of Diesel and Electric Motive Power; Capital and Maintenance Costs for Fixed Railroad Electrification Facilities; Interference of Electrification with Signaling and Communication Systems; Impact of Research and Development on Railroad Electrification; A Railroad View of Electrification; An Economic View of Railroad Electrification; A Financial View of Electrification; A Government View of Electrification.

Proceedings of a conference sponsored by the Transportation Research Board, held June 13-15, 1977, in Washington, D.C.

*Transportation Research Board Special Report* No. 180, 1977, 85 pp, Figs., Tabs., Refs.

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13 170454

**DYNAMICS OF A HIGH-SPEED SLIDING POWER COLLECTOR IN CONSIDERATION OF SLIDING FRICTION**

Considering the sliding friction force produced between a contactor and a rigid collecting rail with a randomly wavy surface, the paper deals with the dynamics of a sliding power collector for a very-high-speed railway (300-500 km/hr). An analytical model is formulated, which has two contact points and takes into account the pitching of a contactor, the stiffness of the sliding direction in a contactor support system, and the nonlinearity of the contact stiffness between a contactor and a rail. Mainly, the influences of the sliding friction and the contact stiffness on the dynamic characteristics, i.e., the etc., are investigated. The equivalent linearization etc., are investigated. The equivalent linearization technique is applied in the analysis. To verify the analytical results, digital simulations are carried out by preparing the artificial collecting rail wave.

Paper for Meeting, September 26-30, 1977.

Yoshida, K (Keio University, Japan); Shimogo, T  
American Society of Mechanical Engineers Pap n 77-DET-93, 1977, 9 pp, 6 Ref.

ACKNOWLEDGMENT: EI  
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13 170574

**ELECTRIFICATION STUDY OF BESSEMER AND LAKE ERIE RAILROAD MAIN LINE--CONNEAUT TO NORTH BESSEMER**

This study covers a 140-mile railroad and would involve a 50-kv catenary installation over 190 track miles carrying 27 million gross tons annually. A hybrid locomotive consisting of an electric/diesel-electric combination would be used. Costs of the various subsystems are given, along with projected maintenance and operating costs of the proposed electric and current diesel-electric operation. Although return on investment is found to be minimal, impending ecological and fuel-supply problems lead to a proposal for pilot electrification.

Bessemer and Lake Erie Railroad Company Feb. 1975, 25 pp, 3 Fig.

ACKNOWLEDGMENT: Bessemer and Lake Erie Railroad Company  
ORDER FROM: Bessemer and Lake Erie Railroad Company, Industrial Engineering Department, Pittsburgh, Pennsylvania, 15230  
DOTL TF859.Z5 B48

13 170575

**COST EFFECTIVENESS OF RESEARCH AND DEVELOPMENT RELATED TO RAILROAD ELECTRIFICATION IN THE UNITED STATES**

The object of this report is to determine the impact of research and development on railroad electrification in the United States. It is presumed that electrification is economically viable and that a prior commitment has been made to electrifying the high density mainlines. Research and development topics are identified from a series of government/industry workshops. Those near-term and mid-term topics found to have major impact include substation and railroad/utility interface improvements to reduce energy costs, improvements in catenary design and construction techniques, improvement in locomotive power density and adhesion, and reduction in electromagnetic interference. Their impact on a postulated network is measured by the savings which could accrue if the research and development accomplishments were implemented when available. Additional non-hardware topics identified for the near term include system engineering, standards, and socio-economic and environmental impact. Far-term topics identified include linear motors and brakes, dc electrification, and improvements for electrification of lighter density routes. The cost benefits of dc electrification for the second increment of the postulated network are presented.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C.

Raposa, FL Spenny, CH  
Transportation Systems Center Intrm Rpt. DOT-TSC-FRA-77-22, Dec. 1977, 166 pp, 14 Fig., Tabs., 4 App.

ACKNOWLEDGMENT: FRA  
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15 158981

**BART IMPACTS ON HIGHWAY TRAFFIC AND TRANSIT RIDERSHIP**

The 71-mile Bay Area Rapid Transit (BART) System, serving San Francisco, Oakland, Berkeley, and their suburbs, is the first regional-scale rapid transit system to open in the United States in over 50 years. This report is one of a series assessing the impacts of BART on transportation and travel in the Bay Area. The report documents what changes in aggregate highway traffic volumes, traffic congestion, bus ridership, and bus services have taken place in the four years since BART started service; and assesses the extent to which these changes may be attributable to BART. (Color illustrations reproduced in black and white.)

Sponsored in part by Department of Housing and Urban Development, Washington, D.C.

Sherret, A Fan, H

Peat, Marwick, Mitchell and Company, Urban Mass Transportation Administration, Metropolitan Transportation Commission, Department of Housing and Urban Development, (UMTA-CA-09-0025) Tech Memo DOT-BIP-TM-20-3-76, May 1977, 165p

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS

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15 163735

**RAILWAYS AND THE FUTURE OF LARGE CITIES**

The author, who is Managing Director (Railways) on the London Transport Executive, refers to the predictable expansion of cities in the next half-century; the outstanding importance of a good transport network in support of this expansion; the immense advantages of the railway, which can ensure high capacity transport at relatively high speed, without unacceptable disfigurement of the environment, and with superior efficiency in the use of energy and space. He concludes that a common planning process is required for movement in an urban area, with rail-borne and road-borne transport each contributing in the areas where they are most efficient.

Robbins, RM (London Transport Executive) *Rail International* Vol. 8 No. 6, June 1977, pp 291-294

ACKNOWLEDGMENT: International Union of Railways, BD

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15 164436

**EVIDENCE OF LAND USE IMPACTS OF RAPID TRANSIT SYSTEMS**

This paper draws from the findings of published empirical studies and observations of the impacts of rapid transit systems on urban development. Analysis is based on comparisons of impact findings by different researchers and for different cities. An initial set of key issues is proposed, against which available information is arrayed and compared. It is concluded that rapid transit can have substantial growth-focusing impacts, but only if other supporting factors are present.

Knight, RL Trugg, LL (De Leuw, Cather and Company) *Transportation (Netherlands)* Vol. 6 No. 3, Sept. 1977, pp 231-248

ACKNOWLEDGMENT: Transportation (Netherlands)

ORDER FROM: ESL

DOTL JC

15 166321

**RURAL COMMUNITIES: THE TRANSPORTATION DILEMMA**

In addressing transportation considerations in rural development, an effort has been made to highlight some of the major areas of difficulty associated with the provision of an adequate transportation system to facilitate growth in nonmetropolitan areas. Transportation is a very necessary condition for rural development, but an adequate transportation infrastructure is not sufficient for that development to take place. The report discusses the growth of light industry, changes in transportation mode such as rail to trucking, and population shifts.

Hart, RK

Boise State University, Idaho Sept. 1976, 96 pp

ACKNOWLEDGMENT: NTIS

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PB-267790/4ST, DOTL NTIS

15 166510

**TRANSPORTATION IN AMERICA'S FUTURE: POTENTIALS FOR THE NEXT HALF CENTURY. PART 1. SOCIETAL CONTEXT**

The report describes four potential socioeconomic futures for the United States and their implications for transportation through 2025. The futures--designated Success, Foul Weather, Disciplined Society, and Transformation--vary particularly in economic performance, climate, institutional structure, and personal values. For each future, Part 1 provides a detailed narrative account or scenario, accompanied by separate analyses of the energy, demographic, economic, and urban implications of each scenario. Part 2 provides demand forecasts for most modes; technology forecasts for twelve transportation modes and seven specific systems or technologies; and analyses of six critical transportation problems.

See also Part 2, PB-270 468.

Curry, D Carlson, R Henderson, C Mandel, T Mitchell, A  
Stanford Research Institute, Department of Transportation, (SRI-URU-5040) Final Rpt. DOT/TPI/20-77/21-1, June 1977, 131 pp

Contract DOT-OS-60160

ACKNOWLEDGMENT: NTIS

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PB-270467/4ST, DOTL NTIS

15 167108

**MARTA TUNNEL CONSTRUCTION IN DECATUR, GEORGIA-A CASE STUDY OF IMPACTS. PHASE II**

The focus of this report is on the assessment-forecasting relationship, namely, how to assess impacts and then to illustrate how those actual impacts could have been forecast. This report presents a case study conducted in Decatur, Georgia, in order to assess the disruptive effects associated with the construction of rapid transit tunnels for the Metropolitan Atlanta Rapid Transit Authority (MARTA) East Line. This case study has three objectives: (1) to pilot test the assessment methodology developed, (2) to refine the methodology as a forecasting tool; and (3) to develop mitigation procedures. A socio-economic profile of Decatur is presented. Impacts of the construction are considered, both in general and specific terms.

See also report dated Jun 76, PB-256 848.

Wolff, BC Scholnick, PH

ABT Associates, Incorporated, Urban Mass Transportation Administration, Transportation Systems Center UMTA-MA-06-0025-7714, AAL-77-18, June 1976, 138 pp

Contract DOT-TSC-108

ACKNOWLEDGMENT: NTIS

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15 167320

**VALUE CAPTURE AND JOINT DEVELOPMENT APPLICATIONS: CHICAGO/LOUISVILLE/LOS ANGELES**

The study presents highlights of findings, defines how value capture can be implemented, describes important legal, financial and community design issues associated with the value capture concept and summarizes the conclusions reached and the methodology employed in this research. In recognition of the diversity of legal, political, economic and physical situations in which mass transit development has and will occur, Value Capture Policy has been studied and is presented as an array of options. Central to Value Capture is a set of techniques which can be applied by a transit or community development entity. Each technique is designed to enable the entity to enhance and capture financial and/or community design benefits related to transit system implementation.

See also report dated 1 Nov 74, PB-244 101.

Sharpe, CP

Rice University, Department of Transportation Final Rpt. DOT/TST-77/72, Jan. 1977, 206 pp

Contract DOT-OS-40007

ACKNOWLEDGMENT: NTIS

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PB-272512/5ST

15 167393

**SYSTEMS MODELS FOR TRANSPORTATION PROBLEMS.  
PART II. THE SOCIAL PHYSICS FOR MODERN SOCIETIES:  
THE ROLE OF THE CITIES**

The objective of the research was to make use of a physically based social systems model, developed earlier, to study the determinants of city sizes and their national interactions. In particular, information on the role of a transportation system in affecting city sizes was required. In this second part, the relation between the urban settlements and a potential mapping that is related to the land (its population density, material and energy resources, activities, products, and consumption) is outlined. The dependence of the urban settlement distribution on long-distance international trade is discussed. The emergence of a new major social institution, the large corporation which is competitive with the urban settlement, is discussed. The socio-economic effects of transportation systems, and their modernization is described.

See also Part 1 dated Sep 77, PB-272 795.

Iberall, AS Cardon, SZ

General Technical Services, Incorporated, Transportation Systems Center  
Final Rpt. DOT-TST-OST-77-34.II, Sept. 1977, 161 pp

Contract DOT-TSC-1157

ACKNOWLEDGMENT: NTIS

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15 167601

**IMPACT OF TRANSIT LINE EXTENSION ON RESIDENTIAL  
LAND USE. ABRIDGMENT**

The purpose of this paper is to investigate the effectiveness of zoning regulations in controlling residential land development in a community that is served by a new extension line of a high-speed rail rapid transit system. A mathematical model was established to determine the significant variables that explained the rapid development that took place in Quincy, a suburb of Boston. In the transit impact study, travel time, zoning policy and public transportation service variables were used in this model. Data was also collected for the period 1963-1973 and stratified by traffic analysis zone. The impact of transportation on each analysis zone was measured by the transportation service variables. Multiple linear regression analyses were performed on various linear and log-linear transformations for the variables. The mathematical model for the city of Quincy illustrated that residential land development will be stimulated by the construction of the new extension line of the rapid transit system. Land developers will begin construction of new housing units with construction of the new transit line if initiated, and will not wait until the line is open for service. Zoning regulation is a significant mechanism for controlling the location and type of land development. Neighborhoods that are primarily zoned for single and two-family dwelling units are particularly vulnerable to rapid change in neighborhood character, if zoning a regulation permits construction of medium and high-density units. Since transit service variables are not statistically significant variables, they have no quantifiable impact on land development.

From TRB Record 627, Rail Transit.

Ossenbruggen, PJ (New Hampshire University); Fishman, MJ (Penney (JC) Company) *Transportation Research Record* No. 627, 1977, pp 10-13, 2 Fig., 3 Ref.

ORDER FROM: TRB Publications Off

15 168007

**ALTERNATIVE ROLES OF TRANSPORTATION IN URBAN  
PLANNING**

This paper explores the function of transportation in modern urban life, and suggests the more active use of transportation investment planning as a tool for advancing urban planning objectives other than the satisfaction of estimated travel demand. Since unrestrained supply of transportation facilities to meet projected desires appears to be likely to fail both in environmental preservation and the long-term satisfaction of travel demand, strategies for reduction and redirection of that demand are emphasized.

Knight, RL (De Leuw, Cather and Company) *Water, Air and Soil Pollution*  
Vol. 7 No. 2, Feb. 1977, pp 215-220, 3 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

15 168902

**THE IMPACT OF BART'S BOND ISSUE ON REGIONAL PUBLIC  
FINANCING**

This report documents the study of the impact of BART's General Obligation bond financing on the cost of public borrowing in the San Francisco Bay Area and the study of the magnitude of the debt on the financing of other public projects. The study comprises a statistical search to see if borrowing cost changes appear related to the level of BART debt, and a series of interviews and surveys among leaders in the municipal bond industry to see what, if any, impact they perceived in the 1962-1972 period. Methodology, results and findings are reported. (Color illustrations reproduced in black and white)

Prepared by Bartle Wells Associates, San Francisco, Calif. Prepared in cooperation with McDonald and Greffe, Inc., San Francisco, Calif. Sponsored in part by Department of Housing and Urban Development, Washington, D.C.

O'Neil, RK Long, CA

Metropolitan Transportation Commission, Bartle Wells Associates,  
McDonald and Greffe, Incorporated, Department of Transportation,  
Department of Housing and Urban Development Tech Memo  
DOT-BIP-TM-27-7-77, Aug. 1977, 142 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS

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PB-273387/1ST, DOTL NTIS

15 168903

**IMPACTS OF BART ON BAY AREA POLITICAL INSTITUTIONS**

The report describes the impacts of BART upon local political institutions. It describes the effects of BART and BART related phenomena upon the process of political mobilization, political organization, and local political activity within two case study communities proximate to BART stations. Policy implications of the research findings are also included.

Prepared by Jefferson Associates, Inc., San Francisco, Calif. Sponsored in part by Department of Housing and Urban Development, Washington, D.C.

Duster, T

Metropolitan Transportation Commission, Jefferson Associates,  
Incorporated, Department of Transportation, Department of Housing  
and Urban Development Tech Memo DOT-BIP-TM-32-6-77, May  
1977, 60 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-273389/7ST, DOTL NTIS

15 168906

**IMPACTS OF BART ON BAY AREA INSTITUTIONS OF  
HIGHER EDUCATION AND THEIR STUDENTS**

This report describes the impacts of BART upon institutions of higher education and student life styles. It provides findings on the impact of BART and mass transit systems on financial and physical considerations by campus administrators, and on choices of campus selection and life routines by students of 'commuter' campuses, at ten selected universities and colleges in the San Francisco Bay Area.

Prepared by Jefferson Associates, Inc., San Francisco, Calif. Sponsored in part by Department of Housing and Urban Development, Washington, D.C. Report on BART Impact Program.

Lunsford, T

Metropolitan Transportation Commission, Jefferson Associates,  
Incorporated, Department of Transportation, Department of Housing  
and Urban Development Tech Memo DOT-BIP-TM-31-6-77, May  
1977, 95 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-273396/2ST, DOTL NTIS

15 168922

**THE IMPACT OF BART ON THE COMPETITIVE ADVANTAGE  
AND EFFICIENCY OF BAY AREA BUSINESS OPERATIONS**

This technical memorandum evaluates the economic effects of BART's transportation service on the competitive advantage and efficiency of Bay



Area business operations. The scope of the analysis includes potential economic impacts resulting from improved transportation service and accessibility for workers to jobs, impacts of regional competitive advantage due to locational advantage or regional image, and possible economic efficiencies associated with BART service. The study methodology, which is also documented, includes a shift/share analysis of Bay Area employment since 1962, extensive interviews with industrial and commercial Decision makers, and four case studies. (Color illustrations reproduced in black and white).

Prepared by McDonald and Grefe, Inc., San Francisco, Calif. Sponsored in part by Department of Housing and Urban Development, Washington, D.C.

Grefe, R McDonald, AN Chase, E McLeod, D  
Metropolitan Transportation Commission, McDonald and Grefe,  
Incorporated, Department of Transportation, Department of Housing  
and Urban Development Tech Memo DOT-BIP-TM-26-7-77, Aug.  
1977, 123 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-273485/3ST, DOTL NTIS

#### 15 170445

#### CHICAGO URBAN TRANSPORTATION PLANNING

The Central Area of Chicago presents a unique opportunity to carry out a carefully planned rapid transit system. The Chicago Urban Transportation District--formed to design and construct the Central Area Transit Project--subscribes to sound land-use policies and is actively working with the City and the private sector to encourage development of land areas adjacent to the proposed transit facilities to their highest and best use. In 1975, partially in response to the need to update the original transit plan, especially in the areas of land use and travel behavior and patterns, the District began a project specific transit planning effort called the Transportation Engineering Program (TEP). The TEP provides assistance in staging and sequencing the Core System, planning, and close coordination with other transportation planning.

*ASCE Journal of the Urban Plan and Develop Div* Vol. 103 No. UP1, Proc Paper 13075, July 1977, pp 53-67, 2 Ref.

ORDER FROM: ESL

DOTL JC

16 151266

**TRANSPORTATION ENERGY CONSERVATION DATA BOOK**

Statistics which characterize the major transportation modes are assembled and displayed, and data on other factors which influence the transportation sector in the nation are presented. Statistical data on energy use in the transportation sector are presented in the form of tables, graphs, and charts. The following topics are covered in six chapters: Characteristics of Transportation Modes; Energy Characteristics, including energy consumption by source and by sector and energy intensiveness; Conservation Alternatives; Government Impacts, including expenditures, regulations and research, development, and demonstration spending; Energy Supply, including domestic petroleum production, prices, and projections; and Transportation Demand, including population characteristics and economic determinants. A bibliography of data sources is provided at the end of each chapter. A more general bibliography glossary, and subject index are included at the end of the book. (ERA citation 02:007439)

Loebl, AS Bjornstad, DJ Burch, DF Howard, EB Hull, JF  
Oak Ridge National Laboratory, Energy Research and Development  
Administration 263 pp

Contract W-7405-ENG-26

ACKNOWLEDGMENT: NTIS

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ORNL-5198, DOTL NTIS

16 153246

**HYDROGEN'S POTENTIAL AS A VEHICULAR FUEL FOR TRANSPORTATION**

Results of a study prepared by Exxon Research and Engineering Company on hydrogen's potential as a vehicular fuel for transportation are analyzed in view of recent developments with metal hydride storage techniques and with increased engine operational efficiencies. An unpublished technology assessment by Battelle-Columbus Laboratories is also reviewed. It is shown that although compressed gas or cryogenic hydrogen generated from coal cannot compete with other conventional fuels, metal hydride storage systems and increased engine efficiencies may bring about a feasible energy alternative for transportation.

Proceedings of the Effects of Hydrogen on Behavior of Mater Conference, Moran, Wyoming, September 7-11, 1975.

Billings, RE (Billings Energy Research Corporation)  
American Inst of Mining, Metallurg & Petrol Engrs Proceeding 1976, pp  
18-33, 18 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

16 157877

**CHARACTERIZATION OF THE U.S. TRANSPORTATION SYSTEM: DOMESTIC AIR TRANSPORTATION (PASSENGERS AND CARGO), HIGHWAY TRANSPORTATION (AUTOS, TRUCKS, BUSES, MOTORCYCLES, BICYCLES), PIPELINE TRANSPORTATION SYSTEMS (PETROLEUM, NATURAL GAS, WATER), RAILROADS (FREIGHT AND PASSENGER), URBAN RAIL TRANSIT, AND WATER TRANSPORTATION OF FREIGHT**  
These internal working papers provide data on the physical state, use, economics, and energy consumption and intensity of the U.S. transportation system, including these modes of transportation: air transportation, highway transportation, pipeline transportation, railroads, urban rail transit, and water transportation.

Aerospace Corporation July 1976, 487 pp, 71 Ref.

ACKNOWLEDGMENT: Transportation Energy Conservation Data Book

ORDER FROM: NTIS, GPO

DOTL NTIS

16 159165

**ENERGY CONSERVATION: TRANSPORTATION (A BIBLIOGRAPHY WITH ABSTRACTS)**

The potential to achieve fuel conservation through technology, management, and planning is discussed. Transportation areas covered include urban mass transit, aviation, marine transportation, automobiles, trucks, and railroads. A few abstracts discuss public attitudes concerning conservation measures.

Supersedes NTIS/PS-76/0402, and Updates NTIS/PS-75/214, and COM-74-11138.

Hundemann, AS

National Technical Information Service Bibliog. June 1977, 208 pp, 203 Ref.

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

NTIS/PS-77/0395/2ST, DOTL NTIS

16 159216

**PROJECT INDEPENDENCE EVALUATION SYSTEM (PIES) DOCUMENTATION. VOLUME II. PIES ECONOMETRIC DEMAND MODEL**

The report describes the structure of the energy demand model of the Project Independence Evaluation System. The demand model consists of several econometric submodels which describe regional final demand for various refined petroleum products, natural gas, electricity, and coal. There are separate submodels for household, commercial, industrial, and transportation sectors of the economy. (Fuel consumption by electric utilities is not considered part of final demand and is modeled separately.) This report describes the overall organization of the demand model, and discusses both the econometric results and the simulation conventions.

See also Volume 1, PB-263 020.

Federal Energy Administration FEA/N-76/412, Sept. 1976, 47 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265822/7ST, DOTL NTIS

16 159217

**PROJECT INDEPENDENCE EVALUATION SYSTEM (PIES) DOCUMENTATION. VOLUME XIII. COAL AND ELECTRIC UTILITY CONVENTIONS FOR PIES**

This report provides a detailed annotated listing of the assumptions made in PIES regarding coal supply and electric utility operation. The data include price assumptions for coal mines of different types, and capacity figures by fuel and load type for electric utility plants.

See also Volume 9, PB-265 772.

ICF, Incorporated, Federal Energy Administration FEA/N-76/423, Sept. 1976, 60 pp

Contract FEA-CO-03-60466-00

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-265824/3ST, DOTL NTIS

16 159364

**ENERGY STATISTICS: A SUPPLEMENT TO THE SUMMARY OF NATIONAL TRANSPORTATION STATISTICS**

This report is a compendium of selected time-series data describing the transportation, production, processing, and consumption of energy. It contains such items as the revenues and expenses of oil pipeline companies, number and capacities of U.S. tank ships, and the total crude oil transported in the U.S. by method of transportation; growth over time of the U.S. oil and natural gas reserves, refinery capacity, and yields; and trends in the demand for fuel and power.

See also report dated Aug 75, PB-252 612.

Gay, WF

Transportation Systems Center DOT-TSC-OST-76-30, Aug. 1976, 144 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-269301/8ST, DOTL NTIS

16 163721

**FORECASTS OF ENERGY CONSUMPTION BY ELECTRIFIED RAILWAYS [Prognozirovanie elektropotrebleniya elektrificirovannyh zheleznnyh dorog]**

The authors describe long and short-term forecasting methods for electric energy consumption, and give guidelines for a more accurate forecast. [Russian]

German, LA Vestnik Vniizt No. 3, 1977, pp 1-6, 1 Fig., 2 Tab., 5 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

16 163869

**THE IMPLICATIONS OF OIL RESOURCES DEPLETION FOR URBAN PASSENGER TRANSPORT INVESTMENT**

An investigation into the implications of energy consideration for long-term urban transport planning is reviewed. The results obtained were reported in a series of working papers on urban transport planning and energy, and a monitoring study of rail commuting on Merseyside with particular reference to the effects of increases in the price of petrol. These working papers are discussed. It is suggested that of the many areas considered for further study, long-term aspects of transport energy should be investigated with a view to developing the techniques employed in the study. For the work into short-term aspects, it is considered that monitoring could be further developed as an addition to the formulation of urban transport policy. /TRRL/

Maltby, D (Salford University, England) *Traffic Engineering and Control Analytic* Vol. 18 No. 4, Apr. 1977, pp 206-207, 7 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 226760)

ORDER FROM: ESL

DOTL JC

16 163873

**HOW MUCH FUEL DOES A TRAVELLER USE? A COMPARATIVE STUDY OF THE ENERGY REQUIRED FOR PASSENGER TRANSPORT BY CAR, BUS AND RAILWAY**

[Hoeveel brandstof gebruikt een reiziger? Een vergelijkende studie van het benodigde energieverbruik voor reizigersvervoer per auto, bus en trein]

The energy consumption of different types of trains, buses and five cars of different price categories is studied. The question is directed towards the comparison of the energy consumption per traveller kilometer in certain traffic situations. For this reason a division is made between transport in urban areas and transport over long distances. The results presented are obtained by a computer simulation, from which the model is obtained. /TRRL/ [Dutch]

Bleecke, JA Burgt, GJ (Delft University of Technology, Netherlands) *Rijwiel-en Auto-Industrie* Monograph Dec. 1976, 69 pp, 23 Fig., 7 Tab., 32 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 227169), Institute for Road Safety Research

ORDER FROM: Rijwiel-en Auto-Industrie, Europaplein, Amsterdam, Netherlands, s

16 164449

**ENERGY PERFORMANCE OF HIGH SPEED GROUND TRANSPORTATION SYSTEMS**

The energy-efficiency of current and proposed transportation systems has been analyzed within a uniform framework which includes energy requirements that relate to the support of weight (L/D ratio) and the energy associated with speed. The study includes automobiles, railways, aircraft, maglev, TACV, TRACV. Other considerations such as cost, viability, growth and transportation policy are discussed briefly. This study forms part of an ongoing program to assess the suitability of specific transportation systems in light of present and future needs.

Sponsored by the Department of Energy, Mines and Resources and the National Research Council, Canada.

Meyer, RF (Auckland University, New Zealand) *Carleton University, Canada* ERG-76-1, Feb. 1976, 63 pp, 7 Fig., 14 Tab., 33 Ref.

ORDER FROM: Carleton University, Canada, Energy Research Group, Mackenzie Building, Room 218, Ottawa, Ontario, Canada

16 165058

**FACTORS INVOLVED IN ENERGY CONSUMPTION AND SAVINGS IN RESOURCES [Fakторы ekonomii i pererashoda energoresursov]**

The author analyses the major factors involved in power and fuel consumption in the main railway departments. He also gives recommendations for making better use of energy resources. [Russian]

Ovcinnikov, FE *Zheleznodorozhnyi Transport* No. 7, 1977, pp 36-43

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmanaya ul. 2, Moscow B-174, USSR

16 165077

**PROCEEDINGS OF THE THIRD NATIONAL CONFERENCE ON "EFFECTS OF ENERGY CONSTRAINTS ON TRANSPORTATION SYSTEMS"**

A five day conference on "The Effects of Energy Constraints on Transportation Systems" was held during the first week of August, 1976 (Aug. 2-6) at the Union College Campus. Topics of discussion included: historical and forecast trends of energy consumption within the transportation sector; energy intensiveness of various modes of transportation; motivations and strategies for energy conservation plans; effects of various urban patterns on personal travel needs; innovative technological modes of transportation from the energy viewpoint. Possible improvements in auto design and engine; innovative technological modes of transportation from the energy viewpoint; Interrelationships of environment, energy, and transportation; Possible Research topics; and Role of federal, state, and local agencies. The seminar was composed of a series of lectures, panel discussions and question and answer sessions. Distinguished lecturers from various universities, research organizations, companies, consulting firms and government (federal and state) agencies were invited to participate. The major emphasis of the conference was on "Conservation Options and Strategies for Implementation". It is expected that the conference helped to disseminate energy data and find ways for conserving energy within the transportation sector.

Sponsored by ERDA, Transportation Energy Conservation Division. Contract Monitor for the proceedings was Dr. Daniel Maxfield, ERDA, Washington, D.C.

Mittal, RK

Union College Proceeding May 1977, 408 pp, Refs.

ACKNOWLEDGMENT: Energy Research and Development Administration  
ORDER FROM: GPO

S/N-060-000-00073-5

16 166149

**FUEL CONSUMPTION: TRANSPORTATION (A BIBLIOGRAPHY WITH ABSTRACTS)**

Fuel consumption by automobiles, trucks, buses, and general aviation aircraft is discussed. Topic areas cover the effect of road conditions, traffic conditions, and emission controls on fuel economy; projected growth and problems facing air transportation; energy efficiency of various urban transportation modes; energy use forecasts; and projections of supply and demand in the transportation sector. Bibliographies on fuel consumption in the industrial, residential, and commercial sectors and on electric power consumption are also available. (This updated bibliography contains 230 abstracts, 95 of which are new entries to the previous edition.)

Supersedes NTIS/PS-76/0475, and NTIS/PS-75/342. Updates COM-74-11102.

Hundemann, AS

National Technical Information Service July 1977, 235 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

NTIS/PS-77/0552/8ST, DOTL NTIS

16 166685

**TRANSPORTATION ENERGY CONSERVATION DATA BOOK: SUPPLEMENT II**

This document is Supplement II to Edition I of the Transportation Energy Conservation Data Book, EAPA 3:0527, which was published in October, 1976, by Oak Ridge National Laboratory. The series of documents is intended to provide a desk-top reference for use by the Transportation Energy Conservation Division of the Energy Research and Development Administration. The supplements contain statistics which update and augment data presented in Edition I. Tables, graphs, and other visuals are used to present statistical data on energy use and related activity of the transportation sector. Data in this supplement concentrate on personal travel characteristics and fuel economy options for automobiles. A list of references is provided and an annotated bibliography and glossary is included at the end of this supplement. (ERA citation 02:034593)

Shonka, DB

Oak Ridge National Laboratory, Energy Research and Development Administration Feb. 1977, 79 pp

Contract W-7405-ENG-26

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

ORNL-5247

**16 166778****ENERGY EFFICIENCY IMPROVEMENT TARGET  
TRANSPORTATION EQUIPMENT INDUSTRY (SIC 37)**

No abstract available.

Set includes PB-270 068 thru PB-270 070.

Kearney (AT) and Company, Incorporated, Federal Energy Administration 1976, 823 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-270067-SET/ST

**16 167397****RAILROADS AND THE ENVIRONMENT: ESTIMATION OF  
FUEL CONSUMPTION IN RAIL TRANSPORTATION. VOLUME  
II. FREIGHT SERVICE MEASUREMENTS**

Fuel consumption measurements have been carried out in cooperation with several railroads for a variety of types of revenue freight service. Intermodal operations have been emphasized, but this report also includes studies relating to branchline and general freight movements. The wide range of operating parameters examined includes train speed, weight, length, type, power-to-weight ratio, and terrain. In particular, this report describes the test conditions, operating parameters and fuel usage indices for 80 separate line-haul movements on six different railroads, covering 53,000 train miles. Trailer-On-Flatcar (TOFC) service predominates, but several manifest freights, two unit coal trains, and two COFC trains are included. Branchline service is also reported and analysed for six 174-mile round trips.

See also Volume 1 dated May 75, PB-244 150.

Hopkins, JB Newfell, AT  
Transportation Systems Center, Federal Railroad Administration Final  
Rpt. DOT-TSC-FRA-77-11, FRA/ORD-75/74.II, Sept. 1977, 46 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-273277/4ST

**16 167516****INTERCITY PASSENGER MODAL SHIFTS AS AN ENERGY  
CONSERVATION OPTION**

This report deals with the study of various policies which effect energy savings in intercity passenger movement. Presently ninety-nine percent of all fuel consumed in intercity passenger travel is by auto and air modes. FEA is concerned with studying the regulatory, modernization, operational efficiencies and intermodal shifts which have potential for energy savings. This paper deals with the strategies for mode shifts. Two corridors-North East and California are studied and results documented. Twenty two scenarios (eighteen individual strategies and four combinations) were modeled for the 1982 time frame. Individual strategies include: Adjustments of air fares through regulatory or tax actions; Rail and Bus fare reductions; Auto cost increases; Rail and Bus block time improvements; Reduced auto availability; and reduced air service frequency. Results of various strategies studied are well documented.

Proceedings of the Third National Conference (Conf-760895), Effects of Energy Constraints on Transportation Systems, Union College, Schenectady, New York, August 2-6, 1976. Entire volume of Proceedings in RRIS, 165077; RRIS Bulletin 7801.

Bowles, RL (Federal Energy Administration)

Energy Research and Development Administration May 1977, pp  
323-335, 5 Fig.

ACKNOWLEDGMENT: Energy Research and Development Administration

ORDER FROM: GPO

GPO 060-000-00073-5

**16 167517****INTERCITY FREIGHT FUEL UTILIZATION AT LOW PACKAGE  
DENSITIES-AIRPLANES, EXPRESS TRAINS AND TRUCKS**

This report provides a comprehensive air energy usage data for low package densities. It is emphasized that all modes do not compete in all markets and indeed modes are complementary. Mode selection varies with the specifics of each transportation requirement: trip length, market size, transport time, commodity characteristics, etc. The major objective of this paper is to

explore the relationship between energy conservation and value of transportation. Several aspects of modal energy analysis are examined, including the impact of freight density on modal trip energy comparison. Only the operational energy consumption data are analysed. The paper concludes: at average air freight density, typical express trains and typical trucks are respectively 7 and 4 times more fuel efficient than air freighters; because of the significant quantities of freight carried in the bellies of passenger airplanes, air freighters do not necessarily represent a correct base for air cargo; the latter depends upon the passenger airplane trip fuel allocation technique. The results presented in this report are markedly different from those found in published analysis which ignore the characteristics of the markets served by each mode. The author also expounds upon the fact that because of unavailability of good data here, fair energy comparisons have been difficult.

Proceedings of the Third National Conference (Conf-760895), Effects of Energy Constraints on Transportation Systems, Union College, Schenectady, New York, August 2-6, 1976. Entire volume of Proceedings in RRIS, 165077; RRIS Bulletin 7801.

Miller, MP (Boeing Company)

Energy Research and Development Administration May 1977, pp  
269-296, 20 Fig., 4 Tab., 25 Ref.

ACKNOWLEDGMENT: Energy Research and Development Administration

ORDER FROM: GPO

GPO 060-000-00073-5

**16 167518****ENERGY EFFICIENCY OF CURRENT INTERCITY PASSENGER  
TRANSPORTATION MODES**

A detailed study was conducted to compare three public modes (aircraft, train, and bus) and one private mode of transportation (automobile). The comparison represented Spring 1974 conditions and was conducted in two parts. During the first part, basic energy efficiency data were collected or developed for each mode. For the second, these data were applied to passenger transportation between 10 city pairs. These results were extended using national system trends to obtain a comparison for the total city pair population. Results from the study are presented and the importance of establishing clear ground rules to ensure fair comparisons through consistent data is emphasized. Many earlier papers show deficiencies in this respect. Some of these deficiencies will be specifically pointed out in order to explain why this paper's results differ from those of previous papers.

Proceedings of the Third National Conference (Conf-760895), Effects of Energy Constraints on Transportation Systems, Union College, Schenectady, New York, August 2-6, 1976. In addition, this paper was first published by the American Institute of Aeronautics and Astronautics as part of the proceedings of the 1975 annual meeting. Entire volume of Proceedings in RRIS, 165077; RRIS Bulletin 7801.

Miller, MP (Boeing Company)

Energy Research and Development Administration May 1977, pp  
245-268, 23 Fig., 3 Tab., 26 Ref.

ACKNOWLEDGMENT: Energy Research and Development Administration

ORDER FROM: GPO

GPO 060-000-00073-5

**16 167519****THE ENERGY USE OF PUBLIC TRANSIT SYSTEMS**

This report deals with the energy efficiency of various public transit systems. Statistical as well as engineering approaches are discussed with special emphasis on impact of load factor upon energy efficiency. Comparative energy analysis is provided for the following systems: Auto gas (small and large); electric auto (small, large) PRTC (small, large); Commuter rail; Rail Rapid Transit; Trolley; Fixed Route Bus; Express Bus; Demand Responsive Bus and Jitney. Data are tabulated for weight, no. of seats, B.T.U. per vehicle mile, and B.T.U. per passenger mile. The report provides a comprehensive bibliography and documents all the pertinent assumptions inherent in most of the related studies. The report also provides definitions on all the systems discussed.

Proceedings of the Third National Conference (Conf-760895), Effects of Energy Constraints on Transportation Systems, Union College, Schenectady, New York, August 2-6, 1976. Entire volume of Proceedings in RRIS, 1965077. Bulletin 7801.

Healy, TJ (Santa Clara University)

Energy Research and Development Administration May 1977, pp  
179-206, Figs., Tabs., Apps.

ACKNOWLEDGMENT: Energy Research and Development Administration  
ORDER FROM: GPO

GPO 060-000-00073-5

16 167520

# **AN ENGINEERING ANALYSIS AND COMPARISON OF RAILROAD AND TRUCK LINE-HAUL WORK (ENERGY) REQUIREMENTS**

The purpose of this paper is to compare the propulsive work requirements of line-haul movement by rail and truck in order to identify those characteristics of such movements which affect the absolute and relative amounts of energy required. This study includes rail movement in conventional cars, rail movement in truck trailers on flat cars (TOFC or piggyback), and over-the-road movement in various types of trailer trucks. Market or movement situation characteristics such as the weight and size of shipments, the average speed, and route profile conditions are varied. In order to identify the effects of varying mode and market characteristics, the work requirements are estimated using engineering relationships, in contrast to most prior comparisons which have used averaged empirical (statistical) data. These engineering models yield point estimates under certain route profile conditions, while in others where an excessive amount of data on the profile would be required a few route parameters can be used to estimate a range of work requirements. These models should be generally useful in comparing energy requirements of transport modes.

Proceedings of the Third National Conference (Conf-760895), Effects of Energy Constraints on Transportation Systems, Union College, Schenectady, New York, August 2-6, 1976. Entire volume of Proceedings in RRIS, 165077; RRIS Bulletin 7801.

Morlok, EK (Pennsylvania University, Philadelphia)  
Energy Research and Development Administration May 1977, pp 82-107, 8 Fig., 3 Tab., 21 Ref.

ACKNOWLEDGMENT: Energy Research and Development Administration  
ORDER FROM: GPO

GPO 060-000-00073-5

16 167922

# **THE STORM OVER THE CBO REPORT**

Rebuttal is given to the Congressional Budget Office report, "Urban Transportation and Energy: The potential Savings of Different Modes." Administration spokesmen, industry officials, state transportation officers and members of the academic community refute the allegation that new rail-transit systems rate poorly in terms of energy efficiency.

Ichniowski, T *Railway Age* Vol. 178 No. 21, Nov. 1977, p 32, 1 Phot.

ACKNOWLEDGMENT: Railway Age  
ORDER FROM: ESL

DOTL JC

16 167948

# **ENERGY RESOURCES USED AS AN INDEX OF TRANSPORT QUALITY [Ispol'zovanie energoresursov-pokazatel' kachestva transportnoj raboty]**

The authors analyze the work energy indices of rail transport, explain the principal methods for improving electric and diesel locomotive efficiency and take into consideration the system for controlling the quality of energy used for train traction purposes in relation to operating requirements. [Russian]

Deev, VV Murzin, LG *Zheleznodorozhnyi Transport* No. 8, 1977, pp 43-48

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmanaya ul. 2, Moscow B-174, USSR

16 167966

# **INFORMATION SYSTEM FOR TRANSPORTATION ENERGY**

There is a proliferation of data on energy related to transportation. However, their present origin and form render their retrieval and use in decision making quite difficult. Therefore, the framework of an information system for transportation energy consumption is developed and applied. The concept of the upper and lower bounds for parameters that measure socioeconomic and technological trends in relation to transportation energy is utilized in long-term forecasting. The inputs, the transformations, and outputs are clearly but not uniquely defined. Examples of information and forecasts provided by the system developed and useful for policy making are

given the form of tables. However, the benefits of the system developed cannot be appreciated until it is computerized and operated by an interactive computer system. This is a subject of further research and development.

Kouskoulas, V (Purdue University); Goodson, RE Staley, JL *ASCE Journal of Transportation Engineering* Vol. 103 No. 5, Sept. 1977, pp 635-650, 16 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

✓16 168020

# **URBAN TRANSPORTATION AND ENERGY: THE POTENTIAL SAVINGS OF DIFFERENT MODES**

Transportation in cities consumes about 10 percent of all the nation's fuel. Potential savings through shifts in urban transportation policies have generated interest in Congress and elsewhere. This paper describes the energy requirements of alternative urban transport technologies and assesses the effects on urban transport fuel consumption of various programs Congress might consider in order to save fuel. This analysis presents several measures of energy use, ranging from a narrow index of propulsion needs to a broad index of program energy savings. Attempts are made to consider energy needed to build and maintain roads and tracks, vehicles, stations and other facilities. Considered are vanpool, carpool, bus, automobile, rapid transit, light-rail transit and commuter railroad. The authors conclude that rapid transit offers little to aid the nation's efforts to save fuel. This is based on such assumptions as the use of automobiles to reach the rapid transit station by most riders, and circuitous routings of fixed-guideway systems.

A study prepared by the Congressional Budget Office for the Committee on Environment and Public Works U.S. Senate.

Congressional Budget Office Sept. 1977, 81 pp, Tabs., 3 App.

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16 168098

# **ENERGY SAVING IN THE TRANSPORT INDUSTRY**

Energy costs for bus and auto travel are reviewed and compared with rail costs. Comparative statistics show that the bus is the most efficient transport mode in terms of primary energy consumer per passenger mile. An express coach with a 65% load factor is more than twice as efficient as either a diesel or electric inter-city train. Future approaches to passenger transport are cited.

Hinton, S (British Road Federation) *Petroleum Review* Vol. 31 No. 364, Apr. 1977, 4 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

16 169964

# **COAL AS A SOURCE OF FUTURE TRANSPORT FUEL**

No Abstract.

Goodard, K *Chartered Mechanical Engineer* Vol. 24 No. 9, Oct. 1977, pp 50-52, 5 Phot.

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

DOTL JC

16 169974

# **ENERGY REQUIREMENTS. METHOD AND TECHNIQUES FOR PREPARING MODELS [La demande d'energie. Methode et techniques de modelisation]**

The radical changes in the energy situation have led to a proliferation of energy models, including demand models in particular. The author identifies these models, lists them according to category and analyses them. [French]

Girod, J *Editions du CNRS* 1977, 186 pp, 197 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Centre Nationale de la Recherche Scientifique, 15 Quai Anatole-France, Paris 7e, France

16 170024

# **FREIGHT TRANSPORT: SHORT AND MEDIUM TERM CONSIDERATIONS. PAPER 6**

This paper is concerned with energy considerations over the short and medium term--defined as the period during which natural hydrocarbon oils

remain sufficiently available for transport requirements. An analysis of the freight transport situation in this context leads to the conclusion that policy decisions are unlikely to result in significant energy savings in the short term. Such savings could however be achieved over a period of years from technical and operational improvements. Improving the fuel efficiency of petrol and of diesel engines, a switch from petrol to diesel engines in the smaller freight vehicles, and the use of electric vehicles and railways, are listed as measures which would contribute to substantial energy savings.

Her Majesty's Stationery Office Monograph Energy Paper N24, May 1977, 25 pp, 8 Tab.

ACKNOWLEDGMENT: TRRL (IRRD 228689)

ORDER FROM: Pendragon House, Incorporated, P.O. Box 255, Old Mystic, Connecticut, 06372

#### 16 170102

##### DIESEL FUELS FROM SHALE OIL

High-boiling shale oil produced from Rocky Mountain oil shale can be reduced in molecular weight by recycle thermal cracking and by coking. Diesel fuels of good quality have been made from the cracked shale oil by acid and caustic treating. Diesel oil made by this process performed acceptably in an in-service test for powering a railroad engine in a 750-hour test. Better quality diesel fuels were made by hydrogenation of a coker distillate. Even better quality diesel fuels, suitable also for use as high-quality distillate burner fuels, have been made by hydrocracking of a crude shale oil from underground in situ retorting experiments conducted by the Laramie Energy Research Center in Wyoming.

Monograph on Alternate Fuel Resources based on paper presented at the Symposium on Alternate Fuel Resources, Santa Maria, California, March 25-27, 1976.

Cottingham, PL (Energy Research and Development Administration)  
Western Periodicals Company Monograph 1976, pp 119-135, 17 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Western Periodicals Company, 13000 Raymer Street, North Hollywood, California, 91605

#### 16 170104

##### NEW GENERATION LUBRICANT FOR EXTENDED DRAIN DIESEL SERVICE

In response to requests by diesel fleet operators, a new class of crankcase lubricant has been developed and has proved outstanding in broad field applications. This new extended drain oil maintains full engine life even though it is used three or four times as long without drain as conventional lubes. More than 10 million unit miles have been run on three grades of the oil (SAE 30, 40, and 15W-40) in four makes of diesel engines. The strong inherent oxidation stability, diesel detergency, high alkalinity (with low ash) of the oil combine to control lube degradation, deposits, wear, and corrosion on a par with conventional oils at normal oil drains.

For Meeting, September 18-22, 1977.

Youngehouse, EC (Exxon Research and Engineering Company);

Schmidt, RP

American Society of Mechanical Engineers Conf Pap ASME N77-DGP-16, 1977, 13 pp, 6 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

#### 16 170105

##### NEW LOOK AT MULTIGRADED DIESEL ENGINE OILS

Benefits for multigraded oils developed for diesel engine service have been found in performance areas such as low temperature engine cranking/starting, oil consumption rate, bearing wear, and fuel economy in stop-and-go service. Studies continue to indicate that multigraded diesel engine oils should be formulated with a minimum amount of pure polymer, consistent with desired viscometric targets, in order to minimize piston deposit formation. Premium multigraded, extended drain lubricants depend upon modern viscosity improver technology coupled with improved detergent-inhibitor additive technology.

SAE Prepr for Meeting, June 7-10, 1976.

Smith, MF, Jr (Exxon Research and Engineering Company); Tunkel, N Bachman, HE Fernandez, WJ

Society of Automotive Engineers Preprint SAE 760558, 1976, 13 pp, 21 Ref.

ACKNOWLEDGMENT: EI

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17 158298

**PLANNING MODEL FOR MULTIPLE-MODE TRANSPORTATION SYSTEM OPERATIONS**

The problem of generating a set of transportation alternatives during the early and intermediate stages of transportation planning is addressed. A linear programming model of a multi-modal transportation system is developed. The model is run interactively to determine optimal operating levels for all modes for various transport policy decisions. The model described is a component of a composite network generation model incorporating dynamic changes. The linear programming components determine optimal operating policies for given points in time. The composite model incorporates these in a dynamic programming framework to determine optimal staged investment policies over several time periods.

Nihan, NL (Washington University, Seattle); Morlok, EK *Transportation Planning and Technology* Vol. 3 No. 2, 1976, pp 59-73, 4 Ref.

ACKNOWLEDGMENT: EI

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17 159385

**OPTREG-AN INTERACTIVE COMPUTER PROGRAM FOR OPTIMIZATION AND REGRESSION**

OPTREG is a computer program which provides stepwise multiple regression analysis and optimization of a user defined function by the geometric simplex method. Both optimization and regression are performed interactively. This gives the user visibility and quick response, as well as a high degree of control over the optimization and regression procedures. Because of the fine control over the optimization algorithm which is available, OPTREG is particularly well suited to optimization of a function which is expensive to evaluate. OPTREG is programmed in Fortran IV, and operates on the CDC 6600 under the Kronos Interactive Timesharing (KIT) operating system. This document is the user manual for the OPTREG program. The OPTREG features are described, examples are given, and KIT control card sets performing the various OPTREG options are provided.

Erickson, RA Southall, R Twigg, DW Wong, YY  
Boeing Computer Services Incorporated, National Highway Traffic  
Safety Administration Final Rpt. DOT-HS-802-422, BCS-G0792, June 1977, 141 pp

Contract DOT-HS-356-3-719

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-269480/OST, DOTL NTIS

17 163261

**INTRODUCTION IN CPM-COST CONTROL AS A MANAGERIAL TOOL**

The system is used to measure and control costs in terms of the same entities of the project as are used for planning and scheduling the activity. Costs are allocated according to the structure of the organization performing the work. The main characteristics of the concept are: it is different from most construction cost accounting systems; costs are measured and controlled on a project basis; effectiveness requires that the site management must include responsibility for expenditures; if detected periodically, all the disturbances regarding cost on the activity basis can be followed. A CPM-Cost system does not necessarily replace existing accounting systems based on organizational structure, if costs are identified with proper degree of detail.

Advanced Construction Estimation and Cost Control Methods, Conference Proceedings, Houston University, Texas, April 2, 1976.

Popescu, C (Oklahoma University)  
Houston University Conf Paper Paper 4.1, 1976, 35 pp, 15 Ref.

ACKNOWLEDGMENT: EI

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17 163292

**COMPUTER GRAPHICS DEMONSTRATION--AREA COAL AVAILABILITY STUDIES**

A computerized mapping system was developed to provide procedures for the rapid and inexpensive display of coal reserve data. Mapping system output consists of two types of maps, point distribution and contour (isopleth), which can be produced for data (coal analyses) associated with a point location (outcrop, drill core, or mine samples). These locations can be in the form of latitude and longitude or Universal Transverse Mercator

(UTM) grid coordinates. The primary advantage of this system is that it enables the display of a rapidly changing data base and computerized map generation without the intermediate steps of digitizing and overlaying to produce base maps. The mapping system is applicable to any regional mineral reserve or resource study for which point location data are available.

Bitler, JR Martin, JD

Bureau of Mines Info Circular 8736, 1977, 19 pp, 6 Ref.

ACKNOWLEDGMENT: EI

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17 163740

**MATRIX METHOD FOR DETERMINING THE ACCESSIBILITY OF THE NODES OF A TRANSPORT NETWORK**

[Matrizientheoretische Verfahren zur Bestimmung der Zugänglichkeit von Knotenpunkten eines Verkehrsnetzes]

Any transportation network may be represented by a graph consisting of nodes (vertices) and links (edges) between adjacent nodes. Several matrices are introduced for describing such a graph and by that the corresponding transportation network. In particular they provide a means of measuring the accessibility of the nodes. The paper discusses the different matrices applied to transportation systems and argues in favor of the so called valued shortest path-matrix which results from raising the valued distance-matrix to a certain power. Finally, this matrix method is applied to the railroad network of the Netherlands and leads to a most accessible node representing an optimal location for the Netherlands Railway's lines. [German]

Schickhoff, I *Tijdschrift voor Economische en Sociale Geografie* Vol. 68 No. 3, 1977, pp 152-167

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Brill (EJ), Oude Rijn 33a, Leiden, Netherlands

17 163775

**APPLICATIONS OF COMPUTERIZED TRACK CHARACTERISTICS DATA BASES TO COST ANALYSIS AND MAINTENANCE PLANNING**

Southern Pacific has developed a cost system and data base from which can be predicted the costs of renewing or replacing the railroad track structure. Engineering production functions describing the physical behavior of various elements of the structure as determined by volume and type of traffic are used to define the portion of the track structure consumed in rendering each incremental unit of service. The system is used for track maintenance planning and for long-term replacement of jointed track with welded rail.

Proceedings, 76th AREA Technical Conference, Chicago, Illinois, March 29-31, 1977.

Lathrop, RA (Southern Pacific Transportation Company) *AREA Bulletin*  
Conf Paper Vol. 78 No. 663, June 1977, pp 531-555, 14 Fig.

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17 163803

**PSEUDO BOOLEAN PROGRAMMING MODELS OF FREIGHT STATION CONSOLIDATION PLANNING**

While the 1700 freight stations on Japanese National Railways now represent an almost 50% reduction since 1960, changing economic conditions require further consolidation. The problem of obtaining an optimal consolidation pattern in terms of revenues and expenditures is formulated using pseudo Boolean programming techniques and the algorithms for the solution are developed. The results indicated that there was insufficient separation of fixed and variable costs for an adequate cost-benefit analysis. Further refinement is necessary.

Suzuki, S *Railway Technical Research Inst Quarterly Reports* Vol. 18 No. 2, June 1977, pp 70-73, 4 Tab., 1 Ref.

ACKNOWLEDGMENT: Japanese National Railways

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

DOTL JC

17 163929

**TRANSFER OPTIMIZATION IN AN INTERACTIVE GRAPHIC SYSTEM FOR TRANSIT PLANNING**

This paper describes a coordinated four-stage interactive graphic process for operational transit planning. Stage 1 deals with route, headway, and



vehicle-type optimization; stage 2 attempts to optimize transfer delays; stage 3 designs runs so that the service resulting from the previous stages can be operationalized; and stage 4 provides computer assistance in making manpower assignments. The network optimization procedure of stage 1 has been previously reported on, and the latter two stages are currently under development. This paper deals principally with the transfer optimization tool of stage 2. The operational tool to optimize transfer delays involves the automated-iterative modification of terminal departure times. An interactive graphic computer approach is used to increase the transparency of the tool to the planner. The analysis takes into account the calculation of expected waiting times for transfers between transit lines with different headways and the interdependence of terminal departure times. Within the interactive graphic optimization process, the user can request computer-generated and computer-drawn charts of transfer movements and delays, time-distance diagrams of individual routes, and computer-produced transfer statistics at individual stops as well as the entire system. The process has been applied to the Basel Transit System in Switzerland, which serves a population of 500,000. In comparison with the existing hand-generated timetable, the optimized timetable reduces the total transfer delays by approximately 20 percent with no increase in operating costs. /Author/

This article appeared in Transportation Research Record No. 619, Innovations in Transportation System Planning.

Rapp, MH (Rapp (W and J) Company, Switzerland); Gehner, CD (Washington University, Seattle) *Transportation Research Record* No. 619, 1976, pp 27-33, 8 Fig., 1 Tab., 9 Ref.

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#### 17 164411

##### UNIQUE EVENT AND DELPHI

The author describes the application of a Delphi forecast in response to a unique event--The Stockton & Darlington Railway Anniversary 1975. He illustrates the successes and failures of the survey and makes recommendations as to how failures may have been avoided. The article also includes ideas on how the Delphi approach might be used in other ways in social forecasting.

Wilson, LS (Durham University, England) *Long Range Planning* Vol. 10 No. 1, Feb. 1977, pp 79-83, 26 Ref.

ACKNOWLEDGMENT: EI

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DOTL JC

#### 17 165176

##### RELIABILITY MODELS FOR TRACK BOUND TRANSIT SYSTEMS

Reliability models for transit system have been presented and the application of state merging and sequential truncation in solving these models has been illustrated. The models and methodology can be suitably modified to suit specific applications.

Proceedings of the Annual Reliability and Maintainability Symposium for Meeting in Philadelphia, Pennsylvania, January 18-20 1977.

Singh, C (Ministry of Transportation and Communications, Can) American Society of Mechanical Engineers, American Society for Quality Control, American Institute of Industrial Engineers, Institute of Electrical and Electronics Engineers, Society of Logistics Engineers, Institute of Environmental Sciences, American Institute of Aeronautics and Astronautics, System Safety Society Proceeding 1977, pp 242-247, 4 Ref.

ACKNOWLEDGMENT: EI

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#### 17 166001

##### IMPROVED COMPUTER-BASED PLANNING TECHNIQUES

Management Science has responded recently to the needs of practitioners by contributing two new technologies. These are network computer implementation technology and NETFORM (network formulation) technology. In this paper we show how these new technologies have been used to model and solve real-world problems. In addition, we attempt to give the practitioner insights into how these important policy evaluation tools may be applied to his unique management problems. (Author)

Glover, F Hultz, J Klingman, D Texas University, Austin Res Rpt. CCS-283, Feb. 1977, 53 pp

Contract N00014-75-C-0616

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

AD-A040592/8ST, DOTL NTIS

#### 17 166148

##### LINEAR PROGRAMMING IN MANAGEMENT (A BIBLIOGRAPHY WITH ABSTRACTS)

Linear programming as an aid to the management decision making process is presented in the bibliography. Models are included for various management situations in different industries. (This updated bibliography contains 82 abstracts, 21 of which are new entries to the previous edition.)

Supersedes NTIS/PS-75/406 and NTIS/PS-76/0488.

Grooms, DW

National Technical Information Service June 1977, 87 pp

ACKNOWLEDGMENT: NTIS

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NTIS/PS-77/0541/1ST, DOTL NTIS

#### 17 167032

##### COMPUTER CODE FOR TRANSPORTATION NETWORK DESIGN AND ANALYSIS

This document describes the results of research into the application of the mathematical programming technique of decomposition to practical transportation network problems. A computer code called Catnap (for Control Analysis Transportation Network Analysis Program) has been developed in the course of this study; this code has the capability to solve the following problems: (1) The traffic assignment problem with fixed demands; (2) The transportation network design problem with or without a budget constraint; (3) The optimal staging problem for transportation network investments over a fixed time horizon. In this report the authors describe the basic structure and algorithms employed in Catnap and give actual numerical results obtained in some representative sample problems. These results indicated that Catnap is an improvement over existing transportation network codes, particularly for solving the network design problem.

See also report dated Oct 76, PB-261 340.

Harvey, RP Robinson, DW

Control Analysis Corporation, Transportation Systems Center Intrm Rpt. DOT-TSC-OST-77-39, May 1977, 126 pp

Contract DOT-TSC-1059

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-270674/5ST, DOTL NTIS

#### 17 167110

##### REPORT OF TASK FORCE FOUR: RECOMMENDED FREIGHT CAR MANAGEMENT AND CONTROL SYSTEMS OF THE FREIGHT CAR UTILIZATION RESEARCH-DEMONSTRATION PROGRAM

Studies were initiated to identify and analyze car management problems, develop and evaluate alternative strategies to attack these problems, and develop and demonstrate hardware and software to implement such strategies. The report is thus a planning document concerned with railroad car management system.

Association of American Railroads, Federal Railroad Administration Final Rpt. FRA/OPPD-77/17, AAR-R-275, June 1977, 182 pp

Contract DOT-FR-65146

ACKNOWLEDGMENT: NTIS

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PB-271408/7ST, DOTL NTIS

#### 17 167524

##### A FLEET-SIZE MODEL FOR INTER-CITY SERVICES

This report describes an extension to the fleet-size model which was described in TRRL report Ir607. The model relates fleet-size, which has an important effect on system costs, to the number of departures per day on an inter-city transport service, taking into account in a simple but realistic way the constraints under which a transport operator must plan his timetable. In the first part of the report, the mathematical formulation of the extension to the model is derived. In the second, the extended model is used to predict the number of trains required to run various services on a major

railway network, and it is shown that the model gives good agreement with actual practice. This report is a supplement to Ir607 (appendix 4) and should be read in conjunction with it.

Walmsley, DA  
Transport and Road Research Laboratory Monograph TRRL Suppl  
Rpt 308, 1977, 9 pp, 1 Tab., 3 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-228151)  
ORDER FROM: ESL

17 167952

**THE USE OF REMOTE CONTROL AS A BASIS FOR ITS  
(INTEGRATED TRANSPORT CONTROL) [Die Fernmeldetechnik als  
Basis fuer das ITS]**

A description of the 4000 local terminals with storage, interface console, read-out display panel and programs; portable terminals; the remote control network linking these terminals, the 85 data concentrators, 9 regional computers and the central computer. [German]

Eizenberger, G Gabriel, R *Die Bundesbahn* Vol. 53 No. 8, Aug. 1977, pp 557-562, 4 Fig., 2 Phot.

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

17 167953

**ITS (INTEGRATED TRANSPORT CONTROL SYSTEM), A JOB  
FOR EDP [ITS eine Aufgabe fuer die elektronische Datenverarbeitung]**  
List of the computer equipment for the ITS project, the implementation schedule, general details of software, reliability arrangements and how the system will fit into existing DB structures. [German]

Rebmann, K *Die Bundesbahn* Vol. 53 No. 8, Aug. 1977, pp 551-556, 3 Fig., 1 Phot.

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

17 167954

**THE INTEGRATED TRANSPORT CONTROL SYSTEM AND THE  
MECHANICAL AND ELECTRICAL ENGINEERING  
DEPARTMENTS [ITS und maschinen-und elektrotechnischer Dienst]**

Article with two separate parts: (1) A detailed list of all the operations necessary for making locomotives available and organizing train crews; inspections; supplies to stock repair sheds; and fleet management. The article shows how computer processes can be used in these fields. (2) The large-scale ITS System has no interruption. The article shows how energy supplied can be consequently guaranteed. [German]

Bauermeister, K *Die Bundesbahn* Vol. 53 No. 8, Aug. 1977, pp 541-548, 7 Fig., 4 Phot.

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

17 167955

**TASKS, AIMS AND PROCEDURES WITH ITS FOR  
PRODUCTION [Aufgaben Ziele und Verfahren des ITS in der  
Produktion]**

Production involves all transport processes (except the commercial and terminal aspects). For freight, the consignment note is the basic document. ITS will define routes, train composition, the information needed in marshalling yards, for car location, traffic with private sidings and with other national or foreign Railways. For passenger traffic, ITS will constantly transmit information to the control posts and maintenance centres so that services can be ensured. [German]

Sitzmann, E *Die Bundesbahn* Vol. 53 No. 8, Aug. 1977, pp 536-540, 5 Ref.

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

17 167982

**CONSTRUCTING AN OPTIMAL FLEET FOR A  
TRANSPORTATION SCHEDULE**

A general method for constructing all optimal fleets is described. A special case of periodic schedules is studied and it is proved that a periodic schedule can be decomposed into an optimal periodic fleet. Applications of the deficit function technique to practical scheduling when passengers have tolerances for departure times are discussed.

Gertsbach, I (Ben Gurion University of Negev, Israel); Gurevich, Y  
*Transportation Science* Vol. 11 No. 1, Feb. 1977, pp 20-36, 4 Ref.

ACKNOWLEDGMENT: EI  
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17 167993

**METHODS FOR THE ESTIMATION OF CONFIDENCE BOUNDS  
FOR THE TOP-EVENT UNAVAILABILITY OF FAULT TREES**

Given the uncertainties of the primary input data a method is described for the evaluation of the first two moments of the top event existence probability. These moments are then used to estimate confidence bounds by several approaches which are based on standard inequalities (e.g. Tchebycheff, Cantelli, etc.) or on empirical distributions (the Johnson family). Several examples indicate that the Johnson Family of distributions yield results which are in good agreement with those produced by Monte Carlo simulation.

Apostolakis, G (California University, Los Angeles); Lee, YT *Nuclear Engineering and Design* Vol. 41 No. 3, 1977, pp 411-419, 18 Ref.

ACKNOWLEDGMENT: EI  
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17 167998

**DESIGN OF TRAIN TIMETABLE AUTOMATIC EDITING  
SYSTEM BY SMALL-SCALE COMPUTERS**

Processes ranging from timetable editing and block copy preparation have been systematized in a train timetable automatic editing system. With the operation of this system, monthly block copies can now be made up rapidly as well as accurately. This article describes what kinds of files constitute information for the timetable, and how the necessary information is processed all the way to final composition of pages. It also explains how maintenance processing is carried out to keep abreast of monthly alterations of schedules and increases or decreases of train runs. Emphasis is placed on file maintenance and a newly developed filing system. The system produces block copies as the final output by using a fully automatic photo-composing machine. A block copy means a page of an ordinary timetable.

Suzuki, S (Hitachi Computer Group, Limited); Otake, S Ebihara, S  
*Hitachi Review* Vol. 26 No. 3, 1977, pp 121-126

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

17 168102

**THE NEXT BIG STEP: COMPUTER TO COMPUTER EXCHANGE**

The author calls for data exchange between railroads via computer-to-computer hookups and for railroads to look at distributed processing of information, relying solely neither on central nor local computer setups. The Southern Railway's approach to some of these data processing problems is described.

Jones, JL (Southern Railway System) *Progressive Railroading* Vol. 20 No. 12, Dec. 1977, pp 23-26, 3 Phot.

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

DOTL JC

17 168932

**CARLOAD WAYBILL STATISTICS. BASED ON A SAMPLE OF  
WAYBILLS FOR TERMINATIONS IN THE YEAR 1976.  
TERRITORIAL DISTRIBUTION, TRAFFIC AND REVENUE BY  
COMMODITY CLASSES**

The statistics have been compiled from a sample of audited revenue waybills submitted to the FRA by 76 railroads. The data regarding territorial distribution of railroad carload terminations have been compiled since 1972 utilizing a computer based Waybill Information Processing System (WIPS)

developed under the direction of the Federal Railroad Administration. The statistics tabulated for 1976 were derived from a total of 136,153 waybills, 44,065 EM-5 documents and 882 multiple car statement documents resulting in 202,924 carloads. The waybill sample includes import, export, transit, rebilled, and piggyback (TOFC-trailer-on-flat-car) traffic. Excluded are shipments weighing less than 10,000 pounds and moving on less than carload rate or any quantity rates, and traffic originating or terminating in Mexico and Canada.

See also report dated 1975, PB-258 460.

Federal Railroad Administration DOT/FRA/RPD-77/1, July 1977, 250 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-273540/5ST, DOTL NTIS

#### 17 169956

#### USING NEW TECHNIQUES TO TRACE VEHICLE DEFECTS [Mit neuen Technologien den Fahrzeugfehlern auf der Spur]

"Hamburg-Consult", consultants for Hamburg's Hochbahn AG (overhead railway) have developed prototype computer-based equipment for detecting vehicle defects called the BEFUND system. This device can be used for underground and urban transport systems as well as for buses, it checks vehicles constantly while they are actually in operation. As transport systems become more and more automated, it will be possible to use the BEFUND system for organizational and maintenance purposes as well. [German]

*Bus und Bahn* Vol. 11 No. 119, 1977, pp 4-5, 2 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Alf Teloecken-Verlag KG, Roemerstrasse 9, 4000 Dusseldorf 30, West Germany

#### 17 170019

#### WAYS TO MOVE. THE GEOGRAPHY OF NETWORKS AND ACCESSIBILITY

This book concentrates mainly on the structure within which movement takes place; that is, the networks and modes of transport and their influence on the spatial quality of locations. Examples and exercises are taken from a variety of situations in the UK and abroad, and used to develop ideas and techniques which can be applied to transport and communication studies in any area. Separate chapters deal with: (1) an introduction to movement; (2) branching networks; (3) the development of networks; (4) the use of networks and modes of transport, and (5) accessibility.

Taken from The Cambridge Topics in Geography Series.

Robinson, R

Cambridge University Press Monograph 1977, 96 pp, Figs., Tabs.

ACKNOWLEDGMENT: TRRL (IRRD-228699)

ORDER FROM: Cambridge University Press, The Pitt Building Trumpington Street, London NW1, England

#### 17 170022

#### PROJECT DYNAMOS. DYNAMIC MODELLING AS A METHOD OF TRAFFIC FORECASTING, REPRESENTED BY THE EXAMPLE OF THE HIGH-SPEED RAILWAY [Projekt Dynamos. Die Dynamische Modellierung als Methode der Verkehrsprognose, Dargestellt am Beispiel der Hochleistungsschnellbahn (HSB)]

For the federal republic there is in hand a survey-orientated global, regional and modal split related forecast for person and goods trips up to 1990 in the shape of the diw-long term forecast. On the basis of the global increase values an investigation is being made into the modal split of person and goods trips up to 1995 for a small area of the federal republic with the help of dynamic modelling. Particular value is placed upon the feedback of decision-relative parameters and the temporal variation of these parameters. Additionally there follows the inclusion of a high-speed railway system by which may be examined how far the inclusion of the high-speed railway alters the modal split and if such a railway can operate economically with balanced results. So far both the method and the contents of the study have been considered. [German]

*Internationales Verkehrswesen* Analytic Vol. 28 No. 7-8, July 1976, pp 191-193

ACKNOWLEDGMENT: TRRL (IRRD-304761), Federal Institute of Road Research, West Germany

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

#### 17 170572

#### CAR UTILIZATION: CAN SHORT LINES BE LINKED INTO THE TRAIN II SYSTEM?

The car utilization controls of AAR's Train II computer system are being extended experimentally to 12 short-line railroads as part of the AAR-FRA Freight Car Utilization Demonstration Program. Short railroads, which normally have 5 to 7 percent of the car fleet on line, will gain experience with an automated information system that can interface directly with Train II and will have the opportunity to automate car information, many for the first time. Incremental per diem would be a further incentive to adopt such a system.

Ellsworth, K *Railway Age* Vol. 178 No. 22, Nov. 1977, 2 pp, 2 Phot.

ORDER FROM: ESL

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18 157749

**INSTITUTIONAL IMPEDIMENTS TO EFFICIENCY: THE CASE OF RAIL FREIGHT CAR SUPPLY**

Research is reported which resulted from efforts to estimate savings which might accrue to the railroad industry from a proposal for market pricing of freight car use. The article examines the impact of present car-pricing and distribution regulations on the supply of railroad freight cars, and estimates the diseconomies incurred by the railroads collectively as a result of these policies. Only the external effects generated by improper pricing and car distribution rules are considered here. Except for excessive empty car mileage and excess peak capacity, other inefficiencies thought to exist in rail operations are not considered.

Berglund, MF (Nebraska University, Lincoln) *Land Economics* Vol. 53 No. 2, May 1977, pp 157-171, 3 Tab., 21 Ref.

ORDER FROM: Wisconsin University Press, P.O. Box 1379, Madison, Wisconsin, 53701

DOTL JC

18 158960

**RAILROAD ACCOUNTING**

This volume contains papers on a variety of subjects related to the development of railroad accounting and costing. The first section includes four articles on the uses of accounting information. The second series discusses railroad costing. The articles include a discussion of how to evaluate contribution of specific rates to railroad profits and a discussion of the costing and management information system currently in use on the railroad. The third section includes articles on deferred maintenance and on accounting for railroad right-of-way. Consecutive articles present arguments first in favor of "betterment accounting" for right-of-way, and second, in favor of "depreciation accounting" for right-of-way. The last articles address themselves to what changes should be made to bring the Interstate Commerce Commission's current Uniform System of Accounts for Railroads into conformity with the Railroad Revitalization and Regulatory Reform Act of 1976.

Prepared in cooperation with Georgetown Univ., Washington, D.C. School of Business Administration, Transportation Research Forum, Washington, D.C. Chapter, American Univ., Washington, D.C.

Buckwell, LJ Hymson, EB

Office of Policy, Plans and International Affairs, Georgetown University, Transportation Research Forum, American University, Bowling Green State University DOT/TPI/70-77/16, May 1977, 224 pp

ACKNOWLEDGMENT: NTIS

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PB-267560/1ST, DOTL NTIS

18 159351

**ANALYSIS OF FACTORS AFFECTING NEC CONSTRUCTION LABOR COSTS**

The study presents the findings and conclusions of the factors affecting the net total labor costs of the principal NEC construction work packages depending on whether the work is performed by Amtrak with its forces or is contracted out to construction firms by either Amtrak or the FRA. The purpose of this cost study is to provide the FRA's NEC Project staff with a set of guidelines for structuring the NEC construction work packages for assignment.

Richardson Associates, Federal Railroad Administration Final Rpt. FRA/NECPO-76/25, Dec. 1976, 83 pp

Contract DOT-FR-56010

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-269127/7ST, DOTL NTIS

18 163806

**REPLACEMENT VALUE COSTING CONCEPTS AND METHODOLOGY**

The study, funded by Canadian National, is essentially a conceptual examination and critical analysis of replacement value costing principles as they might be applied to railway operations. The recommendations, concerning the use of a replacement value system, particularly address the selection of cost information pertinent to the service pricing decision. Freight car capital charges are an important and relatively uncomplicated component of unit costs, and hence were chosen as an example. The development

was directed towards the determination of a realistic unit capital charge per unit time (cost per car per year). For pricing purposes, this must ultimately be converted to a charge per unit of service, possibly on an individual movement basis. It is significant to note that the freight car costing question is simpler than certain companion issues, particularly the problem of applying replacement value to the fixed way. Study of this has been incorporated into the Road Maintenance Cost Model project. In general, a simple uniform set of rules, that are applicable to a broad range of circumstances, must be the ultimate objective of this research.

Sponsored by Canadian National Railways.

Lake, RW Macdonald, JA Schwier, C

Canadian Institute of Guided Ground Transport Final Rpt. CIGGT-77-7, June 1977, 26 pp, 1 Fig., 6 Tab., 2 App.

ACKNOWLEDGMENT: CIGGT

ORDER FROM: CIGGT

DOTL RP

18 164429

**THE EVALUATION OF ROLLING STOCK REPLACEMENT**

This paper outlines an evaluation procedure appropriate to rolling stock operators who undertake replacements according to economic criteria. The approach can be used to determine whether or not any proposed replacement will result in a potential improvement in economic welfare. Moreover, the analysis can be extended to indicate the optimal age of rolling stock replacement. The approach is illustrated with a simple empirical example.

Carr, GR Mackay, KR *Transport Economics and Operational Analysis* No. 2, Nov. 1976, pp 1-15, 2 Fig., 2 Tab., Refs.

ACKNOWLEDGMENT: Transport Economics and Operational Analysis

ORDER FROM: Transport Economics and Operational Analysis, Australian Government Publishing Service, Canberra, Australia

DOTL JC

18 164455

**UNIFORM SYSTEM OF ACCOUNTS FOR RAILROAD COMPANIES PRESCRIBED BY THE INTERSTATE COMMERCE COMMISSION**

No Abstract.

Interstate Commerce Commission, (49-CFR-Part 1201) Jan: 1968, 117 pp

ORDER FROM: GPO

S/N-2600-00955, DOTL RP

18 164912

**DETERMINATION OF OPERATING COSTS FOR RAILROAD FREIGHT CAR COMPONENTS BY SIMULATION MODELLING**

This paper describes an investigation concerned with costs to operate (maintain and acquire) railroad freight car components. The technique used to determine these costs is dynamic simulation cost modelling (SCM). Extensions and modifications of a previously presented version of this technique are described. Also described are the three elements of the technique-the schematic diagram which describes the component usage, the computer program which implements the diagram, and the required input data set. A preliminary input data set and corresponding approximate results are given for the freight car wheel. These results are for the reference (present time) composite national railroad system.

Presented at the 28th AIIE Convention for the Spring Annual Conference and Product Engineering Show, Dallas, Texas, May 24-27, 1977. Also available from ESL.

Krauter, AI (Shaker Research Corporation); Saroop, R American Institute of Industrial Engineers Conf Paper AIIE-P-77-2, 1977, pp 397-407, 5 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: American Institute of Industrial Engineers, 25 Technical Park/Atlanta, Norcross, Georgia, 30071

18 166317

**PROCEDURES FOR ANALYZING THE ECONOMIC COSTS OF RAILROAD ROADWAY FOR PRICING PURPOSES. VOLUME I. PROCEDURES**

The primary objectives of the study are to develop procedures for determining the roadway (fixed plant) costs associated with specific railroad services (routes, equipment, service levels) for use in the pricing of such



services, and to demonstrate how these procedures can be implemented as an element of a railroad costing system. The costing procedures developed depart substantially from averaging techniques based on historical roadway expense data as currently used by most railroads. Determination and allocation of a major portion of roadway variable costs, i.e. those associated with the renewal of the track structure, is accomplished by applying predictive life cycle relationships to the specific track/traffic conditions under consideration. These predictive relationships are derived from existing track research data combined with the experience of track maintenance forces on the Southern Pacific. Methods are developed to systematically obtain and analyze relevant track/traffic data for use with the costing procedures.

See also Volume 2, PB-254 063.

Danzig, JC Rugg, JA Williams, JH Hay, WW  
TOPS On-Line Service, Incorporated, Federal Railroad Administration  
Final Rpt. FRA/RPD-11-CM-R, Jan. 1976, 267 pp

Contract DOT-FR-30028

ACKNOWLEDGMENT: NTIS

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PB-267765/6ST, DOTL NTIS

18 167502

#### ECONOMIES OF TRAFFIC DENSITY IN THE RAIL FREIGHT INDUSTRY

The extent of economies of traffic density in the rail freight industry is a matter of critical importance with respect to public investment in and the financial viability of the United States rail system. Certain inadequacies of previous studies of rail costs are reviewed and methodological modifications proposed. The results of an econometric analysis which incorporates these revisions are presented. The evidence strongly supports the hypothesis that significant economies of density exist, and that many of the light-density lines which comprise 40 percent of the rail system should be eliminated.

Harris, RG (California University, Berkeley) *Bell Journal of Economics*  
Vol. 8 No. 2, Sept. 1977, pp 556-564, 1 Fig., 1 Tab., Refs.

ACKNOWLEDGMENT: Bell Journal of Economics

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18 167514

#### VIABILITY OF LIGHT-DENSITY RAIL LINES: THE UNITED STATES RAILWAY ASSOCIATION'S ANALYTIC POLICIES

The United States Railway Association recognized from the outset that analysis of the viability of light-density freight lines would require well founded, detailed and accurate procedures, and that these procedures would have to be applied meticulously. This document describes the policy framework, analytical techniques and data sources employed. Volume II of the Preliminary System Plan and Volume II of the Final System Plan contain the results of the analysis. The Chapters in this volume: The Problem of Light-Density Lines; Local Freight Service Management System; Data Collection; Development of Cost Input Factors; Viability Analysis; Viability Analysis--Modifications and Adjustments; and Computerization of the Branch Line Analysis.

United States Railway Association Mar. 1976, 798 pp, Figs., Tabs., Apps.

ACKNOWLEDGMENT: United States Railway Association

ORDER FROM: United States Railway Association, 2100 2nd Street, SW, Washington, D.C., 20024

DOTL HE2741.U78

18 167912

#### DEVELOPING A RATIONAL ALTERNATIVE TO ALLOCATING JOINT COSTS

When passenger services are partly financed by national and local government, there is constant pressure for accurate and rational cost data. Arbitrary allocation of costs shared with other services can be very misleading. British Rail is developing contribution accounting as a way of measuring financial performance. Identification of avoidable costs is carried to its practical limits at each level, using data extracted from the management accounting system and the contribution made by individual services or business sectors to joint costs is then compared on the basis of traffic carried and resources used.

Fowler, D (British Railways Board) *Railway Gazette International* Vol. 133 No. 11, Nov. 1977, pp 436-437

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18 168117

#### RESEARCH TO DETERMINE THE OPTIMUM SERVICE LIFE OF RAILWAY VEHICLES BASED ON THE EXAMPLE OF PASSENGER COACHES [Untersuchungen zur Bestimmung einer optimalen Nutzungsdauer von Eisenbahnfahrzeugen, dargestellt am Beispiel von Reisezugwagen]

The author defines and analyzes the factors which enter into economic production and optimization requirements, and defines the notions he proposes to use such as: length of life, useful life, optimum useful life, time required to reimburse capital expenditure, and physical and moral stress of railway staff. He uses a large number of formulae to establish the model "optimum service life", explains the optimization method in this model, gives an algorithm for the application of this method, and finally demonstrates its use on DR B-type 1st and 2nd class coaches. [German]

Drissel, E *Hochschule f Verkehrs F List Wissenschaft Zeitschr* Vol. 24 No. 1, 1977, pp 135-144, 12 Fig., 16 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Hochschule fuer Verkehrswesen Friedrich List, Friedrich List Platz 1, Dresden 801, East Germany

18 169972

#### SOCIAL "BALANCE SHEET" FOR SHORT-DISTANCE PUBLIC TRANSPORT [Sozialbilanz im oeffentlichen Personennahverkehr]

The traditional presentation of company accounts, with their exclusively profit-oriented character, is not a true reflection of the company's activities, in that they tend to overlook the main objectives of a short-distance public transport company. Hence the presentation, for this particular business, of results based on its social aspect, in the form of a "social balance sheet". Alongside general considerations and possible premises for this particular sector of activity, the author identifies the social profit and cost elements, and gives an assessment based on turnover. [German]

Wassmuth, H Ohlms, N *Internationales Verkehrswesen* Vol. 29 No. 4, July 1977, pp 217-223

ACKNOWLEDGMENT: International Union of Railways, BD

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

18 169994

#### TREATMENT OF INFLATION IN ENGINEERING ECONOMIC ANALYSIS

A method for treating inflation in engineering economic analysis is developed using the revenue requirements approach. This method treats all phases of the analysis and can be easily implemented within the framework of conventional revenue requirements analysis. The problems of inconsistent treatment of inflation are discussed and several examples are given. Two pages of discussion of the paper are appended.

Cassidy, F (Public Service Electric and Gas Company); Schirra, GW *IEEE Transactions on Power Apparatus and Systems* Vol. PAS No. 3, May 1977, p 1027, 2 Ref.

ACKNOWLEDGMENT: EI

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DOTL JC

18 170109

#### INCREMENTAL PER DIEM

This is a report of estimated costs and benefits of a change to incremental per diem for freight cars prepared by MIT in conjunction with the Task Force on Reliability Studies of the Car Utilization Program. For seven railroads surveyed, costs of conversion to either one-hour or eight-hour incremental per diem would cost no more than \$4.5 million while yielding annual transportation benefits of \$10 to \$20 million. Benefits would be higher for the one-hour option. Time and some planning would be necessary to achieve maximum potential benefits. It was concluded that the need to revise nearly all switching and terminal arbitraries would be the largest single problem.

Task Force on Reliability Studies, Freight Car Utilization Program

Martland, CD

Association of American Railroads, Massachusetts Institute of Technology  
Final Rpt. Vol. 19 AAR No. R-238, MIT NO. CTS 76-4, July 1976, 300

pp, Figs., Tabs.

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

PB-275433/AS, DOTL RP

18 170568

**RAILROAD RIGHT-OF-WAY USE AND ECONOMIC VALUE**

The economic value associated with the use of railroad rights of way is defined and its measurement is discussed. As long as existing uses are unchanged, the value of a right of way may be substantial but there is no compelling reason to know what it is. Changes in such use arising from causes such as abandonments, supplementary uses by others seeking transmission facilities or new public transport corridors, or assumption of private rail facilities by governments can make valuation important. Assembled rights of way represent a resource for society that should not be discarded lightly and efforts to avoid dismemberment should be stressed.

Beetle, GR *Appraisal Journal* Oct. 1977, pp 511-518

ORDER FROM: American Institute of Real Estate Appraisers, 155 East  
Superior Street, Chicago, Illinois, 60611

DOTL JC

18 170576

**COMPARATIVE COAL TRANSPORTATION COSTS: AN  
ECONOMIC AND ENGINEERING ANALYSIS OF TRUCK, BELT,  
RAIL, BARGE AND COAL SLURRY AND PNEUMATIC  
PIPELINES**

No Abstract

Set includes PB-274 279--PB-274 386.

Illinois University, Urbana, Bureau of Mines, Federal Energy Administra-  
tion 1977, 581 pp

ACKNOWLEDGMENT: NTIS

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18 170577

**COMPARATIVE COAL TRANSPORTATION COSTS: AN  
ECONOMIC AND ENGINEERING ANALYSIS OF BELT, RAIL,  
BARGE AND COAL SLURRY AND PNEUMATIC PIPELINES.  
VOLUME 1--SUMMARY AND CONCLUSIONS**

The report describes a comparative cost analysis of competing trunk line and gathering-distribution system coal carrying modes. It provides a precis of the discussion in the remaining seven volumes and the results of the costing analyses.

Set includes PB-274 379--PB-274 386. See also Volumes 2-8, RRIS 18 170578--170584 respectively.

Rieber, M Soo, SL  
Illinois University, Urbana Aug. 1977, 91 pp, 2 Fig.

Contract JO166163

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18 170578

**COMPARATIVE COAL TRANSPORTATION COSTS: AN  
ECONOMIC AND ENGINEERING ANALYSIS OF BELT, RAIL,  
BARGE AND COAL SLURRY AND PIPELINES. VOLUME  
2--UNIT TRAINS**

The costing of coal carrying unit trains is based on a facility and system description of the operation including necessary upgrading. Some development needs are reviewed. Costing analyses include varying tonnages, mileage, bottlenecks, and utilization. Track capacity is also analyzed.

Set includes PB-274 379--PB-274 386. See also RRIS 18 170577, the first volume, in RRIS bulletin 7801.

Rieber, M Soo, SL  
Illinois University, Urbana Aug. 1977, 116 pp, 26 Fig.

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18 170579

**COMPARATIVE COAL TRANSPORTATION COSTS: AN  
ECONOMIC AND ENGINEERING ANALYSIS OF TRUCK, BELT,  
RAIL, BARGE AND COAL SLURRY AND PNEUMATIC  
PIPELINES. VOLUME 3--COAL SLURRY PIPELINES**

Based on previous work, the pipelines are described and costed. Pipeline and dewatering environmental impacts are discussed. Pipeline flexibility is analysed in terms of variation in the flow rate as well as branching and tapping the truck line for distribution purposes.

Set includes PB-274 379--PB-274 386. See also RRIS 18 170577, the first volume, in RRIS bulletin 7801.

Rieber, M Soo, SL  
Illinois University, Urbana Aug. 1977, 58 pp, 2 Fig.

ACKNOWLEDGMENT: NTIS

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18 170580

**COMPARATIVE COAL TRANSPORTATION COSTS: AN  
ECONOMIC AND ENGINEERING ANALYSIS OF TRUCK, BELT,  
RAIL, BARGE AND COAL SLURRY AND PNEUMATIC  
PIPELINES. VOLUME 4--BARGE TRANSPORT**

Coal transportation by dedicated-integrated tows is described and costed for the major inland waterways. Facility descriptions are provided. Each waterway (including locks and dams) is described for use in the costing analysis. The estimation of line-haul costs is disaggregated. It includes estimation of user costs.

Set includes PB-274 379--PB-274 386. See also RRIS 18 170577, the first volume, in RRIS bulletin 7801.

Rieber, M  
Illinois University, Urbana Aug. 1977, 94 pp, 13 Fig.

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18 170582

**COMPARATIVE COAL TRANSPORTATION COSTS: AN  
ECONOMIC AND ENGINEERING ANALYSIS OF TRUCK, BELT,  
RAIL, BARGE AND COAL SLURRY AND PNEUMATIC  
PIPELINES. VOLUME 6--TRUCK HAULAGE**

An heuristic facility and costing model is developed for over-the-road coal transport at varying distances and tonnages. Cost data are based on industry sources. Road use costs are estimated. The computer program and an example are presented.

Set includes PB-274 379--PB-274 386. See also RRIS 18 170577 the first volume, in RRIS bulletin 7801.

Rieber, M Soo, SL  
Illinois University, Urbana Aug. 1977, 63 pp, 10 Fig.

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18 170584

**COMPARATIVE COAL TRANSPORTATION COSTS: AN  
ECONOMIC AND ENGINEERING ANALYSIS OF TRUCK, BELT,  
RAIL, BARGE AND COAL SLURRY AND PNEUMATIC  
PIPELINES. VOLUME 8--YELLOW BALL RAIL**

The report describes and costs the use of overage rail cars and locomotives as a gathering system for groups of small coal mines in the vicinity of existing lightly used or railbanked track. A transloader is used to establish unit train lots.

Set includes PB-274 379--PB-274 386. See also RRIS 18 170577, the first volume, in RRIS bulletin 7801.

Rieber, M Soo, SL  
Illinois University, Urbana Aug. 1977, 13 pp  
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19 162972

**THE RAILROAD AND THE CITY...A TECHNOLOGICAL AND URBANISTIC HISTORY OF CINCINNATI**

This study assumes three stages in the evolution of the city with respect to urban circulation; they are, the horse-and-pedestrian phase, the railroad phase and the automotive phase. This book looks at the second phase in which technology was to become the primary determinant of the particular urban form and growth configuration that characterize the modern industrial city; and the railroad was to play a crucial and decisive role in this development. The very plan and network of the rails, the physical and geographical position of the tracks on the land and in the area came to dictate the surrounding urban fabric and the pattern of land use. Though the general history of the railway industry has been extensively treated, railroad technology has received only scant attention from serious historians. The role of civil engineering as it has applied specifically to railroads in the construction or right-of-ways, tracks, bridges, tunnels, sheds and towers, has been largely ignored.

Reviewed in ASCE Civil Engineering, June 1977, p 40.

Condit, CW

Ohio State University Press Monograph 1977, 335 pp

ACKNOWLEDGMENT: ASCE Civil Engineering

ORDER FROM: Ohio State University Press, 2070 Neill Avenue, Columbus, Ohio, 43310

19 167394

**AN ECONOMIC HISTORY OF FIVE MIDWESTERN RAILROADS**

The study explains the four basic economic factors that affected the early development of railroads in the Midwest: growth of railroad regulations; increased competition from other modes of transportation; rate of return on investment; and empire building. The author then shows which of these factors was most important in the development of the five midwestern railroads being considered. In both reports, the focus has been on the midwestern railroads because the generally depressed economic condition of many of the railroads in this part of the country makes bankruptcy a strong possibility. One of the five railroads discussed--the Rock Island--is already bankrupt. The others are the Chicago & North Western, the Burlington Northern, the Milwaukee Road, and the Soo Line.

Kaitz, GM

Massachusetts Institute of Technology, Department of Transportation  
Final Rpt. DOT/TST-77/73, Nov. 1976, 92 pp

Contract DOT-OS-30104

ACKNOWLEDGMENT: NTIS

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19 168838

**THE ROLE OF SCIENTIFIC AND TECHNICAL INFORMATION IN CRITICAL PERIOD MANAGEMENT. VOLUME I**

The purpose of this study was to examine the role of scientific and technical information in the resolution of domestic crises. The study was designed to be an exploratory effort, which would provide insight into the use of scientific and technical information and develop hypotheses which could be employed in future experiments or analyses. The method used to conduct the studies included the preparation and analysis of four ex post case histories of domestic crises. The crises examined include: Penn Central bankruptcy, Oil Embargo of 1973-74, Emergency blackout of September 20, 1970 in parts of New York City, and the Apollo 13 incident. (Portions of this document are not fully legible)

Prepared in cooperation with Chase-Mogdis, Inc., Ann Arbor, Mich. See also Volume 2, PB-272 179.

Gellman Research Associates, Incorporated, Chase-Mogdis, Incorporated, National Science Foundation Final Rpt. May 1977, 152 pp

Contract NSF76-05499

ACKNOWLEDGMENT: NTIS

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PB-272178/5ST

19 168839

**THE ROLE OF SCIENTIFIC AND TECHNICAL INFORMATION IN CRITICAL PERIOD MANAGEMENT. VOLUME II**

The crisis management study was designed to be an exploratory effort, which would provide insight into the use of scientific and technical information and develop hypotheses which could be employed in future experiments or analyses. The report has been prepared in two volumes. The second volume presents the full case study and associated documentation for each of four particular crises. (Portions of this document are not fully legible)

Prepared in cooperation with Chase-Mogdis, Inc., Ann Arbor, Mich. See also Volume 1, PB-272 178.

Gellman Research Associates, Incorporated, Chase-Mogdis, Incorporated, National Science Foundation Final Rpt. May 1977, 389 pp

Contract NSF76-05499

ACKNOWLEDGMENT: NTIS

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19 169990

**TWO CENTURIES IN RETROSPECT**

This special review of the history of two centuries of electrical engineering in the United States includes 23 papers. Four papers review the first century, discussing the contributions of Benjamin Franklin and Joseph Henry, Charles G. Page's patent of the induction coil, and the technical adjustments carried out at the terminal stations of the Atlantic cable in the 1870's. The papers on the second century (roughly 1870-date) consider the developments in telecommunication and electronics, electric power generation, electric lighting and electric railroads, and the social, professional & educational aspects of electrical engineering development. Included in this group are the contributions to telephony and telegraphy of Bell and Gray, the development of the electronics industry on the Pacific coast, the contributions of the two National Television System Committees (NTSCs) in promoting high-quality monochrome and color television, the development of the Niagara Falls and TVA hydroelectric complexes, the choice between ac and dc, railroad electrification, the conflict between the concept of a national power grid and the individual utilities, the evolution of the electrical engineering societies, the AIEE and the IRE, a brief history of electrical engineering education, early impacts of communications on military doctrine, creative engineering in a corporate setting as exemplified by C. P. Steinmetz and E. F. W. Alexanderson, and a consideration of the need for enhanced systems engineering to select priorities and goals to meet the challenges of the future.

Proceedings IEEE, Special Issue on Two Centuries in Retrospect.

Ryder, JD Brittain, JE *Institute of Electrical and Electronics Engrs Proc*  
Proceeding Vol. 64 No. 9, Sept. 1976, p 1267

ACKNOWLEDGMENT: EI

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19 170573

**THE PIONEER STAGE OF RAILROAD ELECTRIFICATION**

History of the first quarter century of railway electrification from about 1880 to 1905 is traced. From the Baltimore tunnel project of the Baltimore & Ohio, opened in 1895, to the Long Island Rail Road's Brooklyn, N.Y., project, the evolution of power supply, distribution and motive power is described. Simultaneous developments in France, Germany and Britain are included.

Part 7 of the Transactions held at Philadelphia for promoting useful knowledge.

Condit, CW (Northwestern University, Evanston) *American Philosophical Society Transactions* Vol. 67 Nov. 1977, 45 pp, 17 Fig.

ACKNOWLEDGMENT: American Philosophical Society

ORDER FROM: American Philosophical Society, 104 South Fifth Street, Philadelphia, Pennsylvania, 19106

DOTL RP

20 155102

**STATUS OF COAL SUPPLY CONTRACTS FOR NEW ELECTRIC GENERATING UNITS, 1976-1985**

Electric utility coal consumption is projected to increase 90 percent in the next decade—from approximately 406 million tons last year to 770 million tons in 1985. The report is based on utility industry plans to construct 229 new coal-fired units with total generating capacity of 111,600 megawatts during the period.

Federal Power Commission Jan. 1977, 42 pp

ACKNOWLEDGMENT: NTIS

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PB-264769/1ST, DOTL NTIS

20 163255

**FACTORED ESTIMATES FOR WESTERN COAL COMMERCIAL CONCEPTS. INTERIM REPORT**

No Abstract.

Prepared for ERDA and the American Gas Association.

Detman, R

Braun (CF) and Company Intrm Rpt FE-2240-5, 1976, 127 pp

Contract E(49-18)-2240

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO

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S/N-060-000-00036-1

20 163257

**MINERALS IN THE U.S. ECONOMY: TEN YEAR SUPPLY-DEMAND PROFILES FOR MINERAL AND FUEL COMMODITIES (1966-1975)**

The accompanying supply-demand flow diagram and 10-year tables for mineral and fuel commodities present essential data required by government, industry, and others to formulate policies and programs that can help assure an adequate and continuing supply of mineral raw materials. The 10-year data base terminates with 1975 figures because adequate world information was not available beyond that date. The selected mineral supply-demand tables and flow diagrams comprise but one "output" from the massive body of information and data collected and compiled by the Bureau of Mines on a continuing basis covering mineral production, consumption, prices, shipments, imports, exports, and stocks, as well as industry activities in all States and abroad.

Because of the limited editions, only one copy of any publication can be sent to the person applying and only a few publications to any one applicant. Please enclose a self-addressed label.

Bureau of Mines Spec Pub SP-6-77, 1977, 89 pp, 92 Fig.

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO

ORDER FROM: Bureau of Mines Publications Distribution Branch, 4800 Forbes Avenue, Pittsburgh, Pennsylvania, 15213

20 163259

**KENTUCKY COAL RESERVES: EFFECTS ON COAL INDUSTRY STRUCTURE AND OUTPUT**

The quantity and quality of land with coal reserves in a region act as the long run limits to industry output and are a primary determinant of industry structure. The present reserve base in Kentucky seems quite large relative to current output rates, and exhaustion appears to be a very distant problem. Nevertheless, the effects of the land constraint on the Kentucky coal industry structure and growth prospects over the next decade may be considerable. This report includes a survey of the conceptual links between the land factor and the coal industry. Output growth in Kentucky during the 1955-1972 period is examined from an industry structure point of view. Changes in output are described in terms of changes in average mine size and number of mines. These structural variables are also compared with the same statistics for the nation and for the states of West Virginia and Illinois. This comparative analysis yields some insight into changes in the relative ranking of Kentucky coal lands. The impact of surface mining technology on the Kentucky coal industry is stressed.

Kentucky University IMMR-6-PD5-75, Nov. 1975, 23 pp, 12 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Kentucky University, Institute for Mining and Minerals Research, Lexington, Kentucky, 40506

20 163260

**COAL RESERVES IN MARYLAND--POTENTIAL FOR FUTURE DEVELOPMENT**

After a brief historical review of coal development in Maryland, the authors discuss in detail the five coal basins of western Maryland, which include 11 commercially exploitable coal seams. The estimates of the recoverable reserves in each of the five basins are given, and the potential for future coal development is assessed. The total recoverable coal reserves for western Maryland are put at 854,900,000 tons of coal having fairly high BTU and sulfur content. Of this total, an estimated 100 million tons could be recovered by surface mining methods.

Weaver, KN Coffroth, JM Edwards, J, Jr

Maryland Geological Survey Info Circular 22, 1976, 16 pp, 19 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: Maryland Geological Survey, Johns Hopkins University, Baltimore, Maryland, 21218

20 163308

**COAL MARKET STUDY FOR THE EASTERN INTERIOR PROVINCE TO 2040**

The high-sulfur content of coal threatens to erode its competitive position in the future. The impact of sulfur removal on final costs of eastern interior coal is discussed in analysis. An extensive market survey is conducted that considers both traditional coal markets as well as anticipated future markets. Competition for coal from this province considers low-sulfur Western coal, nuclear power, international oil and coal trade, as well as Appalachian coal producers. Based on projections of future energy consumption under several scenarios, a comprehensive market forecast for eastern interior coal is made. This study is primarily concerned with future coal markets for production from those counties near the Wabash River in the heart of the Eastern Interior Province. An objective here is to consider a most pessimistic energy (and hence, coal) demand for planning purposes.

Ayers, RF (Battelle Columbus Laboratories) *Society of Mining Engineers of AIME, Transactions* Vol. 262 No. 1, Mar. 1977, pp 10-17

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

20 163765

**COSTS OF LOCATING ON-RAIL: PERCEPTIONS OF SHIPPERS AND PRACTICES OF CARRIERS**

Based on a survey of railroads and shippers, the practices attendant to installing a siding for a shipper are analyzed. The financing and repayment practices for such rail connections vary. The role of such practices in rail marketing and industrial development are discussed, although installation costs for most industry groups are not significant. It was determined that the service capabilities of railroads are appealing to a smaller cross-section of industrial firms and that piggyback may be the alternative for direct siding service.

Support for this research was provided in part by the Association of American Railroads and the University of Minnesota Computer Center.

Beier, FJ (Minnesota University) *Transportation Journal* Vol. 17 No. 1, Sept. 1977, pp 22-32, 9 Tab., 4 Ref.

ORDER FROM: ESL

DOTL JC

20 163768

**COAL AND THE RAILROADS--1977**

The ability of the railroads to handle increased coal traffic is documented; tables list the trends in car ownership, car loadings, coal production and revenues.

Association of American Railroads AARb-051077, 1977, 17 pp, 2 App.

ORDER FROM: AAR

DOTL RP

20 164412

**BIBLIOGRAPHY AND INDEX OF U. S. GEOLOGICAL SURVEY PUBLICATIONS RELATING TO COAL, 1971-1975**

The publication lists some 390 reports and maps relating to coal published by the U.S. Geological Survey in the 5-year period, January 1971 through December 1975. It is supplementary to Bulletin 1377 titled, "Bibliography and Index of U.S. Geological Survey Publications Relating to Coal,

1882-1970," and it supersedes Circular 709, titled, "Bibliography and Index of U.S. Geological Survey Publications Relating to Coal, January 1971-June 1974." Most of the publications cited may be consulted in large public libraries and in most college and university libraries.

Walker, FK  
Geological Survey Bibliog. Circular 742, 1976, 36 pp, Refs.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

## 20 164423

### PLANNING OF A NEW SURFACE MINE--WESTERN COAL

There are five geological provinces in the western states from which 100 percent of the lignite and sub-bituminous coal comes. Part of just one province, the Northern Great Plains, has recoverable reserves of lignite and sub-bituminous and bituminous coal which account for 44 percent of the nation's total. Most of western coal is low in sulfur and, therefore, in demand by utilities who must comply with the Clean Air Act. It lies in thick seams appropriate to surface mining methods. With a majority of coal reserves available in the West, several new mines are in planning stages. The article looks briefly at some of the aspects of mine planning which must be considered.

Graham, RJ (Consolidated Coal Company) *Mining Congress Journal* Vol. 63 No. 6, June 1977, pp 42-47

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

## 20 165025

### WESTERN AREA COKING COALS ARE A \$200 MILLION BUSINESS

Production of coking coals in the West is briefly reviewed here. Although overall production of coking coals is stabilizing, some expansion and new production are planned in the Raton Field of Northern New Mexico. The Raton Field coals are the strongest in the West and more than 1.4 million tons are produced annually. Several other fields with a history of coking coal production could be reopened if railroads were available or markets developed within a trucking distance.

*Coal Mining and Processing* Vol. 14 No. 5, May 1977, 3 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

## 20 165027

### COAL PRODUCTION IN OHIO--1800-1974

Coal is Ohio's most important mineral resource, and during the past 175 years over 2.7 billion tons of coal have been mined. This production has come from an approximate 30-county area of eastern Ohio, where both surface and underground mining methods have been employed. This report reviews Ohio's coal production by single counties during the 1800-1974 period, and examines the chemical characteristics of the Ohio coal and its importance to the economy of this state.

Ohio Department of Natural Resources Info Circular 44, 1976, 33 pp, 10 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: Ohio Department of Natural Resources, Division of Geological Survey, Columbus, Ohio

## 20 165084

### THE RAILROADS, COAL AND THE NATIONAL ENERGY PLAN: AN ASSESSMENT OF THE ISSUES

This report, sponsored by six railroads, examines the National Energy Plan proposed by President Carter as it relates to rail transportation. It identifies major areas of concern that have been only inadequately recognized by government policy makers, coal producers and users, and by the railroad industry. It urges that priority policy attention be given to factors of central importance in transportation inherent in a shift to increased reliance on coal. The chapters: Coal's Increasing Importance in the Nation's Energy Picture; Growing Coal Traffic and the Railroads: Meeting the Challenge Railroad Physical Capacity to Accommodate Projected Coal Traffic Expansion; Financial Implications of the Coal Traffic Challenge for the Railroads; The Slurry Pipeline Option: Theory vs. Reality; A Coal Transport Strategy for the United States.

Barber (Richard J) Associates, Incorporated Sept. 1977, 103 pp, Figs., Tabs., Refs., 2 App.

ACKNOWLEDGMENT: Barber (Richard J) Associates, Incorporated  
ORDER FROM: Barber (Richard J) Associates, Incorporated, 1000 Connecticut Avenue, NW, Washington, D.C., 20036

DOTL RP

## 20 165154

### DEMAND FOR FREIGHT TRANSPORTATION: A MICRO APPROACH

The paper describes a theory of transport demand from the viewpoint of the classical theory of the firm. A demand function for transport is developed not only with respect to transport rate, but also with respect to transport time, loss and damage rates, packing costs, etc. Thus some transport quality variables are shown to enter the theory easily and yield intuitively plausible results. The model also yields a decision rule for transport mode selection in industries facing fixed market prices.

Allen, WB (Pennsylvania University, Philadelphia) *Transportation Research* Vol. 11 No. 1, Feb. 1977, pp 9-14, 14 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

## 20 166114

### INVESTIGATION OF THE TRANSPORTATION REQUIREMENTS FOR FUSION POWER PLANTS

This report presents a general investigation of the transport requirements associated with the construction and operation of conceptual fusion reactors. Projections of amounts of construction and operating materials requiring transportation are presented for several proposed designs. The material to be shipped is described along with the shipping containers that might be used, the transport modes and the expected impact of transporting these materials. Transportation of both radioactive and nonradioactive materials will be required. Most of these materials are routinely shipped by the transportation industry. Transportation requirements of a representative fusion reactor are also compared with Liquid Metal Fast Breeder Reactor (LMFBR) requirements. (ERA citation 02:031586)

Rhoads, RE Davis, DK  
Battelle Memorial Institute/Pacific Northwest Labs, Energy Research and Development Administration Sept. 1976, 18 pp

Contract E(45-1)-1830

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

BNWL-2025, DOTL NTIS

## 20 166133

### 1975 ENERGY PRODUCTION SYSTEM IN THE STATES OF THE ROCKY MOUNTAIN REGION

This report presents statistics on the 1975 energy-supply system in the Rocky Mountain region. Detailed data on wood, fossil fuel, electricity, and uranium production, transportation, exportation, conversion, and to a lesser degree consumption, have been compiled for Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming, individually and as a region. Four types of information on the regional energy-production system are given: (1) quantities of energy produced, transported, exported, converted, and consumed; (2) employment in these activities; (3) contributions by these activities to final energy price; and (4) maps of the energy-supply system in each state. The data on energy quantities are presented in two forms: (1) in detail in the form of a reference energy system, and (2) in a simplified form enabling a quick overview of a state's energy-supply system. State-by-state resource data are given for coal, oil, gas, and uranium. (ERA citation 02:029989)

Kolstad, CD  
Los Alamos Scientific Laboratory, Energy Research and Development Administration Dec. 1976, 123 pp

Contract W-7405-ENG-36

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

LA-6624, DOTL NTIS

## 20 166252

### COAL RESERVE STUDY, NEW RIVER GORGE, WEST VIRGINIA

The report is an appraisal of coal reserves in the New River Gorge area of West Virginia. It contains a description of the minable coalbeds in the area,

an assessment of their reserves, and a study of the feasibility of mining from entries outside proposed boundaries of either a wild and scenic river area or a national park.

Prepared in cooperation with Geological Survey, Reston, Va.

Mory, PC Brocoum, AV Beers, AH  
Bureau of Mines, Geological Survey BuMines-OFR-96-77, Mar. 1977, 39 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-267208/7ST, DOTL NTIS

## 20 166626

### PLACE OF COAL IN THE TOTAL ENERGY NEEDS OF THE UNITED STATES

Solar power and fusion technology are expected to be significant contributors to the total energy supply in the 21st century. Geothermal power and hydropower will continue to supply increasing amounts of energy, largely for local markets in the future. In the immediate future the country must depend largely on the fossil fuel resources and nuclear energy. Coal resources and reserves and the role of coal in the energy market are discussed. Problems facing the coal industry are mentioned. (ERA citation 02:036942)

Simon, JA Malhotra, R  
Illinois State Geological Survey, Energy Research and Development Administration Jan. 1976, 16 pp

Contract W-31-109-ENG-38

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

IMN-63

## 20 166691

### FOCUS ON ALASKA'S COAL '75: PROCEEDINGS OF THE CONFERENCE HELD AT FAIRBANKS, ALASKA ON OCTOBER 15-17, 1975

Topic areas include: Coal mining research programs of the Bureau of Mines; Coal resources and coal characterization; Exploration and development; Mining and transportation; Economics and utilization; Mining regulations and environmental conservation; Coal conversion processes.

Sponsored in part by Federal Energy Administration, Washington, D.C. Library of Congress catalog card no. 77-620893. Microfiche copies only.

Rao, PD Wolff, EN  
Alaska University, Federal Energy Administration MIRL-37, Oct. 1975, 279 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-268664/OST

## 20 166737

### ELECTRIC UTILITIES CAPTIVE COAL OPERATIONS

Captive coal is defined as outright ownership and operation of a coal mine, ownership of coal reserves with another company mining the coal, or having a loan guarantee arrangement with a coal mining company. In 1965 only 13.4 million tons or about 5.5 percent of all coal used in electric utilities came from captive mines. By 1975, however, 27 electric utilities were using 48.4 million tons of captive coal, or 11.2 percent of all coal used in the industry.

Federal Power Commission June 1977, 45 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-269348/9ST

## 20 167521

### TRANSPORTATION OF COAL AND OTHER RESOURCES. MEETING ENERGY REQUIREMENTS THROUGH THE 1980S

This seminar explored many aspects of energy transportation, giving special attention to coal. Among the topics were energy demands, sources and availability of transportation, including carrier capacity for coal distribution. Also examined were regional aspects of coal production and consumption to meet utility and other requirements and the environmental, social and financial costs involved in increasing substantially the nation's coal production. Addresses and a series of panels and discussions are included.

Proceedings of a Conference May 24-26, 1977.

American University 1977, 537 pp, Figs.

ACKNOWLEDGMENT: American University

ORDER FROM: American University, Center for Transportation Studies, Washington, D.C., 20016

DOTL RP

## 20 167555

### COAL RECOVERY FROM BITUMINOUS COAL SURFACE MINES IN THE EASTERN UNITED STATES, A SURVEY

The Bureau of Mines conducted a field survey of 153 bituminous coal strip auger mines to estimate coal recovery from surface mines in the Eastern United States. Recovery was calculated from field data by measuring coal losses resulting from mining coal and leaving barriers. The wide recovery range at individual mines indicates the variability of the eastern surface coal mining industry.

Secor, ES Larwood, GM Gupta, AB Lees, AS Bureau of Mines Information Circular No. 8738, 1977, 17 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

## 20 167561

### FUEL TRANSPORTATION. MEETING THE GROWING DEMAND

The Carter Administration energy plan calls for annual coal production to be increased by roughly two-thirds to 1.1 billion tons by 1985. The railroads currently haul about 66% of the coal used by utilities. Assuming that they retained that share, they would be hauling about 725 million tons in 1985 compared to the current 442 million tons per year. By some calculations, the coal production goal would represent an average 8% increase per year over the projected 1977 level, which translates to an assumed annual increase in rail coal tonnage of 35 million tons per year. The ability of the nation's railroads to cope with this enormous increase in tonnage is discussed, noting the need for a great increase in the production of new 100-ton-capacity coal hopper cars. Also discussed are the advantages and responsibilities arising from ownership or leasing of coal cars by utilities. In addition, problems connected with the use of barges for coal transport are considered, including the need for new equipment and the presence of waterway constraints such as dams and locks. Finally, the need for the construction of new coal slurry pipelines is noted, as well as the problem of obtaining water rights needed for this mode of fuel transport.

Rittenhouse, RC Power Engineering (US) Vol. 81 No. 7, July 1977, pp 48-56

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

## 20 167932

### PROJECT PLAN 1977-1979: NATIONAL COAL UTILIZATION ASSESSMENT

No Abstract.

Energy Research and Development Administration ER 1.11 ERDA 77-19/2, 28 pp, Figs.

ACKNOWLEDGMENT: Energy Research and Development Administration  
ORDER FROM: Energy Research and Development Administration, 20 Massachusetts Avenue, NW, Washington, D.C., 20545

ERDA: 77-19

## 20 167933

### PROJECT PLAN 1977-1979: NATIONAL COAL UTILIZATION ASSESSMENT

No Abstract.

Energy Research and Development Administration ER 1.11: ERDA 77-19, 1976, Figs., Tabs.

ACKNOWLEDGMENT: Energy Research and Development Administration  
ORDER FROM: NTIS

DOTL NTIS

## 20 168100

### U.S. COAL DEVELOPMENT--PROMISES, UNCERTAINTIES

It is concluded that the administration's goal of doubling coal production to 1.2 billions by 1985 is unlikely to be achieved; that annual production of 1.0 billion tons will be difficult to achieve. The chapters summarize available knowledge on U.S. coal development as follows: How much do we need?

How much do we have? How do we get it? How can we get it to where we need it? How can we make it usable? How can we solve the social problems? What is the U.S. position in the world coal markets? Where do we go from here?

Report to the Congress.

General Accounting Office Sept. 1977, 300 pp, Tabs., Refs., 4 App.

ACKNOWLEDGMENT: General Accounting Office

ORDER FROM: General Accounting Office, Distribution Section, Room 4522, 441 G Street, NW, Washington, D.C., 20548

DOTL RP

20 168101

## STANDARDIZED COMMODITY TRANSPORTATION SURVEY (CTS) DATA BASE: USER'S MANUAL

This document describes the development, content, and application of a computer based standardized commodity transportation data base which has been established for governmental and general public use. The scope of the data base is presently restricted to primary shipments of manufactured goods from producing plants, as included in the public use files and other special computer tapes published by the Bureau of the Census from its Commodity Transportation Surveys of 1963, 1967, and 1972. These data have been adjusted for differences in units of reporting, certain changes in commodity classification, and in totals for certain commodities that were reported by the Census Bureau after publication of the public use files. To provide rapidity and flexibility of information retrieval, the data have been stored in a computer based data management system which can be accessed by the public. The system includes several utility user routines which can provide a range of detailed and summary tabulations of retrieved data.

Prepared for the U.S. Department of Transportation, Federal Railroad Administration, Office of Policy and Program Development.

Jordan, L. Crutchfield, G. Wright, DG

Transportation Systems Center Final Rpt. FRA/OPPD-77/22, Oct. 1977, 67 pp, Tabs., Apps.

Contract PPA-RR734

ACKNOWLEDGMENT: FRA

ORDER FROM: NTIS

DOTL NTIS, DOTL RP

20 168603

## VOLUMES AND TRANSPORTATION COSTS OF FOSSIL FUELS SHIPPED BETWEEN CENSUS REGIONS

Regional transportation options and costs of transmitting present and future energy sources influence selective choices. A multi-regional model permits energy policies to be addressed at a regional level of disaggregation. A multi-regional linear programming model of the nation's energy system is currently being developed at the National Center for Analysis of Energy Systems, Brookhaven National Lab. The two essential components providing the analytical power to such a model are: (1) an adequate representation of the regional cost structure of energy transportation, and (2) region-specific resource-supply functions. In support of these modeling activities, the Logistics Management Institute (LMI) has derived the volumes and transportation unit costs of coal, crude oil and natural gas shipped between the Nation's Census Regions. LMI has also provided regional supply functions in these same resources. The volumes and costs are based upon the 1985 Reference Case of the Federal Energy Administration's Project Independence Evaluation System (PIES) Model. Results in terms of volumes and unit costs of fossil fuels moved between Census Regions are shown in matrices. Coal movements are covered in Chapter I, crude oil in Chapter II, and natural gas in Chapter III. Coal supply curves are presented in Appendix A, oil supply curves in Appendix B, and natural gas supply curves in Appendix C. (ERA citation 02:039503)

Shaw, ML Wood, RK

Brookhaven National Laboratory Oct. 1976, 50 pp

Contract EY-76-C-02-0016

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

BNL-21995

20 168816

## STATUS OF THE MINERAL INDUSTRIES

Contents: U.S. minerals requirements; The role of minerals in the U.S. economy--1976; U.S. mineral production in relation to the rest of the world;

World steel production; Import reliance; U.S. imports and exports of raw and processed minerals; Energy; Petroleum and natural gas; Uranium; Coal; Bituminous coal and lignite underground and surface mining trends; Iron and steel; Aluminum; Major nonferrous metals (copper, zinc, lead); Old scrap; Plastics; Fertilizers (nitrogen, phosphate rock, potash); Nonmetallic construction materials; Profits after Federal income taxes as a percentage of stockholders' equity; Debt-equity ratios; Index of plant and equipment expenditures; Current asset to current liability ratios; Minerals transportation (railroads, pipelines, waterways, highways).

See also PB-254 448.

Bureau of Mines BuMines-SP-8-77, 1977, 49 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-271912/8ST

20 168844

## ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT. VOLUME IV. APPENDICES

This is a progress report of a three year technology assessment of the development of six energy resources in eight western states. Volume 4 presents two appendices, on air quality modeling and energy transportation costs.

Prepared in cooperation with Radian Corp., Austin, Tex. See also Volume 3 dated Jun 77, PB-271 754.

White, IL Chartock, MA Leonard, RL LaGrone, FS Bartosh, CP Oklahoma University, Radian Corporation, Environmental Protection Agency Final Rpt. EPA/600/7-77/072d, July 1977, 219 pp

Contract EPA-68-01-1916

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-272243/7ST

20 168892

## DYNAMIC MODELS OF THE U.S. AUTOMOBILE FLEET

The report examines some of the dynamic properties of the automobile fleet. The focus is not on new-car demand, but rather on the overall behavior of the system. Relationships derived from previous studies have been incorporated and integrated in a single model. This lends empirical credence to the model as well as allowing a test of internal consistency for a group of parametric relationships estimated independently. An additional objective of the work is to test the utility of the Systems Dynamics modeling approach and the DYNAMO software package for a dynamic automotive fleet model.

Rabe, FT

Environmental Impact Center, Incorporated, Transportation Systems Center Final Rpt. DOT-TSC-OST-77-26, TM-018, Aug. 1977, 43 pp

Contract DOT-TS-9961

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-273278/2ST, DOTL NTIS

20 168893

## AUTOMOBILE SCRAPPAGE AND RECYCLING INDUSTRY STUDY-OVERVIEW REPORT

The principal factors which influence the recovery of materials from junked automobiles are reviewed and evaluated. These include the number and materials composition of the automobiles that are retired annually in the U.S.; the flow of junk automobiles into the commercial recovery cycle and problems associated with abandoned automobiles; operations of the auto wrecking industry where serviceable parts are salvaged; and the structure, operations and technology of the scrap industry which transforms automobile hulks into commercial grades of metal scrap. Since Federal laws and policies impact on the reclamation of materials from junked automobiles, a legal review of key legislation and policies is also included. Because of a strong demand for auto hulks by scrap processors, created by an increased market for ferrous scrap, the problem of an ever increasing accumulation of unprocessed deregistered automobiles has been stabilized. In 1974, the fractional recovery of metallic materials from the approximately ten million automobiles deregistered that year was higher than from other forms of obsolete scrap. The estimated value of the recovered materials was in excess of one billion dollars.

Kaiser, R Wasson, RP Daniels, ACW  
HH Aerospace Design Company Incorporated, Transportation Systems  
Center Final Rpt. DOT-TSC-OST-77-11, Sept. 1977, 409 pp

Contract DOT-TSC-1028

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-273286/5ST, DOTL NTIS

20 168936

#### PROJECTIONS OF 1980 FREIGHT DEMANDS FOR SELECTED MIDWESTERN RAILROADS

The study shows how projections of state-to-state rail freight shipments can be made for all commodities carried on particular rail lines. To make the projections, a combination of data from the MRIO and the other transportation sources were used for five midwestern railroads: Chicago and Northwestern, Soo Line, Milwaukee Road, Burlington Northern, and Rock Island Lines. The step-by-step projection procedure outlined in the report was specifically designed so only a minimum of alterations needed to be made to the various data. This limit on the number of alterations was required partly because of time and cost considerations and partly because of the desire to maintain the data in as close as possible conformity to their original values.

See also report dated Sep 73, PB-233 586.

Pucher, JR  
Massachusetts Institute of Technology, Department of Transportation  
Final Rpt. DOT/TST-76T-40, Sept. 1976, 133 pp

Contract DOT-OS-30104

ACKNOWLEDGMENT: NTIS  
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20 170086

#### NEW MODELS FOR INTERMODAL TRAFFIC SPLIT, BASED ON AMERICAN RESEARCH [Neue Modal-Split-Modelle unter besonderer Berücksichtigung amerikanischer Untersuchungen]

The author describes the various types of models; aggregated, disaggregated, and integrated. He studies their advantages and drawbacks; in conclusion, he lists the conditions which a model must fulfil if it is to be usable. All undue complications are avoided. These conditions describe disaggregated and integrated models based upon the typology of transport users, demonstrating the supply-demand interface, and showing their sensitivity to the characteristics parameters of the supply. [German]

Hilgenfeld, H *Verkehr und Technik* Vol. 30 No. 8, Aug. 1977, pp 298-302, 1 Fig., 1 Tab., 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Schmidt (Erich) Verlag, Herforder Strasse 10, 4800 Bielefeld, West Germany

20 170087

#### COMBINED TRUCK/RAIL TRANSPORTATION SERVICE: ACTION NEEDED TO ENHANCE EFFECTIVENESS

Piggyback--the transportation of truck trailers and containers on rail flatcars, offers in principle increased efficiency at a time when saving energy

is of increasing importance to the Nation. Some shippers who use trucks would use piggyback more if there were better rates, speedier service, and easier handling of loss and damage claims. Interstate Commerce Commission officials believe that railroads generally do not promote piggyback because it may compete with their boxcar service--boxcars with their 40-year lifespan, represent a substantial capital investment. The report discusses how, within its statutory authority, ICC can encourage piggyback growth.

General Accounting Office Cong Rpt. B-139052, Dec. 1977, 37 pp, 2 Phot., 2 App.

ACKNOWLEDGMENT: General Accounting Office  
ORDER FROM: General Accounting Office, Distribution Section, P.O. Box 1020, Washington, D.C., 20013

DOTL RP

20 170106

#### PENNSYLVANIA COAL MODEL

Data banks and models are developed to simulate potential coal production and utilization systems in Pennsylvania. Building from a coal system data base for 1974 and mining simulation models, computer optimization models predict potential coal production and transportation for alternative future demand scenarios. The model allows deviations of costs of various coal supply systems under specific economic, transportation, and environmental constraints. The model also provides insight into such impacts of coal production as employment, land use, and environmental quality.

Appl of Comput Methods in the Miner Ind, Proc of the 14th Symp, Pennsylvania State University, University Park, October 4-8, 1976.

Knight, CG (Pennsylvania State University, University Park); Manula, CB  
American Inst of Mining, Metallurg & Petrol Engrs Proceeding 1977, pp 655-666, 14 Ref.

ACKNOWLEDGMENT: EI

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

20 170457

#### EFFECT OF COAL PREPARATION ON NORTHERN APPALACHIAN RESERVES

The Bureau of Mines has published reports detailing the extent of coal reserves of the United States by state, county, coalbed, rank, and sulfur content. In addition, other Bureau of Mines studies have delineated the sulfur release potential of coals from principal utility-coal-producing coalbeds of the United States. An effort to determine how the present reserves of the Northern Appalachian region would be distributed by sulfur content if they were subjected to various levels of coal preparation is reported in this paper. This study was applied to the bituminous coal reserves of the Northern Appalachian region because many of the coals of this area are amenable to upgrading by physical beneficiation. Included in this region are Maryland, Pennsylvania, Ohio, and 40 northern counties of West Virginia.

Hucko, RE Cavallaro, JA  
American Institute of Chemical Engineers Proceeding 1976, pp 307-416

ACKNOWLEDGMENT: EI

ORDER FROM: American Institute of Chemical Engineers, 345 East 47th Street, New York, New York, 10017

21 151167

**AN IMPROVED TRUCK/RAIL OPERATION: EVALUATION OF A SELECTED CORRIDOR**

Contents: Description of the corridor; Estimating traffic diversions to an improved intermodal operation; The impact of diversion on carriers and shippers; The impact of diversion on motor carrier labor; The impact of diversion in highway programs; Economic geography statistics; Development of freight traffic flow data; Development of teamster wage impact data; Evaluation of major teamster policy alternatives; Highway traffic statistics; Relating changes in highway traffic composition to maintenance expenditures.

See also PB-262 760.

Ainsworth, DP Keale, MJ Liba, CJ Levinson, HM  
Reebie (Robert) and Associates, Incorporated, Federal Highway Administration Final Rpt. FHWA/TE-76/02-F, Dec. 1975, 258 pp

Contract DOT-FH-8158

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-262761/0ST, DOTL NTIS

21 155009

**RAILROAD FREIGHT TRANSPORTATION. VOLUME 1. 1964-1974 (A BIBLIOGRAPHY WITH ABSTRACTS)**

Reports are cited in two volumes on the planning, management, and forecasting of rail freight operations, along with investigations of facilities, rolling stock, yards, components, and track engineering. Volume 1 begins the documentation, including such topics as intermodal operations, energy consumption, scheduling, competition, and theft. Other discussions include cost analyses, computer applications, testing programs, and characteristics within specific regions.

Adams, GH  
National Technical Information Service Bibliog. Apr. 1977, 157 pp, 152 Ref.

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

NTIS/PS-77/0196/4ST, DOTL NTIS

21 155010

**RAILROAD FREIGHT TRANSPORTATION. VOLUME 2. 1975-MARCH, 1977 (A BIBLIOGRAPHY WITH ABSTRACTS)**

Volume 2 of a two volume bibliography on the planning, management, and forecasting of rail freight operations continues the citations begun in Volume 1. The reports deal with freight car design, electronic engineering, economic impacts, intermodal systems, energy, scheduling, rolling stock utilization, rail revitalization, territorial distributions, cost analyses, computer applications, testing programs, and characteristics within specific regions. (This updated bibliography contains 102 abstracts, 50 of which are new entries to the previous edition.) See also NTIS/PS-77/0196, Railroad Freight Transportation. Vol. 1. 1964-1974.

Supersedes NTIS/PS-76/0169.

Adams, GH  
National Technical Information Service Bibliog. Apr. 1977, 107 pp, 102 Ref.

ACKNOWLEDGMENT: NTIS

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NTIS/PS-77/0197/2ST, DOTL NTIS

21 162960

**PERMANENT EQUIPMENT FOR WRONG-DIRECTION RUNNING [Les installations permanentes de contre-sens]**

On lines with double track, each track is in principle reserved for running in one direction. The arrangements necessary so trains can run temporarily in both directions should one track be blocked are long and complicated. To overcome the problem, the SNCF has developed a new system for its double track lines. This falls halfway between two way working as such and the temporary single track system. Design of the system called "permanent wrong-direction running equipment (I.P.C.S.)" includes some advantages of two-way working and these are listed in the article. [French]

Huet, J *Revue Generale des Chemins de Fer* Vol. 96 Apr. 1977, pp 187-201, 5 Fig., 1 Tab., 3 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

21 163235

**THE ECONOMIC JUSTIFICATION FOR THE IMPROVEMENT OF THE CAPACITY OF SINGLE-TRACK LINES**

This report was drawn up for the Economic and Social Commission for Asia and the Pacific (ESCAP). It describes a general method for determining economic criteria for the selection and schedule of successive operations aimed at increasing the throughput of a line, without technical monitoring of those operations. The report contains two examples illustrating the method in question.

Kondratchenko, AP Turbin, IV *Rail International* Vol. 8 No. 5, May 1977, pp 259-277, 9 Fig., 16 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

21 163245

**A NEW METHOD FOR STUDYING RAILWAY JUNCTIONS [Eine neue Methodik zur betrieblichen Untersuchung von Verkehrsknoten]**

This is a summary of a research document published by the University of Hannover under the title: Determination of the capacity of rail junctions using the graph theory. In this article, the authors briefly describe the calculation method used by means of which it should be possible to obtain more exact results than by using methods based on the theory of probabilities. [German]

Voelz, WD Kracke, R *Internationales Verkehrswesen* Vol. 28 N Mar. 1977, pp 112-116, 5 Fig., 2 Tab., 3 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

21 163246

**USE OF ELECTRONIC COMPUTERS FOR THE AUTOMATION OF CONTAINER TERMINALS [Einsatz von Prozessrechnern bei der Automatisierung eines Containerterminals]**

No Abstract. [German]

Geisler, R Trautnitz, W *Siemens Review* Vol. 51 N Mar. 1977, pp 169-173, 5 Phot., 4 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

21 163726

**MAIN FACTORS IN THE IMPROVED USE MADE OF RAILWAY CARS IN THE USSR**

No Abstract.

Solovyova, NP *Rail International* Vol. 8 No. 6, June 1977, pp 317-324, 7 Fig., 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

21 163736

**AUTOMATIC TRAIN SPLITTING IN A MARSHALLING YARD [Le debranchement automatique dans une gare de triage]**

The conventional system for automating marshalling yards, with gravity shunting and the car being stopped at a specific spot by means of remote-controlled retarders which take account of the wagon weight and running resistance, is complicated, expensive and considered, especially by ORE, as imperfect. The author proposes another system without hump or retarders, and with continuous movement at a constant speed of the train, programmed control of the switches which change as the car approaches, complete clearance assured by an auxiliary car pusher, and advancement to the correct position by Hauhinco trolleys. He considers the functional parameters of the system in detail. [French]

Garbers, E *Rail International* Vol. 8 No. 6, June 1977, pp 312-316, 4 Fig., 2 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

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21 163741

**MONITORING THE QUALITY OF OPERATIONS IN A DIVISION** [Upravlenie kachestvom ekspluatatsionnoj raboty na otdelenii]  
The article describes the experience gained by the staff in the Serovsk division (Sverdlovsk network) as regards monitoring the quality of operations. It explains the norms used in this division for each transport mode and the manner in which work efficiency is assessed. [Russian]

Vargin, SN Vidjakin, GG *Zheleznodorozhnyi Transport* No. 5, 1977, pp 26-29

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmanaya ul. 2, Moscow B-174, USSR

21 163751

**WEATHER CONDITIONS AND THE RATIONAL ORGANIZATION OF GRAVITY SHUNTING IN MARSHALLING YARDS** [Opredelenie meteorologicheskikh uslovij pri proektirovanii sortirovozhnyh gorok]  
No Abstract. [Russian]

Starsov, IP *Vestnik Vniizt* No. 4, 1977, pp 58-59, 1 Tab., 4 Ref.

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

21 163753

**PROBLEMS CONNECTED WITH THE SPEEDING-UP OF FREIGHT TRAINS** [Zadaci povyseniya skorostej dvizheniya gruzovyh poezdov]  
No Abstract. [Russian]

Albrecht, VG Verigo, MF *Zheleznodorozhnyi Transport* No. 6, 1977, pp 45-48, 5 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmanaya ul. 2, Moscow B-174, USSR

21 163767

**THE ANALYSIS OF SHIPPER OPERATING POLICIES AND PRIVATE FREIGHT CAR UTILIZATION**

To determine the practices of firms, which increasingly are buying or leasing fleets of freight cars, a study of large forest products companies in the Northwest was made. The problems of private car utilization differ in some respects from that of the railroads operating the general interchange fleet. Conclusions are drawn about the company practices and the effect which railroad practices can have on the utilization of such cars.

Tyworth, JE (Pennsylvania State University, University Park) *Transportation Journal* Vol. 17 No. 1, Sept. 1977, pp 51-63, 7 Tab., 10 Ref.

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21 163808

**REDUCTION OF IMPACT DAMAGE IN AUTOMATIC MARSHALLING YARDS**

A simulation of marshalling yard operations has been developed, representing a significant advance over previous simulations. With emphasis on the frequency of overspeed (potentially damaging) impacts, it was validated using traffic and layout data from the Dorval Yard of Canadian National Railways. It reveals the dependency of overspeed impacts and poor track utilization on retarder release-speed policy and on the profile of the classification tracks. It is readily adapted to other yards and traffic flows. Features of the Monte Carlo approach include nine classification tracks, dual humpleads, realistic traffic flow features, and interactions between moving cuts. The simulation program is in FORTRAN IV. Trial runs on a representative yard configuration indicate that substantial improvements at any yard may be possible through such means as (1) incorporation of a retarder release-speed policy which, in addition to "Distance-to-Go" information, uses a measurement of the velocity of the preceding car, (2) alternation of the gradients in the classification tracks, (3) minor alteration to the target speed.

Sponsored by Canadian National Railways.

Kerr, CN

Canadian Institute of Guided Ground Transport Final Rpt.  
CIGGT-77-11, June 1977, 40 pp, 17 Fig., 4 Tab., 22 Ref.

ACKNOWLEDGMENT: CIGGT

ORDER FROM: CIGGT

DOTL RP

21 165035

**ON THE EMPLOYMENT OF GOODS TRAINS TO CAPACITY**

Traffic conveyance costs include traction costs (which increase with the train load, while decreasing per traffic unit), costs of waiting time for forwarding consignments (a function of the waiting times imposed by train dispatch regulations). In this article the author develops equations relating to these costs and uses them to devise operating procedures that reduce costs to the minimum. The article contains numerous practical examples.

Klivanek, P Brandalik, F *Rail International* Vol. 8 No. 7/8, July 1977, pp 368-394, 9 Fig., 7 Tab., 2 Ref.

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

DOTL JC

21 165061

**TRANSPORT TO THE FAR EAST** [Le transport vers L'Extreme-Orient]

This market is an example of the situation where freight becomes a regulatory factor because of the carriers' natural tendency to seek a balanced tonnage. Most consignments can be carried in containers. Rates on the Siberian route are as much as 25% lower than those charged by sea. [French]

Bernard, G Heugel, H *Moniteur du Commerce International* No. 249, July 1977, pp 51-55, 4 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Societe d'Edition Documentation Econ & Commerciale, 10 avenue d'Iena, Paris 75783, France

21 165064

**CONCERNING LINE CAPACITY DURING SINGLE-TRACK OPERATION WHEN CARRYING OUT ENGINEERING WORK ON THE LINE** [Zur Leistungsfahigkeit eingleisiger Baubetriebszustande]

The planning of engineering work on the track is strongly influenced by the possibility of operating on line sections temporarily reduced to single-track working. The study of the timetables supplies only a limited basis for appreciation. The quality and stability of single-track operating rules are determined in decisive fashion by the rate of line occupation, and distribution of traffic in time. The line occupation rate is influenced by the number of trains and the length of the single-track sections, but also by the type of operation, and grouping trains into series. [German]

Muehlhans, E *Die Bundesbahn* Vol. 53 No. 6, June 1977, pp 383-388, 7 Fig., 1 Tab.

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

21 165068

**THE ROLE OF THE CONTAINER IN INTERNATIONAL TRANSPORT BY RAIL**

Text of talk given by the Chairman of the Intercontainer Board reviews the present situation of container transport, and Intercontainer's aims for the future for the progress of the company, from which the Railways can also benefit if they can meet the standards of present and future markets.

McKenna, D *Rail International* No. 7/8, July 1977, pp 357-362, 1 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD  
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DOTL JC

21 165168

**TRAVELLING TIME ON DENSE NETWORKS**

The purpose of this paper is to present an algorithm which finds the minimal travelling time in a network where travelling along various edges may be restricted to given time intervals, and parking at the vertices is prohibited during the specified periods of time. Such a problem is present in the management of a railway system. When various journeys are already scheduled, an edge is closed in one direction for an additional train during the specified time intervals because other trains are scheduled to move on

this edge in the opposite direction. Similarly, due to parking limitations in stations and junctions, there are no-parking periods for various vertices of the network.

Halpern, J (Toronto University, Canada) *Computer Methods in Applied Mechanics & Eng* Vol. 10 No. 1, Jan. 1977, pp 1-11, 5 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

21 167515

#### RAIL-INTERMODAL OPERATION AND FUEL EFFICIENCY

Over a long-haul, rail is an efficient mode of transportation from an energy as well as cost consideration, whereas trucks are efficient over the short-haul and provide mobility from the point of origin to destination. The integration of services between rail and truck can provide better transportation services to the consumer and can save cost and fuel. This paper deals with this subject area and expands upon the activities being undertaken by "CONRAIL" to enhance intermodal service between the truck and train.

Proceedings of the Third National Conference (Conf-760895), Effects of Energy Constraints on Transportation Systems, Union College, Schenectady, New York, August 2-6, 1976. Entire volume of Proceedings in RRIS, 165077.

Randall, HL (Conrail)  
Energy Research and Development Administration May 1977, pp 395-403

ACKNOWLEDGMENT: Energy Research and Development Administration  
ORDER FROM: GPO

GPO 060-000-00073-5

21 167921

#### STILL YEARS BEHIND

After summarizing the engineering problems confronting conventional piggyback, the author discusses the economic concerns of lower profits per foot of train length than box-car traffic, failure to reduce terminal costs with TOFC and higher equipment costs. TOFC/COFC has not yet solved the problems of car utilization and terminal handling; some solutions are proposed to increase productivity and profitability.

Whitten, HO (Whitten (Herbert O) and Associates) *Modern Railroads/Rail Transit* Vol. 32 No. 11, Nov. 1977, pp 48-52, 4 Tab.

ACKNOWLEDGMENT: Modern Railroads/Rail Transit  
ORDER FROM: ESL

DOTL JC

21 167957

#### ASSESSMENT OF SOLUTIONS TO PROBLEMS CONCERNED WITH AUTOMATED TRAIN-RUNNING [Bewertung der Konfliktlösungen bei der Automatischen Disposition des Zugverkehrs auf Strecken]

Assessment of solutions to problems are an essential factor in automated train-running. The objective is to choose the optimum variable for the basic timetable when there is a disturbance of the train-running schedule. A basic procedure and complementary procedure have been developed for this purpose. The basic procedure consists in classifying trains according to their importance. The complementary procedure goes beyond this, considering the permissible delays for trains when taking the whole train-running schedule into account. [German]

Neumann, E Handschack, R *Eisenbahnpraxis* Vol. 21 No. 7, July 1977, pp 232-235

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

21 167983

#### RAILYARD MODELING--1. PREDICTION OF PUT-THROUGH TIME

An analytic model of railyards has been developed and is reported in two separate studies. This paper is a macroview of yards describing the major operations performed within a yard and how different yards may be classified for modeling purposes. The yard operations are analyzed as queueing phenomena and modeled using queueing relations. These queueing models are used to calculate the probability distribution of put-through times, and their moments, for each major type of traffic. These distributions are compared with observed histograms.

Petersen, ER (Queen's University, Canada) *Transportation Science* Vol. 11 No. 1, Feb. 1977, pp 37-49, 14 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

21 167984

#### RAILYARD MODELING--2. THE EFFECT OF YARD FACILITIES ON CONGESTION

After previously demonstrating that queueing models could be used to describe the classification, connection and train assembly operations in railyards, the paper describes how the service rates for these operations can be related to the physical characteristics of the yard and the traffic handled. Based on the number of classification tracks, the configuration of switching leads, the available yard engines, the marshalling rules and the traffic intensities, the switching workload is estimated. From unit operating times for these switching operations, the rates at which trains can be classified and assembled are calculated. These rates are then modified by standing capacity limitations of the yard. An example of the use of the model is presented.

Petersen, ER (Queen's University, Canada) *Transportation Science* Vol. 11 No. 1, Feb. 1977, pp 50-59, 4 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

21 168104

#### USE OF COMPUTER SIMULATION FOR THE ANALYSIS OF RAILROAD OPERATIONS IN THE ST. LOUIS TERMINAL AREA

This report discusses the computer simulation methodology, its uses and limitations, and its applicability to the analysis of alternative railroad terminal restructuring plans. Included is a detailed discussion of the AAR Simulation System, an overview of twelve other railroad simulations, and an analysis of how they or other simulation systems might aid the restructuring project being conducted by the railroads in St. Louis. Included is critical analysis of what "validation" of simulation means and what it does and does not imply. Also discussed is the meaning of the terms "network" (as in network simulation) and "levels of detail." Simulation builders and railroaders view these terms differently, which often results in disappointment with the results of supposedly "successful" simulation ventures. The importance of user familiarity with both the simulation system and railroad problems is stressed. A major conclusion reached is that none of the existing network simulations is suitable for detailed analysis of railroad terminal areas. Development of a simulation system incorporating a new approach for performing such analysis is within the state-of-the-art and is recommended.

Prepared for the U.S. Department of Transportation, Federal Railroad Administration, Office of Federal Assistance.

Merriam, EW

Bolt, Beranek and Newman, Incorporated Final Rpt. DOT-TSC-FRA-77-25, Nov. 1977, 80 pp, Figs., Tabs., 23 Ref.

Contract DOT-TSC-13305

ACKNOWLEDGMENT: FRA  
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DOTL NTIS, DOTL RP

21 168108

#### GRAVITY SHUNTING USING DOWTY RETARDERS FOR THE PRACTICALLY CONTINUOUS CONTROL OF WAGON SPEEDS [Ablaufanlagen von Verschubbahnhöfen mit quasikontinuierlicher] No Abstract [German]

This subject is also covered in volume 12, number 1, pages 8-13, 1977 of Eisenbahntechnik.

Koenig, H *Eisenbahntechnik* Vol. 11 No. 4, 1976, pp 79-81, 12 Phot., 6 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Bohmann Verlag, Canovagasse 5, A-1010 Vienna, Austria

21 168109

**PROGRAMMED TRAFFIC-A CONVEYOR BELT SUPPLYING INDUSTRY WITH RAW MATERIALS [Programmverkehre Transportbänder zur Versorgung der Wirtschaft mit Rohstoffen]**

Programming train movements, including the aspect of timetable preparation, contributes greatly to improving the quality of transport and reducing costs. The writer describes DB practice in this field: unit trains and the use of rolling stock, advantages offered to customers and cooperation with them, successes and difficulties with the programmed use of Fab/Tab cars, and programming and marketing. [German]

Lueder, H. *Die Bundesbahn* Vol. 53 No. 7, July 1977, pp 495-499, 2 Tab., Photos.

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

21 168110

**A MARSHALLING YARD WITH FOUR SETS OF SIDINGS [O vetryehparkovoj sortirovovnoj stancii]**

No Abstract [Russian]

Litvinovskij, GA Ivan'ko, AA *Transportnoye Stroitel'stvo* No. 8, Aug. 1977, pp 39-40, 3 Fig., 1 Tab., 2 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Mezhdunarodnaya Kniga, Smolenskaya sennaya pl 32/34, Moscow G-200, USSR

21 168112

**DECISIVE FACTORS IN SPEEDING UP WAGON TURN-ROUND TIME [Resajuscie faktory uskorenija oborota wagona]**

The authors describe tests on the Moscow network to speed up transport operations. Ways of speeding up wagon turn-round time are also given. [Russian]

Paristyj, IL Sologub, NK *Zhelezнодорожные Transport* No. 4, 1977, pp 41-47, 4 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmanaya ul. 4, Moscow, B-174, USSR

21 169978

**OPTIMISATION OF TRAIN RUNNING PATTERNS ON DOUBLE TRACK LINES [Optimizacija rezima dvizenija poezdov na dvuhputnyh liniya]**

No Abstract [Russian]

Kozlov, VE Perminova, EA *Zhelezнодорожные Transport* No. 9, 1977, pp 37-41, 5 Fig., 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Ministerstvo Putei Soobshcheniya SSSR, Novo-Basmanaya ul. 2, Moscow B-174, USSR

21 170059

**THE RAILROAD PERFORMANCE MODEL**

This report describes an operational, though preliminary, version of the Railroad Performance Model, which is a computer simulation model of the nation's railroad system. The ultimate purpose of this model is to predict the

effect of changes in government or industry policies on the performance of the railroads. This model simulates the history of individual cars and individual loads of freight; and it explicitly incorporates a number of decisions made by government, railroads, and shippers. This model includes phenomena such as freight car shortages and surplus, interlining, per diem rates, car service rules, the demurrage system, routing of cars, and the allocation of home and foreign empty cars.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Office of Policy and Program Development, Office of Rail Systems Analysis and Program Division, Washington, D.C

Olesen, JF

Transportation Systems Center, (DOT-TSC-FRA-77-1) Final Rpt. FRA-OPPD-77-11, Oct. 1977, 312 pp, Figs., 22 Tab., 24 Ref.

ACKNOWLEDGMENT: FRA

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21 170060

**OVERVIEW OF COMPUTER-BASED MODELS APPLICABLE TO FREIGHT CAR UTILIZATION**

This report documents a study performed to identify and analyze twenty-two of the important computer-based models of railroad operations. The models are divided into three categories: network simulations, yard simulations, and network optimizations. The simulations are used to assess the impact of certain operating policies and planning procedures. The network simulations examine system-wide effects, while the yard simulations focus on the operations performed within a single yard. Network optimizations typically are used to calculate optimal distribution for a rail system's empty freight cars based on the railroad's car distribution rules and goals. The description of each model includes its history, design approach, fundamental logic, unusual features, hardware and software specifications, and its extent of application. In the case of a model's implementation on a rail system, attempts were made to obtain test results and evaluations. This served as a basis for reviewing each model.

Prepared for U.S. Department of Transportation, Federal Railroad Administration, Policy and Program Development, Washington, D.C.

Baker, L

Transportation Systems Center, (DOT-TSC-FRA-77-4) Final Rpt. FRA-OPPD-77-12, Oct. 1977, 96 pp

ACKNOWLEDGMENT: FRA

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21 170571

**LAWS OF RUNNING GIVING THE LEAST TRACTION COST**

The writer demonstrates that on any particular journey, among the infinite number of possible solutions, there is always one solution and one running chart which, following the optimum running, produces the least total cost for each value of the journey time. The equations for this running and the chart system used to explain them are very simple and easy to use. A few examples are given of the optimized charts which are characterized by a continuous variation of the tractive effort through all the running phases.

Di Majo, F (Turin Polytechnic School, Italy) *Rail International* Vol. 8 No. 10, Oct. 1977, pp 499-516

ACKNOWLEDGMENT: Rail International

ORDER FROM: ESL

DOTL JC

22 155091

**SOLVING WOOD CHIP TRANSPORT PROBLEMS WITH COMPUTER SIMULATION**

Efficient chip transport operations are difficult to achieve and maintain because of frequent and often unpredictable changes in chipping rates, distances to mill, time spent in the mill yard, and equipment costs. This paper describes a computer simulation model that will permit a logger to design and maintain an efficient operation as these factors change. Two examples, one based on an actual case study and the other hypothetical, show how to use the program. Applying time and cost data easily collected on his own operation, a logger can use the model to determine the most economical combination of trucks and vans, setout truck use, and work schedules. Written in the General Purpose Simulation System language developed by IBM, the program is very flexible and can be understood and modified if desired with a minimum of difficulty.

Bradley, DP Winsauer, SA  
Forest Service FSRP-NC-138, July 1976, 13 pp

ACKNOWLEDGMENT: NTIS

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PB-264591/9ST, DOTL NTIS

22 162958

**COMMODITY TO VEHICLE RESTRAINT SYSTEMS. DYNAMIC TESTS ON NAILED-WOOD JOINTS**

An account of laboratory tests in which forces, acceleration and displacement produced during the tests were measured for 313 combinations of various types of wood blocks, sizes and quantity of nails and forces of inertia.

Proceedings of the 4th Intersociety Conference on Transportation

Jackson, E  
American Society of Mechanical Engineers Conf Paper GP-6, July 1976,  
4 pp, 1 Fig., 1 Phot., 1 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
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22 162959

**CARGO RESTRAINT CRITERIA FOR RAIL TRANSPORTATION**

An account of the studies mainly carried out by the MTMC (Military Transport Management Command). The forces required for cargo restraint are calculated by 4 methods: The coupler force method, in which the appropriate coupler force (CF) is distributed to the system component masses (M) in the proportion to their share of the weight, the empirical method, the spring mass method, the energy method. The document gives examples of these calculations.

Proceedings of the 4th Intersociety Conference on Transportation.

Kennedy, R  
American Society of Mechanical Engineers Conf Paper GP-5, July 1976,  
6 pp, 7 Fig.

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

22 163253

**NECESSITY INVENTS SOLUTION TO FROZEN COAL CARS**

Frozen coal in hopper cars threatened mine operators, Chesapeake & Ohio, and ship owners with revenue losses during last winter's record cold. Vibratory pile hammers were used to break frozen coal when regular thawing installations proved inadequate.

Construction Vol. 44 No. 11, May 1977, p 27

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22 163285

**BASIC SIZE STEPS IN ASSEMBLING AND HANDLING FRUITS AND VEGETABLES**

Basic size steps in fruit and vegetable packaging and transportation, from individual fruit to container ship, are identified and analyzed as building blocks in the material handling system. A new size step, a mechanically handleable transport unit suitable for retail display, to replace present manual handling containers, is postulated and defined.

Presented at the ASAE Winter Meeting, Chicago, Illinois, December 14-17, 1976.

Sides, SE (Maine University); Hallee, ND Smith, N  
American Society of Agricultural Engineers Paper 76-3554, Dec. 1976, 8  
pp, 1 Ref.

ACKNOWLEDGMENT: EI

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22 163870

**THE DEMAND FOR FREIGHT TRANSPORTATION: A MICRO APPROACH**

Most literature on freight demand has been macro economic in nature or related to inventory behaviour of the firm. The paper describes a theory of transport demand from the viewpoint of the classical theory of the firm. A demand function for transport is developed not only with respect to transport rate, but also with respect to transport time, loss and damage rates, packing costs, etc. Thus some transport quality variables are shown to enter the theory easily and yield intuitively plausible results. The model also yields a decision rule for transport mode selection in industries facing fixed market prices, namely: choose the mode with the highest market price net of all of the transport variables. Unfortunately the rule cannot be generalized to monopoly situations. The model also makes the production and transport processes inter-dependent for the first time. /TRRL/

Bruce, MAP (Pennsylvania University, Philadelphia) *Transportation Research Analytic* Vol. 11 No. 1, Feb. 1977, pp 9-14, 5 Fig., 14 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 226679)

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DOTL JC

22 165080

**EFFECTS OF RAILROAD ABANDONMENT ON SMALL BUSINESS**

This study identifies 33,100 miles of potentially abandonable lines and analyzes a survey of business which could be affected by such cessation of service, drawing conclusions applicable to all such operations. There are nearly 6,000 such firms, nearly two-thirds of which could be classed as small businesses. It is estimated that about 5 percent of all these businesses would close and some others would phase out some of their product lines. About 6 percent would relocate all or part of their operations, but only 2 percent of small businesses would do so. The effects on transport costs, alternate modes, regional distributions, investment requirements and other factors are examined. Special attention is paid to lines affected by the 3R Act.

Sponsored by the Small Business Administration, Washington, D.C.

CONSAD Research Corporation Final Rpt. Apr. 1977, 49 pp, Figs.,  
Tabs., 61 Ref.

Contract SBA-77-170

ORDER FROM: Small Business Administration, Office of Planning, Research  
and Data Management, Washington, D.C., 20416

DOTL RP

22 166721

**CHANGES IN DESTINATION AND MODE OF TRANSPORT FOR ILLINOIS GRAIN, 1954, 1970, AND 1973**

Grain sold from farms moved primarily through four types of firms: (1) country elevators, (2) terminal and export elevators, (3) feed mills and manufacturers, and (4) grain processors. By far the greatest proportion is moved through country elevators. From the country elevator, grain is moved directly and indirectly to Illinois processors, to export terminals, and to feed and processing firms in the Southeast. The channels were similar for all the major grains but differed slightly in the proportions moving to the various destinations. The document presents flow patterns for corn, soybeans and wheat. The primary focus of the study was on transportation requirements and the relationships between transportation and destination. The objective was to demonstrate the relative importance of different types of firms in providing the marketing services.

Illinois University, Urbana Aug. 1976, 22 pp

ACKNOWLEDGMENT: NTIS

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PB-269040/2ST

22 167498

**OMAHA PIONEERS IN RAILHAUL USING HIGH DENSITY BALER**

The first American railhaul operation went into operation earlier this year with Omaha's new \$4.6 million Solid Waste Handling Facility. In addition to pioneering railhaul, the operation is also expected to provide new proof of baling, shredding, resource recovery and balefill technology. The article describes the overall operation, equipment and methods being employed.

*Solid Wastes Management Refuse Remove Journal* Vol. 20 No. 6, June 1977, pp 30-31

ACKNOWLEDGMENT: EI  
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## 22 167503

**NEW FREIGHT ROLLING STOCK ON THE SNCF, ORIGIN AND DEVELOPMENT OF PROJECTS [De nouveaux matériels a marchandises sur la S.N.C.F., naissance et développement des projets]**

The provision of the right types of cars to match customers' requirements is an essential part of railway service. Innovation in this sphere is therefore a commercial necessity. In the first part, the article explains how, at the SNCF, a new car project begins to take shape and how the project is then developed in successive phases by cooperation between the two departments responsible: commercial and rolling stock. An explanation is given of how the prototype is assessed. In the second part, the article describes various recent practical applications and research programs: cars for the conveyance of scrap iron, rough timber, metal trellis-work, reels of cable, etc. [French] Cazenave-Larroche, J Pons, H *Revue Generale des Chemins de Fer* Sept. 1977, pp 449-463, 10 Fig.

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

DOTL JC

## 22 167557

**TRANSPORTATION REQUIREMENTS OF COAL TO THE MARKET PLACE**

Several elements in the Rail Revitalization and Regulatory Reform Act will materially benefit the coal industry. One is Section 310, "Equitable Distribution of Cars for Unit Train Service". The establishment of a dual fleet for railroad owned cars--unit train and non-unit train--will enable mines to receive a more certain car supply. Of nearly equal importance, the new Act brings together capital and commitment in rail ratemaking by virtue of a long needed provision. That provision is Section 206, which provides protection for a rate requiring a capital investment by the carrier, or the users, of one million dollars or more.

From the American Mining Congress Coal Show, Session Papers, Detroit, Michigan, May 10-13, 1976. Also available from American Mining Congress.

Boone, JW (Federal Railroad Administration)  
American Mining Congress Proceeding 1976, 11 pp

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

## 22 167558

**MERRY-GO-ROUND TRAINS**

The movement of coal from collieries to the power plants of the U. K. Coal Board's best customer, the CEGB/SSEB, has been transformed by the introduction of the imaginatively named merry-go-round trains which now carry three quarters of all railborne coal to power plant boilers. Planning, aims and efficiency of the concept of Merry-Go-Round working--a non-stop movement of a permanently coupled set of rail-cars from the colliery to the power plant and back again--are discussed, and the design of the system and the rail-cars is analyzed.

Rainbow, M *Colliery Guardian* Vol. 225 No. 6, June 1977, p 319

ACKNOWLEDGMENT: EI  
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## 22 167881

**UNIT TRAIN/GREAT LAKES BULK SHIP COST COMPARISON**

An analysis is made of the economic tradeoffs between moving bulk goods by unit train or by bulk carrier operating on the Great Lakes. Variations in ship and train size, length of haul, and seaway season are conducted. Results of the research indicate that unit train costs generally exceed those of rail-water shipments in cases where the water portion of the haul is of significant length. Further effects of greater ship size and larger operating periods are also noted.

Beimborn, EA Soomro, MT *ASCE Journal of Transportation Engineering* Vol. 103 No. 5, Sept. 1977, pp 545-554, 6 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

## 22 167919

**CHESSIE DRAWS A BLUEPRINT FOR WINTER**

The winterizing program for the coal dumping facilities of Chessie system at Baltimore and Newport News include thawing sheds, multi-fingered vibrating probes to reduce lading to manageable sized lumps, and screening in dumper hoppers to prevent passage of oversize lumps.

*Progressive Railroading* Vol. 20 No. 11, Nov. 1977, p 65, 2 Phot.

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

DOTL JC

## 22 167935

**GUIDELINES FOR PEST CONTROL IN RAILCARS FOR FOOD TRANSPORTATION**

No Abstract.

Henderson, LS  
Department of Agriculture A 1.68:1178, May 1977, 13 pp

ACKNOWLEDGMENT: Department of Agriculture  
ORDER FROM: GPO

GPO S/N 001000036858

## 22 167939

**HEURISTIC APPROACH FOR LARGE SCALE DISCRETE STOCHASTIC TRANSPORTATION-LOCATION PROBLEMS**

An effective heuristic for determining plant locations and shipments to customers is described. It is assumed that there are a discrete number of possible locations and that the demand at each destination is a random variable. Thus the problem is to minimize expected holding and shortage costs, in addition to linear shipping costs and fixed costs of construction. The algorithm uses dual variables to guide the determination of whether each plant should be opened or not.

LeBlanc, LJ (Southern Methodist University) *Computers and Mathematics with Applications* Vol. 3 No. 2, 1977, pp 87-94, 10 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

## 22 167946

**DRIVES TO POWER TRAIN POSITIONER-DUMPERS**

Today's train positioner-dumper systems are powered by drives capable of exerting 300,000 lbs of force and more than 365 hp. The article describes these drives and their operation. Rotary couplers at both ends of a car let it rotate without uncoupling from a train. Typical single dumper systems are unloading trains at a rate of 30 to 35 cars per hour; a system with multiple dumper units has been designed to unload trains of as many as 231 coupled cars in less than 2-1/2 hours. Single dumper systems are most common, and more than 35 have been installed in the free world in the last 5 years.

Lawson, WF (McDowell Wellman Engineering Company) *Power Transmission Design* Vol. 19 No. 8, Aug. 1977, pp 35-38

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

## 22 167981

**DETERMINING COST VS. TIME PARETO-OPTIMAL FRONTIERS IN MULTI-MODAL TRANSPORTATION PROBLEMS**

This paper provides a framework for choosing modes of transportation (rail, highway, and air) by taking into account the conflicting objectives of minimizing total transportation costs and average shipment times. An efficient algorithm using the operator theory of parametric programming is presented for determining the Pareto-optimal or efficient curve denoting the minimum attainable value for the second objective for differing values of the first objective. The algorithm also provides the optimal routes, modes of transportation, and the corresponding shipping amounts for every efficient point.

Srinivasan, V (Stanford University); Thompson, GL *Transportation Science* Vol. 11 No. 1, Feb. 1977, pp 1-19, 8 Ref.

ACKNOWLEDGMENT: EI  
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DOTL JC

22 168087

**LONG DISTANCE ROAD AND RAIL FREIGHT IN AUSTRIA [Der Gueterfernverkehr in Oesterreich auf Strasse und Schiene]**

The research aimed at establishing a model for the study of the evolution of long distance freight traffic in Austria, on the basis of traffic economy. A study was made of long distance freight traffic from, to and passing through Austria. The study was based on data from the central office for statistics in Austria and the Austrian railway authority. The mathematical model developed included the Austrian road network (motorways, link roads), border crossings, the railway system of the federal Austrian railway and all principal stations and border railway stations. This forms the basis for a traffic economic criterion which makes use of the actual net transport costs for road freight transport from the point of view of the forwarding agent and for rail freight transport in the case of the railway authority. This contains details of all relevant monetary expenditure and transport time and results in a calculation of the long distance freight load on all roads and railway sections in Austria. [German]

Engel, E Petri, P Rollinger, W (Technical University of Vienna, Austria) *Strassenforschung* Monograph No. 650E, 1975, 56 pp, 16 Fig., 19 Tab., 6 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-304687), Federal Institute of Road Research, West Germany

ORDER FROM: Bundesministerium fuer Bauen und Technik, Stubenring 1, Vienna, Austria

22 168090

**FREIGHT COMPLEXES. AN APPRAISAL OF THE ROLE OF FREIGHT COMPLEXES AND POSSIBLE APPROACHES TO DEVELOPMENT OF A NUMBER OF COMPLEXES IN THE UK**

The study was undertaken to assess the future role of freight complexes in the United Kingdom and the form a network might take. This was in response to the conclusions of the LEC's earlier work on transshipment which suggested increased consolidation and other benefits might be achieved by bringing individual operators together into locations which offered first class access and ancillary facilities. The elements of such a complex are reviewed, the core element being modular design high throughput distribution and haulage depots in which an individual operator's space can be expanded or reduced relatively easily. The ancillary services included railhead, lorry and car parking, fuelling, vehicle servicing, plant hire, offices and return load bureau. The distribution depot is considered to be the key element in commercial terms though the ancillary facilities are important services in their own right and as means of attracting tenants for distribution. The possible networks of depots and the costs of such depots in serving the market are assessed. The locations selected are close to population concentration and existing demand for private depots and they are therefore also suited to attracting the private distribution depots market. The conclusions are that for the scale of markets identified complexes in seven locations could be justified. Existing proposals at London and Wakefield were compatible with this and the other broad locations were in the general vicinity of Warrington, Glasgow, Newcastle upon Tyne Bristol, and Stourbridge.

Lorries and the Environment Committee Monograph July 1977, 34 pp, 3 Tab.

ACKNOWLEDGMENT: TRRL (IRRD-228688)

ORDER FROM: Lorries and the Environment Committee, 215 Great Portland Street, London, England

22 168807

**ANALYSIS OF THE INCREMENTAL COST AND TRADE-OFFS BETWEEN ENERGY EFFICIENCY AND PHYSICAL DISTRIBUTION EFFECTIVENESS IN INTERCITY FREIGHT MARKETS**

The report describes a study of the effects of changes in national transportation policy on the traffic allocation and the energy consumption of various modes of intercity freight transportation. Models have been developed to predict the level of service associated with the transport alternatives available to a firm, to predict the total logistics cost of each of these alternatives, and to forecast the demand for various modal services at the disaggregate level. Using these models and methods, it is possible to make detailed forecasts of commodity flows under alternative policy options. Policy options selected for analysis were investigated with a computerized model system which simulated freight flows between four pairs of major metropolitan areas. Before the model could be applied, each policy was analyzed with regard to its effect on the key level of service determinants. The model system was then used to predict the impact of the level of service changes on the shipping patterns of a sample of individual firms. These results have been summed and expanded to produce aggregate forecasts of modal shares and energy consumption.

Roberts, PO

Massachusetts Institute of Technology, Federal Energy Administration, (FEA-50154) FEA/D-77/375, Nov. 1976, 186 pp

Contract FEA-CO-04-50154-00

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-271792/4ST

22 170279

**THE SWEDISH PACKAGING RESEARCH INSTITUTE EXPLAINS HOW SACK DAMAGE ARISES DURING SHUNTING**

That palletized sacks are damaged during shunting is well known. Now the Swedish Packaging Research Institute has studied what can be done to prevent damage. Shunting tests between wagons were performed. In all, 72 shunting tests with test-load placed in different ways were examined. It could be established that the best result was achieved when the direction of the wood of the pallet decks are placed at right angles to the route direction and the sack loads are kept together by pallet adhesive.

*Transport och Hantering* 1977, 40 pp

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Foerlags AB Affaersekonomi, Box 45056, S-104 30 Stockholm, Sweden



23 149943

**MODERN EXPRESS TRAMS [Moderne Sneltrams]**

This book starts from the how and why of the renewed interest in modern tramway technology or light rapid transit (LRT). An attempt has been made to build up a current picture of the state of the art, in which the most relevant features of LRT as a public transport system are highlighted, including the reasons for its rebirth, traffic management developments, town planning, environmental and system building considerations. A closing chapter assembles the most important criteria for financial, socio-economic, commercial and political evaluation, which are, wherever possible, quantified. /TRRL/ [Dutch]

Kaper, HP

Uitgevers Wijt, (90-6007-558-7) Monograph 1976, 156 pp, Figs., Photos.

ACKNOWLEDGMENT: Institute for Road Safety Research (SWOV60008E), TRRL (IRRD 224118)

ORDER FROM: Uitgevers Wijt, 111 P de Hoochweg, Rotterdam, Netherlands

23 157826

**AN APPLICATION OF MODE-CHOICE METHODOLOGIES TO INFREQUENT COMMUTER-RAIL SERVICE**

The feasibility of commuter-rail transit in the southwest Baltimore corridor was studied by a variety of passenger estimation methodologies. The methodologies selected were required to be applicable to the corridor scale, to be run manually, and to be capable of quick response. They were also required to be responsive to the addition of one or two trains per peak period, changes in station location and accessibility, and changes in costs such as parking charges and gasoline costs associated with the automobile. No one methodology met all of the above requirements. However, two methodologies were adapted to consideration of infrequent rail service (one or two trains per peak period) and applied to the corridor. The first methodology involved the application of a simple graphical technique that related modes split to station distance from the CBD; the second involved the application of a marginal utility model to corridor census tracts. The infrequent service capability was added, in the case of the graphical approach, by applying experience factors, and in the computational approach by relating automobile captivity to the number of trains per peak period. Both methodologies were transferable, without reestimation of coefficients, to the southwest Baltimore corridor. Both approaches could be applied manually in a person-week or less; the need for any greater sophistication than the graphical methodology is seriously questioned. /Author/

This article appeared in Transportation Research Record No. 610, Passenger Travel Demand Forecasting.

Kingham, RI *Transportation Research Record* No. 610, 1976, pp 30-36, 5 Fig., 13 Ref.

ORDER FROM: TRB Publications Off

23 158057

**A COMPARATIVE ANALYSIS OF URBAN TRANSPORTATION REQUIREMENTS, VOLUME I**

This report on urban transportation systems covers a study made in 31 urban areas located in 14 countries, including 9 cities in the U.S.A. Information is presented on the development and use of mass transit systems in each of these cities, the costs of providing and operating the systems, the sources of financing required, and the changing patterns of rider usage of transport modes, including the private motor vehicle.

Sponsored by DOT, Federal Highway Administration. See also Volume 2, PB-267789.

Turner, FC Davis, HE

International Road Federation, Federal Highway Administration Final Rpt. FHWA-PL-77013, Feb. 1977, 52 pp

Contract DOT-FH-11-7970

ACKNOWLEDGMENT: Federal Highway Administration, NTIS

ORDER FROM: NTIS

PB-267788/AS

23 158065

**TRANSIT STATION AREA JOINT DEVELOPMENT: STRATEGIES FOR IMPLEMENTATION. VOLUME 1**

Joint development strategies seek to create three conditions in station areas: improved design, integrated transit and land development, and value

capture. This study constitutes one part of an overall effort by UMTA to promote joint development (multiple use of transportation corridors and stops). This study addresses the practical means of implementing joint development. A major focus of this effort is to develop methods which could be used to make accurate estimates of the value capture potential of transit station areas. This report presents the results of a two years analysis of joint development and contains: (1) an analysis of 19 case studies of examples of transit/land use joint development; (2) an analysis of the impacts of transit on property values; (3) an analysis of 28 techniques—including regulatory mechanisms, taxation, land acquisition, and public assumption of risk strategies—available to local governments which can be used to foster station area development; and (4) a proposed model legislation for the creation of Transit Corridor Development Agencies. Three categories of constraints on joint development are identified: limited station area development and value capture potential; multiple ownership of land; and inadequate public/private and interagency coordination. Recommendations resulting from this study include suggestions for program revisions, more coordination among Federal departments, and better Federal-local relationships. This study indicates that the recapture of land values will prove an important but limited source of transit financing.

Sponsored by DOT, Urban Mass Transportation Administration. See also Volume 2, PB-268104.

Administration and Management Research Association, Urban Mass Transportation Administration Final Rpt. UMTA-NY-06-0047-77-1, Feb. 1976, 343 pp

Contract UMTA-NY-06-0047

ACKNOWLEDGMENT: UMTA, NTIS

ORDER FROM: NTIS

PB-268103

23 158066

**TRANSIT STATION AREA JOINT DEVELOPMENT: STRATEGIES FOR IMPLEMENTATION ECONOMIC CASE STUDIES. VOLUME 2**

Case studies is a separate and supplement volume to the Final Report of the Joint Development Study and contains the complete reports on each of the station areas discussed in the Final Report. Case Studies reviews specific examples of joint development. Such an analysis permits an investigation of practical problems faced in creating joint development projects, and it provides a laboratory for testing the usefulness of alternative implementation techniques. Information in this report should be useful to planners. Thus far, transit planners have not included property value impacts as one of the variables used to determine route alignment and station locations. Case studies focuses on the economic analysis of land values in specific transit areas and purports to develop a simple and inexpensive methodology for estimating transit impact and providing a basis for value capture policy. The methodology used in the empirical research (described in Final Report) is conceptually simple and has been designed to be easily applicable by individuals who possess a good working knowledge of development conditions within a given station area. In this report the methodology was applied to the study of land values in fourteen different station areas in four cities: Washington, D.C., San Francisco, Baltimore, and Atlanta. Case Studies are "live" examples of joint development representing a variety of situations and reflecting diverse attempts to deal with actual obstacles. Work in this area covers historical examples as far back as 1900, as well as current projects and proposed developments.

Sponsored by DOT, Urban Mass Transportation Administration.

Administration and Management Research Association, Urban Mass Transportation Administration, (NY-06-0047) UMTA-NY-06-0047-77-2, Feb. 1976, 355 pp

Contract DOT-UMTA-NY-06-0047

ACKNOWLEDGMENT: UMTA, NTIS

ORDER FROM: NTIS

PB-268104

23 158593

**BART AND METRO-RAPID TRANSIT FOR THE SAN FRANCISCO AND WASHINGTON, D.C. AREAS (A BIBLIOGRAPHY WITH ABSTRACTS)**

A two section bibliography is devoted to the development of rapid rail mass transportation in two major metropolitan areas. The first section contains citations referring to BART, the San Francisco Bay area rapid transit system



in California. Section Two refers to the combined subway and surface transit system for the District of Columbia and outlying areas in Maryland and Virginia. Materials in both sections cover line siting, policies and planning, cars and power systems, stations and trackwork, human factors, travel patterns, and public attitudes. Attention is given to financing, revenue, maintenance, local impact, and environmental impact, as well as fare collection, noise, and legislation. Local and regional needs are discussed. Supersedes NTIS/PS-0425 and NTIS/PS-75/421.

Adams, GH  
National Technical Information Service Bibliog. May 1977, 278 pp, 270 Ref.

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

NTIS/PS-77/0372/1ST

23 158941

## PUBLIC TRANSPORTATION: PROBLEMS AND OPPORTUNITIES

The report is a collection of papers on urban transportation solutions that have been tried or are being proposed in North American cities and the specific urban transportation problems which they address. It is designed as a general overview on public transportation issues. The first article examines deficiencies in existing systems, relative use of urban transportation modes, characteristics of transit riders, the peaking problem, and categories of alternatives for improvement. Three other articles examine options for meeting urban transportation needs: rail rapid transit, bus rapid transit, and para-transit. Emphasis is placed on defining the role in urban transportation each option can play and on summarizing system experiences with them.

Hoel, LA  
Virginia University, Department of Transportation DOT/TST-77/39, Mar. 1977, 93 pp

Contract DOT-OS-50233

ACKNOWLEDGMENT: NTIS  
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PB-267304/4ST, DOTL NTIS

23 158994

## A COMPARATIVE ANALYSIS OF URBAN TRANSPORTATION REQUIREMENTS. VOLUME II

This volume contains a report on each of the 31 urban areas studied, as well as a description of the National Setting for each of the 14 countries in which the individual urban areas are located. Volume II contains detailed comments and statistics pertaining to the mass transit situation and experience in each urban area studied, which is the basis of the comments contained in Volume I.

See also Volume 1, PB-267 788.

Turner, FC Davis, HE  
International Road Federation, Federal Highway Administration Final Rpt. FHWA/PL-77-014, Feb. 1977, 434p

Contract DOT-FH-11-7970

ACKNOWLEDGMENT: NTIS  
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PB-267789/6ST

23 159004

## SOLVING PUBLIC PASSENGER TRANSPORTATION PROBLEMS: A NEED FOR POLICY REORIENTATION. VOLUME II

Public transportation has declined because policymakers and outdated regulations have restricted the evolution of transportation systems which more closely reflect the mobility and life-styles of today. Public policy needs to take a consumer-oriented approach to public transportation by recognizing that all consumers do not have the same transportation needs and that one or two modes of transportation cannot satisfy these needs. This report argues that if public transportation is to become an efficient method of satisfying the transportation needs of a community, a brokerage or consumer-oriented approach should be adopted. The transportation broker will match specific individual needs with a broad array of transportation services, and overcome institutional, legal, and operational barriers to the development of new forms of transportation service.

See also report dated Nov 76, PB-267 546.

Davis, FW Oen, K  
Tennessee University, Knoxville, Department of Transportation Final Rpt. DOT/TST-77/35, Jan. 1977, 34p

Contract DOT-OS-40096

ACKNOWLEDGMENT: NTIS  
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PB-267912/4ST

23 159326

## TRANSIT SYSTEM PRODUCTIVITY. AN INFORMATION BULLETIN OF THE TRANSPORTATION TASK FORCE OF THE URBAN CONSORTIUM FOR TECHNOLOGY INITIATIVES

The report includes an overview of issues and problems associated with transit productivity, indicators and techniques for its measurement, institutional perspectives, maintenance, organizational impacts, and purchasing. The report also contains a summary of DOT programs and contacts in this area, as well as an extensive annotated bibliography.

Prepared for Urban Consortium for Technology Initiatives. Transportation Task Force. See also report dated Oct 76, PB-258 733.

Burke, AC French, BI Pearl, DJ Perry, KA  
Public Technology Incorporated, Department of Transportation Final Rpt. DOT/TST-77-8, Mar. 1977, 36 pp

Contract DOT-OS-60076

ACKNOWLEDGMENT: NTIS  
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PB-268593/1ST, DOTL NTIS

23 159341

## MODELS OF RAILROAD PASSENGER-CAR REQUIREMENTS IN THE NORTHEAST CORRIDOR. VOLUME I: FORMULATION AND RESULTS

Models and techniques for determining passenger-car requirements in railroad service were developed and applied by a research project of which this is the final report. The report is published in two volumes. This volume considers a general problem of determining optimal passenger-car allocations given a fixed schedule and predetermined demands. Requirements for car movements are modeled as a set of linear constraints having a transshipment structure, and alternative linear objectives are formulated. Various optimization techniques are developed for one or more objectives, and properties of the sets of optimal solutions are demonstrated. The remainder of Volume I shows how the linear model and optimization techniques may be applied to the Northeast Corridor. Derivations of a schedule and demands are explained, and results of a number of optimizations and analyses are displayed.

See also Volume 2, PB-268 870.

Fourer, R  
National Bureau of Economic Research, Incorporated, Federal Railroad Administration, Transportation Systems Center Final Rpt. FRA/NECPO-76/21, Sept. 1976, 68 pp

Contract DOT-TSC-1179-1

ACKNOWLEDGMENT: NTIS  
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PB-268869/5ST, DOTL NTIS

23 159342

## MODELS OF RAILROAD PASSENGER-CAR REQUIREMENTS IN THE NORTHEAST CORRIDOR. VOLUME II: USER'S GUIDE

Models and techniques for determining passenger-car requirements in railroad service were developed and applied by a research project of which this is the final report. The report is published in two volumes. The solution and analysis of the Northeast Corridor models required the creation of a number of computer programs of several kinds. These programs are available for the use of others and are described in Volume II.

See also Volume 1, PB-268 869.

Fourer, R  
National Bureau of Economic Research, Incorporated, Federal Railroad Administration, Transportation Systems Center Final Rpt. FRA/NECPO-76/22, Sept. 1976, 61 pp

Contract DOT-TSC-1179-2

ACKNOWLEDGMENT: NTIS

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PB-268870/3ST, DOTL NTIS

**23 159345****STUDY OF SUBWAY STATION DESIGN AND CONSTRUCTION**

Due to the high cost of urban underground transit construction in recent years, construction practices used in other countries were reviewed to determine if construction methods which are commonly accepted there might be adapted to U.S. practice. Design and administrative practices were also reviewed to determine which have the most significant effect on station costs to assure that future system developers are aware of the items that offer the greatest opportunities to control costs. Using 13 on-site interviews in Europe and North America, unusual construction methods, design considerations, and general considerations which offer opportunities for cost savings were identified. Two basic points for reducing costs were emphasized repeatedly by those interviewed: the basic recommendation for obtaining economy in station design and construction is to take advantage of every opportunity which the locale and site offer; and while final design and construction practices are the most visible sources of expenditure, it is almost universally the early policy, planning, and design decisions which have the greatest effect on the final cost of a transit project. With the experience and opinions of the many transit authorities and construction agencies and a review of current literature as a base, a set of seven recommended subway station designs were developed. To examine costs, three series of estimates were performed comparing the station types among themselves, comparing the costs of varying major station dimensions, and comparing costs of alternative construction methods, such as slurry walls and other excavation support systems which performed multiple functions.

Prepared in cooperation with Skidmore, Owings, and Merrill, Boston, Mass.

O'Neil, RS Worrell, JS Hopkinson, P Henderson, RH De Leuw, Cather and Company, Skidmore, Owings, and Merrill, Urban Mass Transportation Administration, Transportation Systems Center Final Rpt. UMTA-MA-06-0025-77-6, Mar. 1977, 208 pp

Contract DOT-TSC-1027

ACKNOWLEDGMENT: NTIS

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PB-268894/3ST, DOTL NTIS

**23 159596****PLANNING AND DESIGN OF INTERMODAL TRANSIT FACILITIES**

This paper presents an analysis of the present state of the art of transit station planning and design. It discusses the design process in terms of (a) design parameters and standards (e.g., stairways, ramps, and passageways; escalators; platforms; fare and exit control; moving walkways and ramps; bus facilities; and parking facilities); (b) design of the station environment (e.g., lighting, ventilation, acoustics, and fire control; passenger information and graphics; passenger security; commercial activities; and special provision for the handicapped); and (c) design methodology (e.g., deterministic, probabilistic, and impedance models; simulation; and validation problems). A classified bibliography is included.

This article appeared in TRB Research Record No. 614, Transit Facility Operation.

Hoel, LA (Virginia University); Rozner, ES (GAI Consultants, Incorporated) *Transportation Research Record* No. 614, 1976, pp 1-5, 52 Ref.

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**23 159597****IMPROVING PEDESTRIAN ACCESS TO TRAIN PLATFORMS AT GRAND CENTRAL TERMINAL**

A technical study of the feasibility of providing northern access for train passengers to the upper and lower level platform at Grand Central Terminal in Manhattan is reported. At present, access is available at the southern ends of the platforms only. The purposes of the study were to identify (a) the functions of Grand Central Terminal, (b) the best location for northern access pedestrian facilities, (c) the passageway widths required to handle peak volumes, and (d) the impacts of the recommended design on the movement of people and trains. Four types of surveys, an on-board rail passenger survey; a pedestrian interview survey; pedestrian volume counts; and special studies on pedestrian walking speeds; platform and train

discharge times, and the number of encumbered persons, were conducted. Grand Central Terminal functions as an intermodal transfer facility, a link in the midtown pedestrian network, a commercial center, and an extension of the subway stations. The recommended improvement concept includes two east-west and two north-south passageways to serve both the upper and lower level platforms. The impacts of 25 and 50 percent increases in passengers on the widths required for the proposed passageways were estimated, based on evaluation criteria related to congestion, walking distances, travel times, railroad operations, handicapped persons, orientation, and capital and operating costs.

This article appeared in TRB Research Record No. 614, Transit Facility Operation.

Hocking, RJ (Barton-Aschman Associates, Incorporated); Kuner, R (New Alternatives, Incorporated) *Transportation Research Record* No. 614, 1976, pp 6-13, 10 Fig., 2 Tab., 2 Ref.

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**23 159598****PUBLIC POLICY AND OPTIMAL TRANSPORTATION PLANNING STRATEGIES**

Restrictions on metropolitan core area travel by private vehicles to limit air pollution and to reduce fuel consumption will necessitate extensive programs for change-of-mode facilities on line-haul public transport routes. The parking spaces in the core area must be transferred so as to minimize the total vehicle-kilometers traveled throughout the area subject to technical, public policy, and economic constraints. This creates a need for a master plan that will identify the apportionment and extent of parking and other change-of-mode facilities, including feeder bus service at line-haul public transport routes. This paper briefly describes the salient transportation and parking features in Boston as a background to formulating a generalized public policy and a linear programming approach for the preparation of optimal plans incorporating a defined range of objectives and constraints.

This article appeared in TRB Research Record No. 614, Transit Facility Operation.

Schoon, JG (Smith (Wilbur) and Associates); Falcocchio, JC Pignataro, LJ McShane, WR (Polytechnic Institute of New York) *Transportation Research Record* No. 614, 1976, pp 14-20, 4 Fig., 6 Tab., 10 Ref.

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**23 159599****NO-BARRIER FARE COLLECTION**

This paper reviews a study performed by the Metropolitan Atlanta Rapid Transit Authority on the feasibility of a no-barrier fare-collection system and discusses the potential of this self-service concept in the United States. No-barrier fare collection (often referred to as self-service or automatic) is widely used in Western and Eastern Europe to handle fare-collection requirements. It is not used anywhere in North America, and good information on European experience with it is sparse at best. The assumption that cheating would be rampant in the United States if this concept were employed has unrealistically dominated discussions of it and overwhelmed any rational analysis of its benefits. This study found no large propensity to defraud; it estimated that 3 to 5 percent of daily passengers could be expected to evade fares. This figure is larger than that found in European cities, but can nevertheless easily be handled. The no-barrier fare-collection concept thus appears to have a good potential in the United States, particularly for certain applications. One of these is for integrated bus-rail systems using zone fare structures and another is for light rail systems.

This article appeared in TRB Research Record No. 614, Transit Facility Operation.

Padron, M Stanger, R (Metropolitan Atlanta Rapid Transit Authority) *Transportation Research Record* No. 614, 1976, pp 21-26, 2 Tab., 4 Ref.

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DOTL JC

**23 159600****CENTRAL-AREA BUS TERMINALS: PLANNING AND DESIGN GUIDELINES (ABRIDGMENT)**

Bus terminal planning and design must reflect the particular needs of each specific situation. The terminal must be located in conjunction with rail

rapid transit lines, busways, and contraflow bus lanes and are useful mainly where the urban area population exceeds 750,000 and the downtown employment exceeds 50,000. Freeway access by free-flowing grade-separated ramps and bus roadways is essential for a major terminal. Comments are made on the relationship of terminals to bus volume concentrations, cost, revenue, demand and economic feasibility. The scale of development and basic functions. Internal terminal design should separate vehicle and passenger movements, carefully reflecting their specialized circulation and geometric requirements. Intercity and commuter services should have separate platforms to reflect their differing service patterns and berth occupancy requirements. Berth space requirements should reflect both scheduled and actual peak-period bus arrivals and departures. General design features are listed.

This article appeared in TRB Research Record No. 614, Transit Facility Operation.

Hoey, WF Levinson, HS (Smith (Wilbur) and Associates) *Transportation Research Record* No. 614, 1976, pp 27-31, 3 Fig., 4 Tab., 1 Ref.

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DOTL JC

23 159601

## MEASURING SERVICE DELIVERED BY TRANSPORTATION TERMINALS

A procedure for deriving an index of the adequacy of a design to provide a particular service is introduced and applied to the evaluation of passenger transportation terminal designs. The concept of the service rendered by a transportation terminal or facility is defined as the rendering of assistance to the users of the facility to satisfy their needs and purposes. The index presented here takes account of all the movements of a passenger from the moment of arrival at the terminal to his departure. All of the design features and impacts on service flow and organization are reflected in the index. The index combines all these occurrences in a logically and intuitively satisfactory way that may be tested against user valuations and refined until index and valuations consistently agree. The determination of the ratio of number active and number helped, and the calculation of the index of service is detailed.

This article appeared in TRB Research Record No. 614, Transit Facility Operation.

Perilla, O (Port Authority of New York and New Jersey) *Transportation Research Record* No. 614, 1976, pp 32-34, 2 Tab., 2 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

✓ 23 163226

## THE FEASIBILITY OF UPGRADING PENINSULA PASSENGER RAIL SERVICES. FINAL REPORT

The feasibility of increasing use of Southern Pacific commuter services over the 47 mile Peninsula line between San Jose and San Francisco, CA., was studied under a grant from UMTA. Among potential means for increasing usage would be improved access, all-day transit-type operation, better connection with transit, and extension to a new San Francisco terminal. The experience of a private operator could be combined with the resources of public agencies to produce a staged expansion of service in response to changes in demand. Such steps should be part of an overall transportation plan for the Westbay Corridor.

This Final Report, financed in part by UMTA/U.S. DOT, contains 4 parts: Summary; Legal Considerations; Operations, Marketing and Costs; and Reference Supplement.

Metropolitan Transportation Commission Final Rpt. UMTA-CA-09-0025, 1975, 287 pp, Figs., Tabs., Photos., Refs.

Grant

ORDER FROM: Metropolitan Transportation Commission, Hotel Claremont, Berkeley, California, 94705

23 163251

## THOUGHTS ON THE USE OF "AGGREGATED" AND "DISAGGREGATED" METHODS IN TRANSPORT PLANNING [Ueberlegungen zur Verwendung "aggregierter" und "disaggregierter" Methoden in der Verkehrsplanung]

Discussion on the use of "aggregated" or "disaggregated" models in transport planning is still going on. But it is already clear that disaggregated

planning methods, i.e. individualist ones based on individual behaviour, have become more important and considerably increase the possibilities of planning. [German]

Kutter, E *Internationales Verkehrswesen* Vol. 28 No. 2, Mar. 1977, pp 89-96, 2 Fig., 1 Tab.

ACKNOWLEDGMENT: International Union of Railways, BD

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

23 163291

## STOCHASTIC SIMULATION OF PASSENGER FLOW AT STATIONS [Stochastische Simulation des Fahrgastflusses in Haltestellen]

Present methods for station planning are based on averaged empirical data. For optimizing stations with random configurations and dimensions, a stochastic simulation is described which enables all determinative parameters of passenger flow to be realistically calculated. Taking an urban rapid transit station as an example, it is shown that simulation can furnish new and important data for the layout of such stations. [German]

Hejj, E Sigl, D Zimek, D *Krupp Tech Mitteilungen, Forschungsber u Werksber* Vol. 35 No. 1, Jan. 1977, pp 73-82, 11 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

23 163730

## HIGHER AVERAGE SPEED, A RESEARCH AND DEVELOPMENT PROJECT AT THE NORWEGIAN STATE RAILWAYS [Hoyere reisehastighet, et forsknings-og-utviklingsprosjekt ved NSB]

The target for the project was to investigate technical possibilities, the market and the economical consequences of increased average speed for long distance express trains. Because of the many and sharp curves at the NSB, the only practical way is to increase curve speeds. It is found that with suitable designed rolling stock, incorporating hydraulic body tilting etc., the curve speeds can be increased by 30 to 40 percent. Together with higher average acceleration levels, shorter stops and an increase in maximum velocity from 120 to 130 km/h, the average speed can be increased about 30 percent, i.e. from 80 km/h now to about 100-110 km/h.

Glommé, M *NSB Teknisk* Vol. 3 No. 1, 1977, pp 2-26, 53 Phot., 12 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

23 163745

## HIGH SPEED PROJECTS ON THE SWEDISH STATE RAILWAYS [Entwicklungen fuer hohe Fahrgeschwindigkeiten bei den Schwedischen Staatsbahnen]

The SJ has directed its efforts towards resolving the problem of high speed operating on existing lines with tilting-body coaches. The article describes the studies conducted on traction, savings in journey time depending on curve negotiation constraints, track layout and maintenance, tilting-body systems, lighter stock, and the results of tests carried out with a prototype. A speed of 240 km/h was reached. [German]

Knall, G *Elektrische Bahnen* Vol. 21 No. 2/3, Mar. 1977, pp 37-43, 4 Fig., 4 Tab., 4 Phot., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Leichtbau der Verkehrsfahrzeuge, Rosenheimer Strasse 145, Munich 80, West Germany

23 163868

## THE STRUCTURE OF NEW SYSTEMS FOR PUBLIC TRANSPORT [De structuur van de nieuwe systemen voor openbaar vervoer]

The computer increasingly plays a central part in modern traffic systems. With these advanced technical aids public transport can be improved. Improved public transport can reduce the need for private transport. Improved means of public transport such as tram, "bustaxi", personal rapid transit, dual-mode systems and the Witkar are discussed. /TRRL/ [Dutch]

Kroes, JLB (Delft University of Technology)

Genootschap voor Automatisering Monog Rpt. 1976, pp 7-12

ACKNOWLEDGMENT: TRRL (IRRD 226887), Institute for Road Safety Research

ORDER FROM: Genootschap voor Automatisering, 40 Paulus Potterstraat, Amsterdam, Netherlands

### 23 163877

#### MERSEYRAIL: LINK AND LOOP IN OPERATION

Brief details are given of the new Merseyrail link and loop underground railway system. British Rail's proposals envisaged the extension of the Mersey/Wirral lines in a loop under Liverpool city centre and the southerly extension of the existing Southport/Ormskirk lines under the city to link exchange and central stations. The effect of these two relatively simple underground lines would be to knit a number of unrelated radial routes together to form a basic integrated rapid-transit system with much improved interchange facilities. The loop and link lines are being brought into full use in stages during 1977. To achieve the north-south link the lines from Southport/Ormskirk have been diverted north of the exchange terminal into a new double track tunnel, through a station at Moorfields, providing an interchange with the loop, to continue into central low level station. Future plans for further extensions to the system are described. /TRRL/

*Modern Railways* Analytic Vol. 24 No. 245, June 1977, pp 213-214, 1 Fig., 2 Phot.

ACKNOWLEDGMENT: TRRL (IRRD 226928)

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

DOTL JC

### 23 163878

#### SOME PASSENGER ACCESS CHARACTERISTICS TO CERTAIN INTER-CITY RAIL TERMINI IN GREAT BRITAIN

The paper examines some of the characteristics of access to a main terminal for inter-city travellers between the centrally-located rail termini of Leeds, York and Newcastle, and develops access travel cost and time versus straight-line distance relationships for various access modes. Some of the access travel time relationships have been compared to previous work carried out in London, and this has indicated some degree of comparability between the areas, especially for the road-based access modes. /TRRL/

Moss, AJ Leake, GR (Leeds University, England) *Traffic Engineering and Control* Analytic Vol. 18 No. 6, June 1977, pp 315-318, 3 Fig., 5 Tab., 9 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 227194)

ORDER FROM: ESL

DOTL JC

### 23 163922

#### INTERFACING TRANSPORTATION MODES FOR ACCESS TO A CENTRAL BUSINESS DISTRICT (ABRIDGMENT)

The objectives of this study were to estimate the desires of travelers in the CBD area of Alexandria, Virginia in relation to the two Metro stations; to investigate various small-scale transit systems that would interface between the primary and access modes, and select a vehicle that is based on the level of demand, urban design, and operational, environmental, and community acceptance; and to recommend a series of preliminary corridors for the proposed mini transit system. Land use modeling, travel forecasting model, and trip desires relative to the mini transit system were examined. System analysis include urban design and community impact factors, technological analysis, and evaluation criteria. The authors conclude that the range of demand indicates a sufficient number of trips to justify a mini transit system in the CBD of Alexandria; a small fleet of mini buses is well suited to accommodate the peak hour volumes; an elevated guideway would be incompatible with the historic and residential environments; the selection of a minitransit vehicle will give weight to considerations of carport, interior design and the attractiveness of the vehicle as it contributes to the city street scope.

This article appeared in Transportation Research Record No. 619, Innovations in Transportation System Planning.

Khasnabis, S (Wayne State University); Joyner, HR (Barton-Aschman Associates, Incorporated); Pickard, JG (Buchanan (Colin) and Partners, England) *Transportation Research Record* No. 619, 1976, pp 1-4, 1 Fig., 6 Ref.

ORDER FROM: TRB Publications Off

DOTL JC

### 23 163924

#### BUSWAY VERSUS RAIL BRANCH: ANALYSIS OF ATLANTA'S TUCKER-NORTH DEKALB CORRIDOR (ABRIDGMENT)

The purpose of this study was to evaluate comprehensively the costs, operational effects, and patronage aspects of busway versus rail rapid transit in the Tucker-North Dekalb (T/ND) corridor in Atlanta. Two transportation alternatives were considered: a rail branch providing direct, no transfer service and operating as a separate radial line; and a busway alternative operating a feeder service route. A discussion of passenger attraction, capital costs, operating cost, and quality of service factors for both the rail and busway alternatives is included. It is concluded that for the study corridor, capital costs of busways will be lower than those for rail branches; rail service into a branch corridor will invariably be of a higher quality than will a busway feeding a main rail line; and operating costs will not be as costly to operate as a busway feeder system. For these reasons, a rail branch will attract a substantially greater number of riders than will be busway alternative.

This article appeared in Transportation Research Record No. 619, Innovations in Transportation System Planning.

Stanger, R Padron, M (Metropolitan Atlanta Rapid Transit Authority) *Transportation Research Record* No. 619, 1976, pp 8-10, 1 Fig., 1 Tab.

ORDER FROM: TRB Publications Off

DOTL JC

### 23 164152

#### INTERTOWN PUBLIC TRANSPORT. ALTERNATIVES FOR CANBERRA

Canberra's intertown public transport service is the central part of a previously agreed overall strategy of public transport services whereby feeder buses radiate from the independent town centres which, in turn, are linked by A high quality intertown service. Previous studies have suggested busway, rail, or automated systems (if available) for operation on the metropolitan intertown service. This report describes a study which examined a large number of conventional and non-conventional alternative public transport systems for use on the express intertown service which at present is operated with buses running in mixed traffic. The study primarily evaluated the feasible alternatives on technical, economic and environmental grounds, although other considerations were also taken into account. No consideration was given to the feeder bus system which was assumed to provide the same service irrespective of the type of intertown system utilized. /TRRL/

National Capital Development Commission, Australia Monograph Oct. 1976, 122 pp, Figs., Tabs., Refs.

ACKNOWLEDGMENT: TRRL (IRRD 227245)

ORDER FROM: National Capital Development Commission, Australia, 220 Northbourne Avenue, Canberra, A.C.T., Australia

### 23 164419

#### USE OF A SIMULATION MODEL IN THE STUDY OF THE TRACKAGE OF A PASSENGER STATION [Impiego di un modello di simulazione nello studio del dispositivo dei binari di una stazione viaggiatori]

An illustration is given of the logics of a simulation model composed as an auxiliary to the definition, in the project phase, of the permanent way in a passenger station. Mention is then made of the modalities of the use of the model and the results achieved. [Italian]

Burgio, A Bortoliero, M *Ingegneria Ferroviaria* Vol. 32 No. 1, Jan. 1977, pp 9-15

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

### 23 164446

#### DISTRIBUTION MODEL OF TRAIN PASSENGERS ALONG THE WHOLE ROUTE AND THROUGHOUT THE DAY [Modele de distribution des voyageurs dans les trains]

The author, who is employed by the Barcelona Transport Division of RENFE, has devised a calculation model enabling a theoretical train-running graph to be plotted which is adapted as closely as possible to predicted passenger requirements. The article firstly considers these requirements that is to say the spread of the intention to travel over the different sections of line and at different times of the day; it then refers to the criteria of choice

between trains and concludes by showing how the timings and lengths of trains are established after the necessary final corrections have been made. An experimental verification of the model is made by taking the Barcelona-La Tour de Carol line as an example. [French]

Battle i Gargallo, L (Spanish National Railways) *Revue Generale des Chemins de Fer* July 1977, pp 417-423, 8 Fig.

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

DOTL JC

## 23 165022

### CRITERIA AND PROCEDURES FOR MAKING ROUTE AND SERVICE DECISIONS BY AMTRAK: HEARINGS BEFORE THE SURFACE TRANSPORTATION SUBCOMMITTEE OF THE COMMITTEE ON COMMERCE...

No Abstract.

Record of the hearings held March 3-4, 1976.

United States Senate Cong Rpt. Y 4.C 73/2:94-80, 1976, 273 pp, Refs.

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO  
ORDER FROM: GPO

## 23 165033

### RUBBER-TIRED RAPID TRANSIT--1. SYSTEMS CONCEPTS

Rubber-tired transit technology is receiving much attention for application to medium capacity rapid transit systems due to superior traction capability and the potential for reduced noise generation. Data from a worldwide survey identify other surprising benefits. This technology appears to merit inclusion as an alternative in technological assessments for urban rapid transit application. Part I reviews the state-of-the-art in the world today and describes typical system concepts.

Sulkin, MA Miller, DR *ASME Journal of Mechanical Engineering* Vol. 98 No. 5, May 1976, pp 26-33

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

## 23 165034

### RUBBER-TIRED RAPID TRANSIT--2. TECHNICAL CHARACTERS

This second article in a series provides a detailed look at some of the more important characteristics of today's rubber-tired rapid transit systems as described in Part 1. Data covering the wide variety of switching, guidance, and support concepts; tire loadings and operational capabilities are analyzed and correlated to provide a better understanding of the state-of-the-art. In the interest of energy conservation a comparative analysis of energy utilization of both steel-wheeled and rubber-tired vehicles is included.

Sulkin, MA Miller, DR *ASME Journal of Mechanical Engineering* Vol. 98 No. 6, June 1976, pp 39-45

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

## 23 165038

### A NEW METHOD OF ESTIMATING TRAFFIC VOLUME [Ein neues Verfahren zur Schaetzung des Verkehrsumfangs]

Estimates of expected traffic volume for new lines or future operation are an important basis for any planning. Up to the present, most of the procedures used involved the application of gravity models, in which the departure points may not be exact and so give inaccurate results. The method explained in this article has already been applied in a series of cases in the GFR and abroad for studies concerning rail and road traffic. The author applies it to the area of Limburg and Diez on the Lahn. [German]

Leibbrand, K *Die Bundesbahn* Vol. 53 No. 6, June 1977, pp 389-394, 6 Tab.

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

## 23 165059

### MODERN DEVELOPMENT METHODS APPLIED TO TRAIN CONFIGURATIONS WITH SPEEDS OF 300 KM/H [Moderne Entwicklungssystematik fuer Zugkonfigurationen mit 300 km/h Hoechstgeschwindigkeit]

The author describes how a series of iterations with simulation of costs and value analysis can be used to define the best technical and economic alternatives to select for the high speed train. This method has resulted in the choice of a train with 432 seats and a dining car, weighing 544 tonnes, hauled by two 4500-kW CC locomotives, each weighing 93 tonnes and driven by asynchronous motors, with an acceleration when starting of 0.39 m/sec/sec and a residual acceleration of 0.046 m/sec/sec at 300 km/h. [German]

Luebke, D Pleger, J *Elektrische Bahnen* Vol. 48 No. 6, June 1977, pp 134-141, 10 Fig., 2 Tab., 5 Ref.

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

DOTL JC

## 23 165067

### PRICING A TICKET TO RIDE

Few subjects arouse such heated correspondence as British Rail's passenger fares policy. Not only the level of fares, but the way in which they are arrived at. In fact, pricing policy is very simple as BRB's Chief Passenger Marketing Manager explains.

Ellison, D *Modern Railways* Vol. 34 No. 347, Aug. 1977, pp 302-305, 6 Phot.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: University Microfilms International, 300 North Zeeb Road, Ann Arbor, Michigan, 48103

DOTL JC

## 23 166453

### METHODOLOGY FOR THE DESIGN OF URBAN TRANSPORTATION INTERFACE FACILITIES

Procedures and techniques are described which determine measures of the performance of transit station designs. Categories of measures are defined according to the manner by which they are treated in the design process; as a result of policy, or as measures of performance and economic efficiency. Policy items considered include concessions, advertising, personal care facilities, telephones, acoustics, construction materials, design flexibility, parking facilities, and provisions for the handicapped. Performance measures are associated with passenger processing, passenger orientation, the physical environment safety, and security. The policy and performance considerations along with cost factors are used to specify a systematic transit interchange facility design methodology that is recommended to practitioners. Comprehensive descriptions of appropriate analytical techniques for the evaluation of transit station designs are provided in the appendices to the report.

Demetsky, MJ Hoel, LA Virkler, MR  
Virginia University, Department of Transportation Final Rpt.  
DOT/TST-77/46, UVA/529036/CE76/102, Dec. 1976, 119 pp

Contract DOT-OS-50233

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-269956/9ST

## 23 166482

### ALTERNATIVE CONCEPTS FOR UNDERGROUND RAPID TRANSIT SYSTEMS: EXECUTIVE SUMMARY

A study was performed for the Office of the Secretary of the U.S. Department of Transportation to determine if construction costs and operating energy requirements of future high-performance underground rail mass-rapid-transit systems can be decreased while maintaining or improving service. The alternative design approaches studied were limited to well-established design concepts which differ from those used in the BART (San Francisco), WMATA (Washington, D.C.) and MARTA (Atlanta) systems. They include: gravity assist; over/under tunnels; over/under and short stations; various subway train propulsion configurations; and optimized operational control policies. Comparisons were made of several system designs for a specific route and patronage structure. These comparisons indicate that it is practical to significantly reduce construction costs and

operational energy requirements of modern underground systems while improving service by incorporating alternative concepts. Without any attempt at optimization, savings in capital costs in excess of 24% and savings in energy as high as 70% in traction effort and 88% in braking are shown to be achievable. The Executive Summary briefly describes the purpose, approach, and results of the study.

Dayman, BJ Heft, RC Kurtz, DW Macie, TW Stallkamp, JA  
Jet Propulsion Laboratory, Office of the Secretary of Transportation,  
National Aeronautics and Space Administration Final Rpt.  
DOT/TST-77-31, P-51-520, Mar. 1977, 38 pp

Contract DOT-AS-60019

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-270102/7ST, DOTL NTIS

### 23 166501

#### BART IMPACT PROGRAM: TRENDS IN TRAFFIC PATTERNS AT THE BAY BRIDGE AND CALDECOTT TUNNEL

Utilizing multiple regression techniques, this paper presents an analysis of the effects of the opening of the Bay Area Rapid Transit (BART) System's transbay crossing on the traffic at two major highway facilities, the San Francisco-Oakland Bay Bridge and the Caldecott Tunnel. Looking at data collected semi-annually since 1965, it was found that there was a sudden shift in trend lines in 1974 after the BART transbay tube was opened. Vehicle volumes dropped, transit patronage jumped, but total person trips in the short run followed roughly the trends of the previous eight years. Transbay vehicle and transit traffic has increased at a more rapid rate since 1974, with mid-day off-peak transit patronage showing a large increase. While an important temporary phenomenon, the 1973-74 increase in gasoline prices was not found to contribute much to this sudden change in the long-term trends. BART also caused the removal of a substantial number of buses from the two facilities, effectively increasing their vehicle-handling capacity. This has resulted in higher traffic flow rates during the height of the peak periods. (Color illustrations reproduced in black and white.)

Prepared in cooperation with Metropolitan Transportation Commission, Berkeley, Calif.

Homburger, WS Dock, FC  
California University, Berkeley, Metropolitan Transportation  
Commission, Department of Transportation, Department of Housing and  
Urban Development, (HUD-CA-09-0042) DOT-BIP-WP-32-3-77, July  
1977, 66 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-270370/0ST, DOTL NTIS

### 23 167342

#### A PROCEDURAL GUIDE FOR THE DESIGN OF TRANSIT STATIONS AND TERMINALS. PHASE I

The guide provides a synthesis of state-of-the-art concepts regarding the planning, design, and evaluation of passenger transportation stations. The enclosed material directs transportation planning teams to search for efficient station designs. The guide describes the important stages and considerations in a comprehensive terminal analysis methodology. When it is used with the two supplementary research reports, the specific details of the various tasks are given. The guide acknowledges that the transit station design process requires contributions from many disciplines and skills. It assists to coordinate station development programs in accommodating inputs from the disciplines. It further highlights the elements of different stations to assure valid comparisons relative to performance and cost criteria.

Report on Design of Transportation Interface Facilities. See also report dated Feb 76, PB-253 742.

Demetsky, MJ Hoel, LA Virkler, MR  
Virginia University, Department of Transportation Final Rpt.  
DOT/TST-77/53, UVA/529036/CE77/103, June 1977, 78 pp

Contract DOT-OS-50233

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-272619/8ST

### 23 167501

#### TRANSIT'S ROLE IN JAPAN'S MAJOR URBAN CENTERS

Three metropolitan centers in Japan occupying 7 percent of the land area contain 40 percent of the nation's population. This report describes current developments in urban transportation in Japan with particular emphasis on identifying problems of major urban areas. While congestion and pollution may be universal problems of urban areas, Japan has special problems such as a rapid increase in demand for transit over very short periods and a great dependence on public transportation for mobility.

Noguchi, T (Weidlinger Associates) *Transit Journal* Vol. 3 No. 3, June 1977, pp 43-58, Figs., Tabs., 8 Ref.

ACKNOWLEDGMENT: Transit Journal

ORDER FROM: American Public Transit Association, 1100 17th Street, NW, Washington, D.C., 20036

### 23 167504

#### COMMERCIAL PASSENGER RESEARCH AT THE SNCF [La recherche commerciale voyageurs a la S.N.C.F.]

After giving the historical background of commercial research at the SNCF Commercial Department since it was begun in 1967, the author defines the concepts of market research, commercial research and marketing. A cycle exists beginning with knowledge of the market and going through the definition of the product so that the final product can be correctly produced. The purpose of commercial research is to describe and explain. To obtain this result, information methods and techniques are employed; they cover both the qualitative and quantitative aspects. The SNCF has therefore set up a structural commercial research organization that has carried out numerous inquiries, some of which are described. The final objective of commercial passenger research is to fulfil all passenger requirements as closely as possible and thereby improve the efficiency, coherence and quality of the service operated. [French]

Chauvineau, J *Revue Generale des Chemins de Fer* Sept. 1977, pp 433-448, 4 Fig., Photos.

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

DOTL JC

### 23 167536

#### INTERNATIONAL CONGRESS--INTERNATIONAL UNION OF PUBLIC TRANSPORT, 42ND, 1977

Proceedings include 10 papers that deal with the priority for surface public transport, regional transport in the development of an integrated public transport system, information and orientation systems in metropolitan railroads, development of the motorbus and its integration in modern transport systems, costs of public transport, automation of the control of public transport operations, proposals for the public transport problems, and transport services in medium-sized urban regions.

The 42nd Intl Congress, Montreal, Quebec, May 22-27, 1977. Also available from International Union of Public Transportation, Brussels, Belgium. This consists of 10 papers and 8 Booklets.

International Union of Public Transport Proceeding 1977

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

### 23 167550

#### TRANSIT STATION PLANNING AND DESIGN: STATE OF THE ART

Proceedings include 7 technical papers that deal with transit station planning and design, aspects of rapid transit station, design of pedestrian facilities for the Washington metro, and methodological issues for transit station.

Transp Facil Workshop, Conference Pap and Summ of Conference Proceedings, New York, New York, May 22-24, 1974. Also available from Carnegie-Mellon University, TRI.

Hoel, LA (Virginia University); Roszner, ES  
Carnegie-Mellon University TRI Res Report n8, 1976, 186 pp

ACKNOWLEDGMENT: EI  
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23 167598

## INNOVATIVE SCHEDULING FOR THE BAY AREA RAPID TRANSIT SYSTEM. ABRIDGMENT

This paper explains the scheduling constraints imposed by both the computer automated block system (CABS) logic and the track geometry of the Bay Area Rapid Transit (BART) system in the Oakland area, which is called WYE because the track configuration is like a Y. The alternative schedules that were developed within these constraints to ameliorate the excess passenger demand on the Concord-Daly City route are also presented.

From TRB Record 627, Rail Transit.

Harmon, FE (Bay Area Rapid Transit District); Wong, PJ (Stanford Research Institute) *Transportation Research Record* No. 627, 1977, pp 1-4, 4 Fig.

ORDER FROM: TRB Publications Off

23 167602

## EVALUATION OF ALTERNATIVE STATION SPACINGS FOR RAPID TRANSIT LINES. ABRIDGMENT

This paper presents a case study in which two alternatives for station spacing for non-central business district (non-CBD) sections of rapid transit lines are evaluated in terms of capital and operating costs, demand, and user benefits. This study involves the use of either a long or a short station spacing for a proposed rapid transit line in Chicago. The two alternatives for station spacings were chosen because they represent realistic strategies for station location on the line. The basic trade-offs between the two alternatives are shown in cost and demand and user savings. Compared with the long alternative, the short alternative cost more to construct and operate, increases the user's in-vehicle time, but decreases the user's access times to stations. A detailed evaluation was undertaken to provide a quantitative examination of the trade-offs between the two alternatives. This evaluation concluded an analysis of the costs, the ridership, and the user savings associated with the long and short alternatives. A quantitative comparison of the alternatives is given as well as a sensitivity analysis of the analytical results. The study concludes that in terms of cost and demand and user savings, the long alternative is superior to the short alternative for the non-CBD section of a rapid transit line in Chicago. The evaluation approach used in this paper can be applied to comparing alternative strategies for station locations as well as to individual station locations in various circumstances.

From TRB Record 627, Rail Transit.

Permut, H (Chicago Regional Transportation Authority); Vuchic, VR (Pennsylvania University, Philadelphia) *Transportation Research Record* No. 627, 1977, pp 13-17, 2 Tab., 13 Ref.

ORDER FROM: TRB Publications Off

23 167958

## THE FUTURE OF PASSENGER TRANSPORT IN EUROPE [L'avenir des transports de voyageurs en Europe]

A report on passenger transport requirements between large European urban areas. There are four volumes: Steering Committee report giving a brief description of the study conducted and an interpretation of its results; report of the Project Group which describes the transport networks of all the various modes, gives intermodal split and traffic demand models and outlines development strategy; one volume of appendices; and one volume of maps. [French]

Organization for Economic Cooperation and Development May 1977, p 940, 2 Fig.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Organization for Economic Cooperation and Development, Suite 1207, 1750 Pennsylvania Avenue, NW, Washington, D.C., 20006

23 167967

## BUSWAY VERSUS RAIL TRANSIT--A LAND-USE PERSPECTIVE

Inherent in the decision between implementing a busway and rail branch are "perceived" or expected land-use impacts attributed to each mode. External to the decision-maker, time and market generally influence land patterns more than modal choice. Unfortunately, perceived impacts related to mode choice exist in the mind of decision-makers and frequently control the mode selection process. This paper examines the land-use assumptions and perceived impacts formulated during a busway versus rail branch alternative analysis in Atlanta, Ga. The principal assumptions utilized in the deci-

sion-making process are described and analyzed. Deficiencies in the process are identified and means of improvement are presented.

Bers, EL (Sverdrup and Parcel and Associates, Incorporated); Hotine, P *ASCE Journal of Transportation Engineering* Vol. 103 No. 5, Sept. 1977, pp 605-616, 11 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

23 167980

## OPTIMUM STATION SPACING ON A RAILROAD LINE

[Interstation optimale sur une ligne de chemin de fer]

The author makes a theoretical study of a model for building a railroad line or a metropolitan railroad in a given area taking the minimization of the passenger's journey time as the optimization criterion. Such a model enables the repercussion of the various solutions considered to be tested in relation to the cost of infrastructure, rolling stock and operations. [French]

Mehrazine, H (Teheran University, Iran) *Revue Generale des Chemins de Fer* Vol. 96 Feb. 1977

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

23 168063

## ANALYSIS OF USER RESPONSE TO THE 1975 NEW YORK CITY TRANSIT-FARE INCREASE (ABRIDGMENT)

This paper describes how before and after survey data were used to supplement aggregate ridership counts in describing the effects of a fare increase on patrons of the New York City transit system. While the overall rate-of-ridership decline may be sufficient for a financial analysis, the growing recognition of the role of transit in economic, social, and equity issues requires more in-depth understanding of the kinds of people who ride less or sacrifice mobility when transit-fare increases occur. Two surveys, one before the fare increase was announced and another 3 months after its implementation, allowed the analysis of a before and after pattern of transit use by a given sample of riders. (Except for those derived by inference, data on the effects of fare increases on the various groups of riders and the types of trips abandoned did not previously exist for the New York City transit system.) The author concludes that the 1975 transit-fare increase resulted in ridership reductions in roughly equal proportions from all major socioeconomic and demographic groups. The survey results support the theory of automobile availability as a major determinant in mode-choice decisions. The over representation of riders from double fare zones among the changers emphasizes the urgency of a comprehensive transfer policy to mitigate the effects of two fares on this group of riders.

This article appeared in Transportation Research Report No. 625, Transit Planning and Operations.

Obinani, FC (Tri-State Regional Planning Commission) *Transportation Research Record* No. 625, 1977, pp 12-14, 2 Tab., 5 Ref.

ORDER FROM: TRB Publications Off

23 168071

## APPROACH TO THE PLANNING AND DESIGN OF TRANSIT SHELTERS

For a transit patron, the transit shelter is one of the most easily recognizable elements of the transit system, but, at present, this type of transit-interface facility is considered simply for its cosmetic value. This attitude creates a weak link between the transportation system and its users and can threaten the viability of the urban transit system. This paper presents the theses that transit shelters have a more significant role in the community and in the transit system than being just a windbreak or weather-protection device; that they are an interface point with the system and should protect, comfort, inform, and guide the user; that they should blend into the surroundings but still be visible; and that they should not be isolated or passive agents. The paper sets forth an innovative approach to the planning and design of shelters and describes what a shelter facility is versus what it ought to be. It also describes the types of activities that are involved in the development of the transit shelter and the types of functional social financial physical and user issues that should be considered. The benefits that can be derived through the use of this approach are discussed. /Author/

This article appeared in Transportation Research Report No. 625, Transit Planning and Operations.



Bodmer, LA (Sink (James M) Associates); Reiner, MA (Chicago Regional Transportation Authority) *Transportation Research Record* No. 625, 1977, pp 48-53, 3 Fig., 1 Tab., 10 Ref.

ORDER FROM: TRB Publications Off

### 23 168072

#### ROLE OF SIMULATION MODELS IN THE TRANSIT STATION DESIGN PROCESS

This paper summarizes the ways in which a transit-station simulation model could be developed to function as a more integral part of the design process. It examines in detail the interface of the user with the model. Specific problems dealing with network and spatial representation are discussed, and the model output is matched with the information needs of the designer at the appropriate stages in the design process. The paper concludes with a discussion of the cost-effectiveness of station-simulation models. /Author/

This article appeared in Transportation Research Report No. 625, Transit Planning and Operations.

Lutin, JM Kornhauser, AL (Princeton University) *Transportation Research Record* No. 625, 1977, pp 53-57, 1 Fig., 5 Ref.

ORDER FROM: TRB Publications Off

### 23 168073

#### REHABILITATION OF SUBURBAN RAIL STATIONS

This paper reports the results of a study of the feasibility of rehabilitating underused suburban railroad stations. Seventy-seven stations on eight commuter lines in New Jersey were surveyed. Each station was inspected, photographed, and evaluated for its restoration potential by criteria that were developed for the study. The Red Bank station was selected as a case study. The study included the development of community and local government participation, the renovation of the 100-year old depot, the redesign of the passenger facility as an intermodal terminal for bus, rail, and taxi the redesign of the pedestrian facilities, and an economic analysis. The municipality has now taken possession of the station, which is used by 1500 daily commuters. Preliminary architectural plans have been drawn up, the station has been designated as an historic site, and the building restoration and sitework are nearly completed. This study is intended to be a prototype for other restoration projects that could modernize urban transportation facilities while preserving historically valuable structures. The emphasis is on maximizing the economic benefits of the project. /Author/

This article appeared in Transportation Research Report No. 625, Transit Planning and Operations.

Lutin, JM (Princeton University) *Transportation Research Record* No. 625, 1977, pp 57-63, 5 Fig., 8 Ref.

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### 23 168089

#### DATA PROCESSING OF THE RAIL TRAVEL SURVEYS OF 1971-72

This memorandum describes the computer processing by the GLC of the whole of the British rail survey (1971-72) and part of the underground travel survey (1971-72). These surveys were done to supplement the greater London transportation survey. The resultant data files are used by interested organisations to evaluate transport policies and forecast rail travel demand.

Feltham, AM  
Greater London Council, (0306-7203) Monograph No. 513, 1977, 59 pp, Figs., Tabs., 10 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-228679)

ORDER FROM: Greater London Council, County Hall, London SE1 7PB, England

### 23 168735

#### URBAN TRAVEL DEMAND FORECASTING PROJECT PHASE I FINAL REPORT SERIES, VOLUME III. DISAGGREGATED SUPPLY DATA COMPUTATION PROCEDURES

The document presents the methods and conventions used by the Urban Travel Demand Forecasting Project to prepare disaggregated urban trip time and cost data for use in the development of behavioral travel demand models. Temporally, spatially, and functionally disaggregated times and costs are calculated for individual work trips taken by surveyed samples of employed persons. The surveys were conducted before and after the introduction of the Bay Area Rapid Transit (BART) service in the San

Francisco Bay Area. Together with the socioeconomic data derived from these surveys, the work trip data provide the basis for developing and validating the behavioral models. Chapter 3 describes the development of the temporal disaggregation methods used in the calculation of highway and transit trip attributes. Chapter 4 details the procedures and states the many conventions and assumptions necessary to complete the before-BART data set. It also describes some peripheral procedures used in the preparation of cost and reliability data. Chapter 5 details the preparation of the after-BART data.

Reid, FA

California University, Berkeley, National Science Foundation  
UCB-ITS-SR-77-8, NSF/RA-770142, June 1977, 72 pp

Grant NSF-GI-43740

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-270930/1ST

### 23 168904

#### TRAVEL IN THE BART SERVICE AREA

BART, the 71-mile Bay Area Rapid Transit System, serving San Francisco, Oakland, Berkeley, and their suburbs, is the first regional-scale rapid transit system to open in the United States in over 50 years. This report is one of a series assessing the impacts of BART on transportation and travel in the Bay Area. The report analyzes the results of two travel surveys: (1) the May 1976 BART Passenger Profile Survey, an on-route self-completion questionnaire survey of 8,000 BART riders, and (2) the BART Impact Program May 1975 Areawide Travel Survey, a telephone interview survey of 1,000 individuals in the BART service area. The report presents information on the socioeconomic characteristics of BART, bus, and automobile travelers, the purposes and other characteristics of their trips, and the shares of areawide travel carried by the modes.

Prepared by Peat, Marwick, Mitchell and Co., San Francisco, Calif. See also report dated Apr 76, PB-261 017. Report on BART Impact Program.

Etkin, SA Sherret, A

Metropolitan Transportation Commission, Peat, Marwick, Mitchell and Company, Urban Mass Transportation Administration, Department of Housing and Urban Development, (UMTA-CA-09-0025) DOT-BIP-WP-35-3-77, Sept. 1977, 86 pp

Contract DOT-OS-30176

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-273393/9ST, DOTL NTIS

### 23 168905

#### EXPLANATORY MODELING OF TRANSBAY TRAVEL CHOICE

The 71-mile Bay Area Rapid Transit (BART) System, serving San Francisco, Oakland, Berkeley, and their suburbs, is the first regional-scale rapid transit system to open in the United States in over 50 years. This report is one of a series assessing the impact of BART on transportation and travel in the Bay Area. Travel modes are defined in terms of 14 service attributes including quantifiable attributes such as travel time and cost, and more difficult-to-quantify attributes such as dependability and safety. Disaggregate models which relate mode-choice probability to perceived satisfaction with the alternative modes are estimated using data for the 14 attributes collected by semantic differential scales. Several different models are estimated and compared for BART-bus and BART-auto choices, for work and nonwork trip purposes, for geographic stratifications of the data, and using linear and logit functional forms. The models provide convincing explanations of mode choice behavior and show that travel time and travel time-related attributes such as dependability and flexibility are the dominant determinants of choice. However, large improvements in BART's service are indicated as necessary to increase ridership significantly assuming bus and automobile service levels remain unchanged.

Prepared by Peat, Marwick, Mitchell and Co., San Francisco, Calif. Sponsored in part by Department of Housing and Urban Development, Washington, D.C. See also report dated May 75, PB-245 983. Report on BART Impact Program.

Fan, H Sherret, A

Metropolitan Transportation Commission, Peat, Marwick, Mitchell and Company, Urban Mass Transportation Administration, Department of Housing and Urban Development, (UMTA-CA-09-0025) DOT-BIP-WP-34-3-77, Oct. 1977, 110 pp

Contract DOT-OS-30176  
ACKNOWLEDGMENT: NTIS  
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PB-273395/4ST, DOTL NTIS

**23 168934**  
**PROCEEDINGS OF WORKSHOP ON METHODOLOGY FOR**  
**EVALUATING THE EFFECTIVENESS OF TRANSIT CRIME**  
**REDUCTION MEASURES IN AUTOMATED GUIDEWAY**  
**TRANSIT SYSTEMS, HELD AT CAMBRIDGE,**  
**MASSACHUSETTS ON MAY 25-28, 1976**

The workshop focused on current methods of assessing the effectiveness of crime and vandalism reduction methods that are used in conventional urban mass transit systems, and on how they might be applied to new AGT systems. Conventional as well as novel methods of assessment were presented and discussed. Among the major issues discussed were the use of critical incident techniques to assess the community's needs with regard to transit security; the establishment of a board similar to the National Transportation Safety Board, which will focus on security issues; and the role of security specialists and management in transit planning. The information herein should be of interest to transit security planners and researchers, law enforcement agencies, planners of AGT systems, and in general those people who are concerned with the problems of crime and vandalism in transit systems.

Hawkins, W Sussman, ED  
Transportation Systems Center, Urban Mass Transportation  
Administration, (UMTA-MA-06-0048) Final Rpt. DOT-TSC-UM-  
TA-77-27, UMTA-MA-06-0048-77-1, July 1977, 118 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-273695/7ST, DOTL NTIS

**23 169971**  
**AIR TRANSPORT AND THE RAILWAYS IN EUROPE.**  
**COMPETING OR COMPLEMENTARY TRANSPORT MODES?**  
[Europäischer Luftverkehr und Eisenbahn. Konkurrierende oder  
komplementäre Verkehrsträger?]

The author discusses: The areas specific to each transport mode: business and long-distance travel for air carriers and travel over distances of 200 to 500 km for rail transport; the criteria that are important for travellers: safety, frequency, punctuality and speed. He compares the two modes from these points of view, envisages progress that could be made, concludes that they are complementary, apart from a marginal area where both compete for passengers, and hopes that they can develop without being distorted by competition. [German]

Hermesen, W *Verkehrsannalen* Vol. 24 No. 1-2, 1977, pp 19-37

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Verkehrsannalen, Gauermannngasse 4, Vienna 1010, Austria  
DOTL JC

**23 169975**  
**DEFINITION OF A EUROPEAN HIGH SPEED SURFACE**  
**TRANSPORT NETWORK [Definition d'un reseau europeen de**  
**transports terrestres a grande vitesse]**

Details of a high speed surface transport network that could be adopted for introduction in Europe looking forward to 1990. Starting from a maximum network made up of a series of routes (based on existing master plans) which provide links between various European towns with more than 300,000 inhabitants, routes are then rejected which do not meet the criterion of immediate profitability. The countries involved are Great Britain, France, Belgium and W. Germany. [French]

Roudier, J Schwartz, D  
Institute of Transport Research No. 21, Apr. 1977, 16 pp, Figs., Tabs.,  
Photos., 18 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Institute of Transport Research, Avenue du General Mall-  
eret-Joinville, Boite Postale 28, 94 Arcueil, France

**23 169976**  
**THE NEW HIGH SPEED LINES AND REGIONAL PLANNING IN**  
**JAPAN [Les nouvelles voies ferrees a grande vitesse et l'aménagement**  
**du territoire au Japon]**

Details of the characteristics of the Shinkansen and its effects on regional planning in Japan. Background to and macro-economic impact of the Tokaido Line on local communities and the environment, comments on regional planning policy in relation to the railway network. [French]

Plaud, A *Transports* No. 225, Sept. 1977, pp 387-393, 3 Fig., 4 Phot., 10 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: Editions Techniques et Economiques, 3, rue Soufflot, 75005  
Paris, France

**23 169983**  
**COMPARISON OF COST FUNCTIONS IN MODAL-SPLIT**  
**MODELS**

Using the entropy trip distribution of Wilson as a base, an intercity bimodal-split model was developed based on the generalized cost of travel. Two variants of the model were calibrated and compared against rail and air domestic intercity travel data in the United Kingdom: one using a linear generalized cost function and the other a nonlinear generalized cost function. These were used to predict the modal share for changes in intercity travel times and frequencies that have taken place, and the predicted values compared with actual results. No significant differences were found between the two model variants. It is concluded that for the domestic intercity situation investigated, there is no significant advantage to be gained by departing from the conventional linear generalized cost function.

Underwood, JR (West Indies University, Trinidad); Leake, GR *ASCE*  
*Journal of Transportation Engineering* Vol. 103 No. 6, Nov. 1977, pp  
763-772, 9 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

**23 169985**  
**ANALYSIS OF PREFERENCE FOR MIXED-MODE TRANSIT**

The general concept and service characteristics of mixed-mode transit (MMT) are discussed. The interface between a rail system and a variety of access modes has been examined in the context of introducing an innovative transportation mode. Preference models for MMT systems were developed to assess the percentage of users who might prefer an MMT configuration to conventional transit alternatives.

Nicolaidis, GC (General Motors Corporation); Murawski, CA *Traffic*  
*Quarterly* Vol. 31 No. 3, July 1977, pp 471-496

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

**23 169986**  
**TRANSIT ALTERNATIVES ANALYSIS FOR LOS ANGELES**

An interdisciplinary team of public agency personnel and consultants has recently performed a transit alternatives analysis subject to guidelines promulgated by UMTA mandating a comprehensive assessment of the social, economic, environmental, and urban development goals of an area as an integral part of the transportation planning process. The alternative analysis, the first to be completed subsequent to the new UMTA directives, utilizes an iterative and hierarchical approach to transit planning proceeding from system level evaluation, followed by a selection of high-priority areas or corridors for further analysis, which is in turn, followed by the selection of the highest priority subareas for extremely detailed analysis and evaluation. Major categories of investigation included an analysis of many quantifiable measures leading toward cost-effective transit solutions (e.g., capital and operating costs) as well as a qualitative comparative assessment of such factors as visual impacts and direct impacts on land-use goals and objectives.

Taylor, P (Southern California Rapid Transit District); Howell, L *ASCE*  
*Journal of Transportation Engineering* Vol. 103 No. 6, Nov. 1977, pp  
665-684, 6 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

23 169989

**WELDED STEEL STRUCTURES FOR RAILROAD PLATFORM ROOFING** [Geschweisste Stahlkonstruktionen fuer Ueberdachungen von Bahnsteigen]

Three new systems of welded steel structures for railroad platform roofs which represent a major improvement over conventional systems both from the design and welding point of view, are described. The systems make possible a considerable reduction of specific steel consumption. [German]

Zimmer, R (Staatl Bauaufsicht, Pruefamt-Magdeburg, E Germany);

Vogt, S Winkelvoss, K *Schweisstechnik* Vol. 27 No. 7, July 1977, pp 316-321, 7 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

23 170021

**TRAFFIC MODAL CHOICE--BUSINESS AND SERVICE TRIPS (FINAL REPORT)** [Verkehrsmittelwahl--Geschaefts-und Dienstreiseverkehr (Endbericht)]

With a broadly based analysis of the factors determining the modal choice in business and service trips, the present study attempts to fill some of the gaps in the empirical knowledge of modal selection. Firms and travellers were both surveyed. This was extended by case studies of certain firms. In order to extricate the determinants of modal choice, types of organisations with different travel needs were fashioned, for each of which the declared variables were sought. The different types of organisation were concerned with much-travel, distant-travel, objective-travel and seasonal-travel. [German]

*Internationales Verkehrswesen* Analytic Vol. 28 No. 7-8, July 1976, pp 189-191

ACKNOWLEDGMENT: TRRL (IRRD-304760), Federal Institute of Road Research, West Germany

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

23 170023

**RAIL PASSENGER STRATEGIES FOR EDMONTON--CALGARY INTERCITY SERVICE**

The paper examines the 174ml rail link between Edmonton and Calgary, and discusses the possibilities of improving the service provided on this line. Although at present having the smallest share of the passenger traffic market, this transport corridor could be upgraded through the use of high-speed trains and a more frequent and reliable service. The paper describes the current railway system and its operating costs, together with technical aspects of improving the service offered, and also costs. It also evaluates a number of alternative service improvements. The conclusions consider the market groups for which an improved service would be intended, its effect on other transport modes and long-term energy savings.

Jahnsen, S Maxne, J Morrall, J *Logistics and Transportation Review* Analytic Vol. 13 No. 1, 1977, pp 69-93, 10 Tab., 7 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-229332)

ORDER FROM: British Columbia University, Faculty of Commerce, Vancouver V6T 1W5, British Columbia, Canada

23 170080

**STREAMLINED SYSTEM OF SURFACE GUIDED URBAN TRANSPORT** [Donzept einer Oberflächen-Stadtbahn]

General outline of the proposed system which, combined with the possible use of existing tram tracks, is characterised by: The building of stations with platforms the level of which is displaced cross-wise in relation to the traffic flow so that the traffic should not be obstructed when the trams are stationary, and simplified multiple-unit articulated rolling stock. [German]

Leimbach, KR *Verkehr und Technik* Vol. 30 No. 8, Aug. 1977, pp 302-305, 4 Fig., 1 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Schmidt (Erich) Verlag, Herforder Strasse 10, 4800 Bielefeld, West Germany

23 170081

**AN INTER-CITY TERMINAL ACCESS MODAL CHOICE MODEL**

The calibration and testing of a modal split model for access to and egress from airports and centrally located rail terminal was undertaken as part of a detailed analysis of bimodal choice between rail and air for inter-city travel in Great Britain.

Leake, GR Underwood, JR *Transportation Planning and Technology* Vol. 4 No. 1, 1977, pp 11-21, 5 Phot., 13 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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DOTL JC

23 170448

**RAIL PASSENGER SERVICE IN AN ENERGY DEFICIENT WORLD**

Before AMTRAK, all rail passenger service in the United States had been operated by private, local, or at least regional, railroads; but all these railroads were in the freight business, where the money was, and no one would invest in passenger service because of competition from road and air transport. The article describes the special characteristics of AMSTRAK's operation of a 27,000-mile network, linking 21 cities considered as terminal points, with the results achieved, problems to be solved and future trends.

Reistrup, PH *Rail International* No. 7-8, July 1977, pp 349-356

ACKNOWLEDGMENT: International Union of Railways, BD

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23 170569

**SUPERTRAM: TYNESIDE'S METRO GATHERS MOMENTUM**

The Tyne and Wear Metro--a cross between a railway and tramway system--is the first purpose-built urban transport system to be installed in a major British city for perhaps half a century. Project construction was stopped in May 1976 for a reappraisal of costs and benefits. Now it is going ahead, with the first section of the line due to open in early 1979.

Aldous, T *New Scientist* Vol. 76 No. 1079, Nov. 1977, 3 pp

ORDER FROM: IPC Magazines Limited, 66-69 Great Queen Street, London WC2E 5DD, England

DOTL JC



24 053226

## PRESRIPTIONS CONCERNING THE ORGANISATION OF THE WORK OF ORE (APPENDICES)

No Abstract.

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

International Union of Railways DG 1/E, June 1972, 47 pp, 10 App.

ACKNOWLEDGMENT: UIC  
ORDER FROM: UIC

DOTL RP

24 153331

## COMBINED RAIL AND ROAD TRANSPORT [Rullande landsvaeg-en transportloesning]

Combination of road and rail traffic for the carriage of goods in the form of the "piggy-back" and other systems is gaining ground on the continent. The principle is that rail is used for long distance travel and road for short hauls to and from the rail depots. The chief advantages are punctuality, safety and speed. The limiting factor is the loading profile of the railway. Since a lorry of 4M height on top of a goods flat wagon would be too high, special wagons in the form of low platforms on small wheels or ordinary flat wagons with pockets for the lorry wheels are used. Development started in France in 1946, and in 1966 1M ton freight were carried. In Germany, 2M tons were carried in 1975. Five other countries have also introduced the system, and in 1974 the 7 user countries carried a total of 4.6M tons freight. In the UK, owing to the short distances, unfavourable loading profile and small lorries, the system is uneconomic. Very little use is made of it in Sweden where the railway concentrates on container traffic. For the system to be economic, long transport distances are necessary. [Swedish]

Livijn, C *Lastbilen* Analytic No. 11, 1976, pp 46-48, 2 Fig., 3 Phot.

ACKNOWLEDGMENT: National Swedish Road & Traffic Research Institute (VTIN42004E), TRRL (IRRD-224561)

24 155081

## SOLIDA INDUSTRIAL PARK FEASIBILITY STUDY, SCRANTON, PENNSYLVANIA

This report presents the results of the subject study and, based upon an analysis of results, to illustrate the preliminary plan of the type and extent of development proposed on the SOLIDA Parcel. Among the main areas of study were the natural or intrinsic environmental factors of the surrounding population and utility availability. The potential of the Erie Railroad yards as a site for possible industrial, commercial, residential and/or recreation development, involved numerous factors that were considered and carefully analyzed.

Bellante, Clauss, Miller and Nolan, Economic Development Administration EDA-77/065, Oct. 1976, 67 pp

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-264472/2ST, DOTL NTIS

24 156085

## SERVICE AS A CRITERION FOR EVALUATING RAILROAD MERGERS. RAIL MERGER STUDY. ISSUE PAPER NUMBER 1

A critical aspect of any railroad merger is impact on service. Service embodies a range of railroad activities which vary in importance according to the needs of each user. Users are acutely sensitive to service fluctuations and can determine the financial viability of carriers. This paper identifies and analyzes the major service issues that affect formulation of railroad merger policies and the valuation of specific merger proposals. A general framework for analysis is provided in Chapter II, followed by a specific review of substantive policy and process issues in Chapters III and IV respectively. This is one of a series of seven studies to aid the ICC in identifying and solving problems involved with rail mergers.

See RRIS 165085-165091 for other Issue Papers in this series. 751b RRIS Bulletin 7801, 24.

Interstate Commerce Commission Issue Paper 1, Aug. 1977, 118 pp, Refs.

ORDER FROM: Interstate Commerce Commission, Rail Services Planning Office, Washington, D.C., 20036

24 159352

## PROCUREMENT PLANS AND PROCEDURES FOR THE NEC IMPROVEMENT PROGRAM

The study presents the results of an analysis of alternative plans and procedures for procuring materials and equipment essential to the NEC Project. The purpose is to assist the NEC Project in identifying and implementing procurement plans, to consider how the NEC might coordinate the program's procurement needs, and to document and describe a detailed set of procedures that may be utilized by the technical staff to monitor demand/supply trends.

Richardson, L  
Richardson Associates, Federal Railroad Administration Final Rpt.  
FRA/NECPO-76/24, Dec. 1976, 70 pp

Contract DOT-FR-56010

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-269147/5ST, DOTL NTIS

24 163233

## ANNUAL REPORT OF THE CANADIAN INSTITUTE OF GUIDED GROUND TRANSPORT--1976-77: RESEARCH PROGRESS

This Annual Report is comprised of progress reports on ongoing projects and abstracts of final reports on projects completed during this past year. The subjects covered include (a) communication and control, (b) track structures and dynamics, (c) freezing problems, (d) economics and management, (e) cybernetics and operations research, (f) magnetic levitation, (g) human factors, (h) systems studies, and (i) special projects. Also included is a complete list of CIGGT publications available on request.

Roney, MD Arnold, SN  
Canadian Institute of Guided Ground Transport Ann. Rpt.  
CIGGT-77-6, Apr. 1977, 208 pp, Figs., Tabs., 1 App.

ACKNOWLEDGMENT: CIGGT  
ORDER FROM: CIGGT

DOTL RP

24 163761

## RAILROAD VANDALISM

No Abstract.

Hearing before the Subcommittee on Crime of the Committee on the Judiciary, House of Representatives, Ninety-fifth Congress, first session, on H.R. 4507...March 9, 1977.

United States House of Representatives Cong. Rpt. Y 4J89/1:95-3, 1977, 135 pp, Figs.

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO  
ORDER FROM: GPO

24 163763

## STATE TRANSPORTATION MAPS

Includes two separate versions of transportation maps for each state, the Transportation zone edition and the State edition. Transportation zone edition includes zones which overlap into surrounding states. Complements United States transportation zone maps which were distributed as a loose-leaf volume of maps by Federal Railroad Administration, Office of Policy and Program Development in Oct. 1975 (Contract DOT-FR-40012). Because of variances in scale, two or more states are combined in some instances on one map, while other states are split in two, resulting in a total of 41 maps in each edition.

Eighty-two maps 55 x 43 or 43 x 55 cm. Prepared for Office of Policy and Program Development, Federal Railroad Administration.

Geological Survey Maps 1976

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO (TD 3.16:T68/2/975-76)  
ORDER FROM: GPO

S/N-050-005-00020-8

24 163764

**RAILROAD CONGLOMERATES AND OTHER CORPORATE STRUCTURES: A REPORT TO CONGRESS AS DIRECTED BY SECTION 903 OF THE RAILROAD REVITALIZATION AND REGULATORY REFORM ACT OF 1976**

No Abstract.

Interstate Commerce Commission Feb. 1977, 140 pp, Figs.

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO (IC 1.2:R 13/19)

ORDER FROM: GPO

S/N-026-000-01061-6

24 163785

**13TH ANNUAL RAILROAD ENGINEERING CONFERENCE PROCEEDINGS: "RAILROAD CHALLENGES IN AMERICA'S THIRD CENTURY--IMPROVED RELIABILITY AND SAFETY"**

This report constitutes the proceedings of a two-day railroad engineering conference held at Pueblo, Colorado on October 12 and 13, 1976. The conference theme was the reliability and safety aspects of railroad operations. Technical papers were presented during three sessions relating to the following topics: operations/crew, track maintenance, and train and equipment. A visit to the DOT's Transportation Test Center was included in the conference program for the observation of test operations at the newly completed Facility for Accelerated Service Testing (FAST).

Conference and report sponsored by the FRA/U.S. DOT, Office of Research and Development.

Federal Railroad Administration Proceeding FRA/ORD-77/13, July 1977, 152 pp

ACKNOWLEDGMENT: FRA, NTIS

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PB-272948/AS, DOTL NTIS

24 163789

**PUTTING RESEARCH TO WORK FOR A SAFER RAILROAD**

The organization and utilization of a systemwide Track Train Dynamics Program by Southern Pacific Transportation Company is described. Interdepartmental committees on System and Division levels are carrying out the objectives of SP's TTD application program. The general goal is safe, efficient and economical train operation by reduction of derailments and of component failures in equipment, track and loading to improve reliability for shippers and greater net profit.

Presented at the 13th Annual Railroad Engineering Conference, Pueblo, Colorado, October 12-13, 1976, and included in the Conference proceedings, "Railroading Challenges in America's Third Century--Improved Reliability and Safety," sponsored by the FRA's Office of Research and Development, U.S. DOT.

Lind, EF (Southern Pacific Transportation Company)

Federal Railroad Administration Conf Paper FRA/ORD-77/13, July 1977, pp 24-32

ACKNOWLEDGMENT: FRA

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24 163797

**FINAL STANDARDS, CLASSIFICATION, AND DESIGNATION OF LINES OF CLASS I RAILROADS IN THE UNITED STATES. VOLUME 2 (FINAL)**

Final Volume II contains designations of all Class I Railroad lines in the United States based upon the standards developed in Final Volume I. Each Class I Railroad line segment in the national rail network was subjected to individual analysis using the most current information available following the publication of Volume II (Interim) on January 19, 1977--notably correction/update information that was received by May 13, 1977 has been included in this Final Volume II. Statistical summaries of route mileage by line designation are presented, along with cross-reference information. Following the tables is an enlarged fold-out national network map displaying the line designations by categories.

See also Preliminary Standards, RRIS 24 139937 7701; Volume 1, RRIS 24 149462 7702; and Volume 2 (Interim), RRIS 24 152670, 7702.

Federal Railroad Administration Final Rpt. Final Volume 2, June 1977, 212 pp, Figs., Tabs., Refs.

ORDER FROM: GPO

24 163798

**A SURVEY OF RAILROADS OF SELECTED INDUSTRIAL COUNTRIES**

This study represents the fourth edition of a series in which Union Pacific railroad has reviewed the financial results of selected nationalized railroads together with the financial status of U.P., Penn Central, Class I line haul railroads, Amtrak, Canadian National, and Canadian Pacific. The statistical data focuses on 1975 but provides relevant data on the four prior years to give perspectives. It still appears that nationalized systems compare unfavorably with privately owned systems.

See also RRIS 24 099209, Bulletin 7502.

Union Pacific Railroad Company Sept. 1977, 138 pp, Refs.

ACKNOWLEDGMENT: Union Pacific Railroad Company

ORDER FROM: Union Pacific Railroad Company, 345 Park Avenue, New York, New York, 10022

DOTL RP

24 164434

**AN ANALYSIS OF A STRATEGIC RAIL CORRIDOR NETWORK (STRACNET) FOR NATIONAL DEFENSE**

This study identifies a Strategic Rail Corridor Network (STRACNET) for peacetime and contingency rail requirements of national defense. Peacetime rail traffic patterns, clearances on various routes, and service to military installations and defense industries are used to produce a rail corridor network of 30,000 miles. Corridors rather than specific lines are identified so individual companies are not advocated in the study. The recommendations are in compliance with requirements of Section 901(3) of the 4R Act.

See also RRIS 24 164435 7801.

Banks, WE Barclay, RP

Army Military Traffic Management Command MTMC-RND-76-1, Nov. 1976, 93 pp, 14 Fig., 8 Tab., 17 Ref., 8 App.

ORDER FROM: Army Military Traffic Management Command, Railroads for National Defense Project Management Group, Washington, D.C., 20315  
DOTL RP

24 164435

**DEPARTMENT OF DEFENSE INSTALLATIONS AND ACTIVITIES REQUIRING RAIL SERVICE (REVISED 8 JUNE 1977)**

This directory lists defense facilities requiring rail service and is a companion document to that identifying a Strategic Rail Corridor Network (STRACNET).

See also RRIS 24 164434.

Army Military Traffic Management Command Mar. 1977, 14 pp

ORDER FROM: Army Military Traffic Management Command, Railroads for National Defense Project Management Group, Washington, D.C., 20315  
DOTL RP

24 164437

**SOCIALIZED RAILROADS IN THE U.S.--THE GRAND TRUNK WESTERN**

The Grand Trunk Western, primarily operating in Michigan, is a U.S. subsidiary of Canadian National Railways which has been operated at a loss for many years because CN regarded it as a valuable feeder. The continuing subsidy from CN and through it from Canadian taxpayers is seen as inhibiting any incentive for more efficient operation, for abandonment of light-density routes or consolidation of operations with adjacent carriers in a territory with redundant rail service. While GTW is exempt from political considerations, it is seen as an example of the problem of public ownership of railroads.

Conant, M *California Management Review* June 1977, pp 53-69, 2 Tab., 18 Ref.

ORDER FROM: California Management Review, Graduate School of Business Administration, Berkeley, California, 94720

DOTL JC

24 164443

**AMTRAK'S INCENTIVE CONTRACTS WITH RAILROADS--CONSIDERABLE COST, FEW BENEFITS**

Since 1974 under its performance incentive contracts with 10 railroads, Amtrak has spent \$32.6 million to improve on-time performance and \$1.5



million to improve quality of maintenance. On-time has improved mainly because of a more liberal definition and because of lengthened schedules and not because of the incentives. Incentives have had virtually no effect on improving the quality of equipment maintenance. While new contracts have changed the threshold for incentives, it is contended that there is still insufficient incentive for railroads to adhere to schedules or improve the quality of train servicing and maintenance.

General Accounting Office Cong. Rpt. GAO-CED-77-67, June 1977, 72 pp, Tabs., 4 App.

ACKNOWLEDGMENT: NTIS

ORDER FROM: General Accounting Office, Distribution Section, Room 4522, 441 G Street, NW, Washington, D.C., 20548 NTIS

DOTL RP, PB-269615/1ST

24 164444

#### **HANDBOOK FOR PRESERVATION OF LOCAL RAILROAD SERVICE**

Throughout the United States, there is an accelerating abandonment of redundant and/or unprofitable light density railroad lines. This abandonment can be economically harmful to both the shippers and the communities that were previously served. Although greater dependence upon truck transportation is a viable alternative in many cases, other situations indicate that the greatest priority should be attached to preserving some form of local railroad service. The objective of this research was to develop a Handbook to assist shippers, local and state governments, and rail planners when their Class I rail service is scheduled for abandonment. Two major options are detailed in the Handbook. The first regards innovative procedures which may be used by local groups in attempting to preserve service by the existing Class I carrier. The second approach considers the alternative of operating the particular line as an independent railroad.

Sponsored by the Office of University Research U.S. DOT. Project Monitor for this research was Mr. T. Murphy, U.S. DOT.

Patton, EP Langley, CJ, Jr  
Tennessee University, Knoxville, (TC-77-001) Final Rpt. DOT-TST-77-34, Jan. 1977, 114 pp, 2 Fig., 14 Tab., 10 App.

Contract DOT-OS-50125

ACKNOWLEDGMENT: OST

ORDER FROM: NTIS

DOTL TF673.U38

24 164448

#### **STUDY OF MERGER ALTERNATIVES: RUN-THROUGH TRAINS**

The subject of run-through-trains (and pre-blocking) is given special attention by RSPO because it involves coordination techniques by railroads which are capable of attaining a portion of the advantages generally ascribed to mergers without going through the merger process. This report expands the discussion contained under Section 11 of Merger Issues paper No. 7, Alternatives to Merger.

Sponsorship provided by the Rail Services Planning Office, Interstate Commerce Commission, Washington, D.C.

Banks (RL) and Associates, Incorporated Sept. 1977, 93 pp, Figs., Tabs., Refs., 4 App.

ORDER FROM: Interstate Commerce Commission, Rail Services Planning Office, 1900 L Street, NW, Washington, D.C., 20036

DOTL RP

24 165065

#### **POSITION OF THE GOVERNING BOARD OF THE DB ON THE CONSOLIDATION OF THE GERMAN FEDERAL RAILWAY [Vorstellungen des Vorstandes der DB zur Konsolidierung der Deutschen Bundesbahn]**

A general statement by the Chairman of the DB Board. The situation of the DB will be consolidated by: increased productivity, concentration of traffic and investment, rationalization, and reforms to adapt structures to these measures. The author gives details of the measures, then describes the conditions to be met in the context of DB staff policy, and of Government policy as regards the DB, if these measures are to be successful. [German]

Vaerst, W *Die Bundesbahn* Vol. 53 No. 6, June 1977, pp 373-377

ACKNOWLEDGMENT: International Union of Railways, BD

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

24 165082

#### **SHORT LINE RAILROADS AS AN INVESTMENT**

This study examines the investment potential of shortline railroad ownership in the light of potential abandonment of over 33,000 miles of light-density lines in the U.S. Such abandonment includes some line segments that could be transformed into short lines. Local development agencies as well as individuals and other investors are evaluating either an equity or debt position in shortline railroads. The study is specifically about three shortline railroads operated by the Delaware Otsego Corp. of New York State, two of which are former branches of Class I railroads. Although the management of Delaware Otsego believes in the long run its three railroads can be a profitable investment, the financial position in their early years of operation has not been favorable. Capital requirements are high and the Corporation's existence is mainly attributable to two grants from the State of New York.

Dennis, CN (University of Southern Mississippi)

Small Business Administration May 1977, 60 pp, 1 Fig., Tabs., Refs.

ORDER FROM: Small Business Administration, Office of Planning, Research and Data Management, Washington, D.C., 20416

DOTL RP

24 165083

#### **TECHNICAL PROCEEDINGS OF THE INTERNATIONAL RAILROAD TECHNOLOGY TRANSFER SEMINAR. NEW ORLEANS, LOUISIANA, JANUARY, 1977**

Contents: Welcome and introduction to FRA's International Technology Exchange Program, R.E. Parsons; An overview of Department of Transportation's International Cooperation Program, B.A. Ramundo; Observations of 1975 U.S. Railroad Electrification Delegation visit to USSR, M.D. Meeker; Status of European electric traction technology, A.N. Addie; Recent European advances in achieving unity power factor, M. Guarino; A summary of U.S.-Poland cooperative research programs in railroad technology, R.M. McCafferty; Track maintenance and safety in the USSR, R.F. Beck; Observations of the USSR Shcherbinka Test Track Facility and the Lissino-Ostrovskaya Track Buckling Facility, D.P. McConnell; Rail practices in the USSR, D.H. Stone; Rail flaw detection, state-of-the-art in the USSR and its possible U.S. application, H. Cecon; Track performance in the USSR, R.M. McCafferty; Concluding remarks, R.E. Parsons.

Federal Railroad Administration Proceeding Jan. 1977, 62 pp, 93 Fig., Refs.

ORDER FROM: FRA

DOTL RP

24 165085

#### **IMPACTS ON OTHER CARRIERS OF RAIL MERGERS AND CONSOLIDATIONS. RAIL MERGER STUDY. ISSUE PAPER NUMBER 2**

This paper reviews the role of the Interstate Commerce Commission in rail merger cases with respect to impacts on carriers not directly involved in applications as has been the case in the past and as it will be under provisions of the 4R Act of 1976. In the past ICC concentrated on maintaining inter-railroad competition in an area, protecting weak carriers if possible. New statutory provisions may cause ICC to place less importance on the plight of other railroads, weak or strong. This paper examines 16 policy options, the circumstances under which they may be appropriate and their probable effectiveness in achieving the ICC's objectives.

See RRIS 156085 for Issue Paper 1; RRIS Bulletin 7801,24.

Interstate Commerce Commission Issue Paper 2, Aug. 1977, 77 pp, Refs.

ORDER FROM: Interstate Commerce Commission, Rail Services Planning Office, Washington, D.C., 20036

24 165087

#### **IMPACT ON LABOR. RAIL MERGER STUDY. ISSUE PAPER NUMBER 3**

Provisions of the Interstate Commerce Act require that merger approvals require a fair and equitable arrangement to protect the interests of involved employees. Chapters I and II explore the issue of labor protection from the standpoints of management and labor respectively. Chapter III explores the role played by the Federal Government. Appendices contain a digest of employee protective provisions of merger cases from 1960 to 1976, copies of relevant statutes and copies of actual agreements. Government's presence in labor protection is generally perceived as having reduced or eliminated the need for one or the other of the involved parties to bargain.



Interstate Commerce Commission Issue Paper 3, Aug. 1977, 115 pp, 4 App.

ORDER FROM: Interstate Commerce Commission, Rail Services Planning Office, Washington, D.C., 20036

#### 24 165088

##### ENVIRONMENTAL AND COMMUNITY IMPACT. RAIL MERGER STUDY. ISSUE PAPER NUMBER 4

This paper is concerned with the environmental and community impacts of rail mergers. Chapter I attempts to put into perspective the different types of community and environmental impacts which may result from a rail merger. Chapter II contains a discussion of the statutory and regulatory framework for consideration of impacts. Chapter III discusses some problems with regard to the evaluation process. The goal is to identify the actual environmental and community impacts of mergers, relative significance of the different impacts and assessment methods which may be used.

Interstate Commerce Commission Issue Paper 4, Sept. 1977, 34 pp

ORDER FROM: Interstate Commerce Commission, Rail Services Planning Office, Washington, D.C., 20036

#### 24 165089

##### THE ROLE OF GOVERNMENT IN RAILROAD RESTRUCTURING. RAIL MERGER STUDY. ISSUE PAPER NUMBER 5

Government interest in merger or restructuring of railroads differs from that involving other modes because railroading involves with it control over rights-of-way and rail services in potentially large markets and geographical areas. Involved are impacts on shippers, communities, employees and other transportation companies. There has also been a need to preserve and improve major services threatened by the physical and financial deterioration of individual railroads. Discussed are government's objectives and priorities; the degree of government initiative in starting the restructuring process; the powers and control exercised and degree to which disposition of assets is directed; the amount of money government is willing to spend; and the roles and powers of individual agencies and the structure of interaction among them.

Interstate Commerce Commission Issue Paper 5, Aug. 1977, 186 pp, Figs., Tabs., 1 App.

ORDER FROM: Interstate Commerce Commission, Rail Services Planning Office, Washington, D.C., 20036

#### 24 165090

##### NATIONAL DEFENSE. RAIL MERGER STUDY. ISSUE PAPER NUMBER 6

The role of railroads in the nation's defense and importance of defense considerations in ICC merger hearings are the subject of this paper. Chapter I explores national defense rail requirements and assesses the potential impacts of mergers upon these requirements. Chapter II discusses the present institutional and regulatory framework surrounding consideration of national defense needs in rail merger proceedings. The remainder of the paper analyzes options available to the ICC and Department of Defense which might insure that essential defense rail services are maintained. These options are analyzed in terms of their interactions, costs, institutional barriers and their effectiveness in meeting the national defense requirements.

Interstate Commerce Commission Issue Paper 6, Aug. 1977, 61 pp, 4 Fig.

ORDER FROM: Interstate Commerce Commission, Rail Services Planning Office, Washington, D.C., 20036

#### 24 165091

##### ALTERNATIVES TO MERGERS. RAIL MERGER STUDY. ISSUE PAPER NUMBER 7

While for a half century mergers have been advocated as a means of arresting the decline of the U.S. rail system, recent experiences have cast some doubt on the effectiveness of the process. This paper explores operations, marketing and financial arrangements which may be viewed as alternatives to full-scale corporate mergers. Each alternative is described and its current application in the rail industry is identified. The advantages, disadvantages and major constraints on each are discussed. A summary of costs and benefits of the alternatives is presented.

Interstate Commerce Commission Issue Paper 7, Aug. 1977, 75 pp, 80 Ref.

ORDER FROM: Interstate Commerce Commission, Rail Services Planning Office, Washington, D.C., 20036

#### 24 165092

##### COMPILATION OF EXECUTIVE SUMMARIES. EXECUTIVE SUMMARIES OF SEVEN ISSUE PAPERS IN THE STUDY OF RAIL MERGERS AND CONSOLIDATIONS

This paper is a compilation of the Executive Summaries of a series of seven issue papers: Service (Report 1); Impact on Other Carriers (2); Labor Impact (3); Environmental and Community Impact (4); Role of Government (5); Defense (6); and Alternatives to Merger (7). These papers have been prepared to review the advantages and disadvantages of mergers, to identify the principal problems involved; and to propose solutions to the problems identified.

Interstate Commerce Commission Aug. 1977, 30 pp

ORDER FROM: Interstate Commerce Commission, Rail Services Planning Office, Washington, D.C., 20036

#### 24 166147

##### RAILROAD MANAGEMENT AND PLANNING. VOLUME 2. 1974-1977 (A BIBLIOGRAPHY WITH ABSTRACTS)

Studies are presented of Government and regional planning concerning costs, terminals, intermodal systems, comparisons, safety, community relations, environmental impacts, railway abandonment, and high speed systems. Other discussions include noise control, commuter services, demand characteristics, and transportation models. See also NTIS/PS-76/0170, Railroad Management and Planning. Vol. 1. 1964-1973.

Supersedes NTIS/PS-76/0171, and NTIS/PS-75/321.

Adams, GH

National Technical Information Service Bibliog. June 1977, 107 pp, 102 Ref.

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

NTIS/PS-77/0531/2ST, DOTL NTIS

#### 24 166359

##### ANALYSIS OF STATE AND LOCAL TAXATION OF AMERICAN RAILROADS

The report is an analysis of state and local taxation of American railroads. The report examines the status, structure, and magnitude of the property taxes assessed against railroads. Though property taxes are a substantial expense for railroads, they have steadily decreased in importance. Twelve states exempt certain types of railroad property or grant exemption from property taxes to railroads and use other forms of revenue collection. The remaining states use the unit rule. The report examines the tax systems of the unit rule states and the in lieu taxes imposed by twelve states. Valuation, allocation, assessment, equalization, apportionment, and classification are analyzed with respect to railroad property. Sources of discriminatory tax treatment of railroads are identified. The report concludes that there are several possibilities for tax discrimination and that there are few areas that would suffer substantially if railroad property were removed from the tax base.

Thompson, DL Barth, J Garthner, R Sours, S

State University of New York, Binghamton, National Science Foundation

Final Rpt. Jan. 1977, 144 pp

Grant NSF-STP75-22353

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-268151/8ST, DOTL NTIS

#### 24 166765

##### EXAMINATION OF THE UNITED STATES RAILWAY ASSOCIATION'S FINANCIAL STATEMENTS AND OTHER MATTERS CONCERNING ITS OPERATIONS. REPORT TO THE CONGRESS

The report presents the results of the audit of the United States Railway Association's financial statements for the fiscal year ended June 30, 1976, and also discusses other matters concerning operations of the Association.

General Accounting Office CED-77-64, July 1977, 49 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-269747/2ST



24 167493

## COST FUNCTIONS OF CLASS II RAILROADS AND THE VIABILITY OF LIGHT TRAFFIC DENSITY RAILWAY LINES

The objective of this article is to develop cost functions for light-density rail lines, utilizing the data of selected Class II railroads. The influence of traffic volume and length of haul upon ton-mile costs are determined and the economic viability of light-traffic railroads is appraised. Various alternatives, including truck haulage, are examined.

Sidhu, ND Charney, A Due, JF *Quarterly Review of Economics and Business* Vol. 17 No. 3, Sept. 1977, 24 pp, 7 Tab., 14 Ref.

ACKNOWLEDGMENT: Illinois University, Urbana  
ORDER FROM: Illinois University, Urbana, College of Commerce and Business Administration, Urbana, Illinois, 61801

DOTL RP

24 167494

## THE UNITED TRANSPORTATION UNION'S SELECTIVE STRIKE TECHNIQUE

The use of the selective strike to circumvent the provisions of the Railway Labor Act regarding nationwide rail strikes is discussed. Settlement procedures of RLA and Federal emergency legislation were seen by the Brotherhood of Railway Trainmen and the successor United Transportation Union as placing unfair constraint upon the unions' ultimate economic weapon, the work stoppage. The role of coalition bargaining and the unique position of a coalition of railroad managements dealing with an international union are explored. It is concluded that the selective strike has altered the bargaining technique; there has been no threat of a nationwide rail strike in over eight years.

Wilner, FN  
Transport Consultants, Incorporated Press 1977, 80 pp, Refs.

ACKNOWLEDGMENT: Transport Consultants, Incorporated Press  
ORDER FROM: Transport Consultants, Incorporated Press, P.O. Box 4308, 1417 Peters Creek Road, Roanoke, Virginia, 24015

DOTL RP

24 167496

## TECHNOLOGICAL CHANGE AND THE THEORY OF THE FIRM: THE AMERICAN LOCOMOTIVE INDUSTRY, 1920-1955

This is a case study of decision making during a period of rapid technological transition from steam to diesel power in the locomotive-building industry. A brief historical review of the changing technical environment with which the firms were struggling precedes an analysis of the decision-making of the several locomotive builders. Where behavior is inconsistent with profit maximization, behavioral explanations are suggested. The study demonstrates also the substantial long-term economic impact of government policies on the locomotive-building industry. Production assignments of specific locomotive types in 1942 significantly affected the fate of the individual builders and the status of competition in the postwar period.

Marx, TG (Foster Associates, Incorporated) *Business History Review* Vol. 50 No. 1, Apr. 1976, pp 1-24

ACKNOWLEDGMENT: Business History Review  
ORDER FROM: Harvard Graduate School of Business Administration, 214-16 Baker Library, Soldier Field, Boston, Massachusetts, 02163

24 167509

## UTILITY-OWNED COAL CARS: A BOOM THAT REBUTS THE SKEPTICS

The growing fleet of privately owned hopper and gondola cars for unit train service has reversed the declining trend in ownership of open-top cars in railroad service. Utilities, coal companies and leasing organizations are all involved and surveys show that the fleet of non-railroad-owned coal cars will continue to expand.

Welty, G *Railway Age* Vol. 178 No. 18, Sept. 1977, pp 28-29, 1 Phot.

ACKNOWLEDGMENT: Railway Age  
ORDER FROM: ESL

DOTL JC

24 167527

## THE LEGACY OF THE LONG SHORT TERM 1855-1955

The institutional environment in which a transport system operates is as much a determinant of its form and efficiency as are the physical and

economic constraints on its development. The dominant concern of speakers at this forum is with positive means of action aimed at extracting the greatest degree of efficiency from the existing infrastructure and available uncommitted resources. It would be useful, however, if planners attempting to remedy the shortcomings of the Victorian Railway system realize the ramifications of the political parameters which constrained its development, operation and attempts at rationalisation. For it is those same parameters which have long encouraged the adoption of short term solutions to the problems of unwanted competition as an alternative to positive measures to finance and support development.

Aron, J (Victoria-Urban Renewal Authority)  
Victorian Ministry of Transport Analytic May 1977, 15 pp, 2 Fig., 1 Tab., 8 Ref.

ACKNOWLEDGMENT: TRRL (IRRD-227886)  
ORDER FROM: Victorian Ministry of Transport, 570 Bourke Street, Melbourne, Victoria, Australia

24 167569

## LAKE BAIKAL-AMUR RIVER RAILWAY MAINLINE (BAM), THE SCIENTIFIC AND TECHNOLOGICAL PROBLEMS OF ITS CONSTRUCTION AND OPERATION

A great railroad is in the process of construction in the USSR, the 3 145 km railroad mainline from Lake Baikal to the Amur river named for short BAM (Baikal-Amur Mainline). It is to facilitate the development of East Siberia and the Far East, a total area of 10.3 million sq km with very large natural resources. The line passes through most difficult terrain, including permafrost, with seasonal temperature variations from 40 degree to -65 degree C. The complexity of this railroad line has brought up a number of difficult problems for researchers and designers, the first and foremost being reliability of all structures and facilities in all conditions. The article discusses some of the difficulties in detail.

Verigo, MF (All-Union Railway Transportation Research Inst) *Rail International* Vol. 8 No. 5, May 1977, pp 246-252

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

24 167570

## RAILWAY ENGINEERING RESEARCH IN THE ERA OF UNIT TRAINS AND 120 MPH PASSENGER SERVICE

Advances in the railroad engineering field in Canada and engineering innovation in design of the 100-car unit trains, increasing freight volumes and train speeds, and advanced control systems developed to meet future transportation needs are discussed.

Hilborn, J *Engineering Journal (Canada)* Vol. 60 No. 2, Mar. 1976, pp 15-20

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

24 167576

## RAIL SYSTEMS DIAGRAM

The Regional Rail Reorganization Act of 1973 and the Railroad Revitalization and Regulatory Reform Act of 1976 have fostered a coordinated federal/state/local effort to develop alternatives to railroad abandonments or discontinuances of rail service. This package of maps, printouts and statistical summaries is intended to enhance the planning required by the 4-R Act by presenting a composite overview of the present and future rail systems within the individual states. Those lines which carriers may seek to abandon in the future, for which abandonment may be sought within three years and for which abandonments applications are pending are color coded so that planners can evaluate and assess the viability of light-density lines.

Includes set of 41 color-coded consolidated rail systems diagram maps.

Interstate Commerce Commission Sept. 1977, 10 pp, 4 Tab., 3 App.

ACKNOWLEDGMENT: Interstate Commerce Commission  
ORDER FROM: Interstate Commerce Commission, 1112 ICC Building, Washington, D.C., 20423

DOTL RP

24 167915

**RAIL MERGER STUDY: PRELIMINARY REPORT**

This report contains preliminary recommendations of the ICC's Rail Services Planning Office concerning the future course of rail mergers and consolidations. After exploring seven issues, the basis of Issue Papers previously issued, this report marks the first point in the studies mandated by the Railroad Revitalization and Regulatory Reform Act of 1976 where RSPO is taking positions and making recommendations. Among the recommendations to the ICC are advocacy of rail restructuring through the merger process; endorsement of end-to-end mergers as more advantageous and less risky than parallel mergers; emphasis on voluntary agreement among carriers rather than government directive; acknowledgment that labor protective conditions must be based on statute; declaration that mergers are not the effective way to deal with marginal carriers and that ICC's primary responsibility is to assure adequate service rather than preservation of corporate entities; continue present policies with respect to national defense as a merger criterion; and continue present procedures with respect to environmental and community impact. A series of other recommendations are also included.

Interstate Commerce Commission Nov. 1977, 40 pp, 1 App.

ACKNOWLEDGMENT: Interstate Commerce Commission

ORDER FROM: Interstate Commerce Commission, 1112 ICC Building, Washington, D.C., 20423

DOTL HE2757 .U54

24 167917

**THE MAKING OF CONRAIL**

The Regional Rail Reorganization Act of 1973 brought into being Conrail, a private sector rail carrier created through government planning and launched with government capital. The United States Railway Association, a non-profit planning agency, was created by Congress to implement the statutory requirements, balancing ICC's goal of service preservation at the cost of financial viability against DOT's readiness to sacrifice adequate service for profits. The adequacy of the planning process relating to Conrail's routes, physical facilities and market structure are critical to the railroad's future. The status of policy making, finance, organization and prospects for the future are discussed.

This article was first published by the author on June 30, 1977, as part of a panel discussion on "The Railroad's Future: The 4-R Act" before the 48th Annual Meeting of the Association of Interstate Commerce Commission Practitioners in New York.

Hillman, JJ (Northwestern University, Evanston) *ICC Practitioners' Journal* Vol. 45 No. 1, Nov. 1977, pp 18-26

ORDER FROM: Association of Interstate Commerce Comm Pract, 1112 ICC Building, Washington, D.C., 20423

DOTL JC

24 167920

**ARE TERMINAL RAILROADS TERMINAL?**

Information and statistics on 25 Class I Switching and Terminal Railroads are incorporated in this article. Changes resulting from run-through trains, Amtrak's assumption of passenger services and new industry practices have affected these railroads. Present problems and prospects are discussed.

Shaffer, FE *Modern Railroads/Rail Transit* Vol. 32 No. 11, Nov. 1977, pp 60-62, 1 Phot.

ACKNOWLEDGMENT: Modern Railroads/Rail Transit

ORDER FROM: ESL

DOTL JC

24 167964

**MAIN PROBLEMS IN THE OPERATION OF HIGH-SPEED TRAINS [Osnovnye problemy vysokoskorostnogo dvizheniya poezdov]**

Technical-economic aspects of the development of high-speed running on railway lines. Results obtained in service with ER 200 electric trains and the CS 200 electric locomotive, automation of train movement control, and maintenance of track and bridges. [Russian]

Rjazanov, VI *Elektricheskaja i Teplovoznaia Tiaga* No. 8, 1977, pp 34-38

ACKNOWLEDGMENT: International Union of Railways, BD

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

24 168099

**CONGRESSIONAL SYMPOSIUM RAILROADS--1977 AND BEYOND: PROBLEMS AND PROMISES (BACKGROUND MATERIAL)**

This background material provides relevant material for a two-day Congressional symposium on Railroads. It is not intended to be comprehensive but is selected on the basis of its relevance to the topics of the Symposium. The material has generally been organized to provide basic statistics relevant to railroads, railroad employment, general industry analysis, regulatory reform, Conrail, electrification prospects and a directory of key people and organizations along with a glossary of common railroad terms.

United States House of Representatives 1977, 275 pp, Tabs., Photos., Apps.

ACKNOWLEDGMENT: United States House of Representatives  
ORDER FROM: GPO

24 168103

**THE "PLAIN-JANE" BOX CAR GAINS ACCEPTANCE**

Orders which will expand the TTX Railroad Fleet of 10,000 box cars by 25 percent indicate the success of this industry-owned car pool. The RBOX cars are exceeding the industry average for utilization and loading; the car distribution practices and other factors in use of the cars are discussed.

*Progressive Railroading* Vol. 20 No. 12, Dec. 1977, pp 48-49, 1 Phot.

ACKNOWLEDGMENT: Progressive Railroading

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

DOTL JC

24 169979

**PLANNING AND EXECUTION OF CAR INVESTMENT OPERATIONS [Systematische Planung und Durchführung wagentechnischer Investitionsvorhaben]**

These operations take into account: The general policy directives of the Transport Ministry, safety, transport demand, profitability, and the goal of providing carbuilding industry with a regular work-load. The article explains in general terms how modern management methods assist in organising these operations, program them over a period of time, and more particularly how the DB monitors implementation of the projects. [German]

Molle, P Woebken, W *Die Bundesbahn* Vol. 53 No. 9, Sept. 1977, pp 651-656, 1 Tab., 4 Phot., 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

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

24 169987

**TRANSPORTATION SYSTEMS FOR AMERICA'S FUTURE-A MANAGEMENT OVERVIEW**

This special publication is based on presentations from the keynote session at the 1976 SAE National West Coast Meeting. Its purpose was to provide an overall view of America's transportation needs for the future and how they can best be met. Because of the outstanding success of the session, SAE decided to publish the keynote presentations so that the viewpoints expressed could reach a broader audience. Specifically, the publication contains an overview of transportation system requirements nationally and panel discussions of this overview from the viewpoints of the automobile industry, the railways, rapid transit equipment manufacturers and railway equipment manufacturers.

Presented from Keynote Session at SAE National West Coast Meeting, San Francisco, August 9-12, 1976.

Society of Automotive Engineers SAE Spec Publ N420, Nov. 1976, 58 pp

ACKNOWLEDGMENT: EI

ORDER FROM: SAE

24 170083

**INTEGRATED HIGH SPEED TESTING OF VEHICLE, TRACK AND CATENARY [Integrierte Schnellfahrversuche fuer Fahrzeug, Fahrweg und Fahrdrabt]**

The DB is planning to construct lines for traffic operating at 300 km/h. Because of the homes and centres of economic activity over its territory, these lines will be equipped for mixed traffic of high-speed passenger and freight trains. Tests are being conducted of all components. [German]

Enser, H *Glaser's Annalen ZEV* Vol. 101 No. 8-9, Aug. 1977, pp 303-311, 3 Fig., 7 Phot.

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

DOTL JC

24 170103

## EUROPEAN TRANSPORT OVER THE NEXT 25 YEARS

Despite the slow-down in economic growth rates it seems clear that the volume of traffic in Europe will have approximately doubled by the year 2000. To cope with this increase, the author looks at two possibilities:

Restrictions on road use, and a major restructuring of the railways—namely to reserve the main lines of the existing rail system for goods traffic. The latter would triple current peak goods-carrying capacity. A new high-speed transport system should be constructed to cope with the passenger traffic. This would be much cheaper than constructing new motorways and would consume less energy.

Bouladon, G (Battelle Geneva Research Center, Switzerland) *Futures* Vol. 9 No. 4, Aug. 1977, pp 264-271, 8 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC



25 052521

**FIRST DEFINITION OF A HIGH SPEED TRANSPORT SYSTEM OVER NEW LINES IN CONNECTION WITH THE CHANNEL TUNNEL. CONTRIBUTION TO THE STUDY OF THE EUROPEAN HIGH SPEED INTER-CITY RAIL NETWORK**

[Première définition d'un système de transport TGV par lignes nouvelles en liaison avec le Tunnel sous la Manche. Contribution à l'étude du réseau ferroviaire européen interville à très grande vitesse]

No Abstract. [French]

International Union of Railways, BD Sept. 1973, 28 pp, 5 App.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: International Union of Railways, BD, 14 rue Jean Rey, 75015 Paris, France

DOTL RP

25 148238

**TRANSPPLAN 76: INITIAL IOWA TRANSPORTATION PLAN**

This plan which stresses the roles played by the public and private sectors in providing transportation services is presented in seven sections which cover: statewide transportation planning, the Iowa Transportation Policy, modes, needs, resources and programming, critical issues, and public investment in transportation. Iowa has been using a needs study approach for more than 15 years as its basic highway planning tool. The Iowa Transportation Plan is concerned with the socio economic and environmental consequences of transportation investments as well as decisions on types and timing of investments and funding sources. Iowa's transportation policy supports the establishment of an adequate and safe multimodal transportation system. Air, waterway, rail, transit, road and pipe transit modes are considered, and financial needs and resources are discussed. Passenger and freight modes and planning values related to energy intensiveness are discussed, and freight and passenger cost characteristics are noted.

Iowa Department of Transportation Mar. 1976, 274 pp, 82 Fig., 67 Tab., 6 Ref.

ORDER FROM: Iowa Department of Transportation, Planning and Research Division, Des Moines, Iowa, 50319

25 155406

**TOWARD 2000: OPPORTUNITIES IN TRANSPORTATION EVOLUTION**

This report describes possible directions for the Nation's transportation system evolution, and identifies research and development strategies to take advantage of the most promising opportunities. The document begins with a brief examination of population and demographic trends, and makes some conjectures about the future. The report then examines transportation opportunities in five major areas: urban transportation, intercity transportation, the private automobile, freight-systems, and cross-cutting issues such as decision-making. The report also includes general discussions of the relationships among transportation changes in the spatial organization of the nation (land use), and the use of resources: energy, labor, and capital.

Ward, JD O'Leary, KL Bartholow, B Chu, SC Linhares, AB  
Office of the Secretary of Transportation Final Rpt. DOT-TST-77-19, Mar. 1977, 152 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-266763/2ST, DOTL NTIS

25 155991

**STATEWIDE TRANSPORTATION PLANNING: THE NORTH CAROLINA EXPERIENCE**

North Carolina's experience in statewide transportation planning represents a new attempt to deal with comprehensive multimodal transportation planning at the statewide level through the use of sketch-planning techniques. The characteristics and relationships of the social, economic, political, and environmental systems that affect the state are described and analyzed. Four projected futures for the state are identified with corresponding development patterns. All feasible modes of transportation are considered, and transportation requirements are defined for each projection. The elements common to all or most of these requirements are screened and formulated into low-risk, short-range (5-year) action programs, grouped into four major classes: capital improvement, operating, regulatory, and promotional programs. Similar classes are used to identify mid-range (10 to 15-year) conceptual programs. These, however, provide policy direction

rather than deal with specific projects and are addressed to each of the different projections separately. This paper presents an overview of this process and preliminary comments on its usefulness to statewide transportation decision making. The effort indicates that sketch planning can be effective and economical as a planning approach. As a decision-making tool, it seems that more time and better reconciliation of conflicts in the public and private sectors are needed before it is fully useful.

Rihani, FA (Noonan, Knopfle, and Feldman); Sams, LH (North Carolina Department of Transportation); Taggart, RE, Jr (Ernst and Ernst) *Transportation Research Record* No. 603, 1976, pp 42-48, 8 Ref.

ORDER FROM: TRB Publications Off

25 158931

**STUDY OF FEDERAL AID TO RAIL TRANSPORTATION**

This Report to the Congress presents an analysis of the effects on the railroads of past and present policies and methods for providing Federal aid to the rail and non-rail modes of transportation, together with recommendations for future policy for providing Federal aid to rail transportation. The analysis of Federal actions includes direct Federal aid, tax policies, and economic regulation of each of the major modes of domestic intercity transportation (i.e., air, highway, pipeline, rail and water transportation). The Report includes an assessment of the impacts of socio-economic forces on the railroads in order to provide a framework for the analysis of the effects of Federal actions on rail transportation. The Report also includes an analysis of the potential effects of the Railroad Revitalization and Regulatory Reform Act of 1976 on the viability of rail transportation. (Portions of this document are not fully legible.)

Report to the Congress pursuant to Section 902 of the Railroad Revitalization and Regulatory Reform Act of 1976, Contract DOT-OS-60505.

Office of the Secretary of Transportation DOT/TPI/30-77/08, Jan. 1977, 248 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-267215/2ST, DOTL NTIS

25 163227

**NEVADA STATE RAIL PLAN. RAIL PLANNING WORK STATEMENT. JANUARY 1977 (ADDENDUM MARCH 8, 1977)**

The State Rail Plan was prepared by the State of Nevada in compliance with the Railroad Revitalization and Regulatory Reform Act of 1976 which makes financial assistance available to 31 states outside the Northeast region. The Nevada State Highway Department in conjunction with the Nevada Public Service Commission is responsible for the Plan. Primary concerns are to assess the financial viability of existing rail services, maximize future benefits for both shippers and carriers and formulate recommendations directed toward averting future rail service problems, rather than developing short-range solutions. The sections: Philosophical Framework, Organization and Public Involvement, Goals and Objectives, Data collection, Analytical Methodologies, Planning Process.

Contact person for the Plan is George B. Westenhoefer, Chief Planning Survey Engineer.

Nevada Department of Highways Jan. 1977, 55 pp, 4 Fig., 4 App.

ORDER FROM: Nevada Department of Highways, 1263 South Stewart Street, Carson City, Nevada, 89712

25 163254

**PRELUDE TO LEGISLATION TO SOLVE THE GROWING CRISIS IN RURAL TRANSPORTATION**

No Abstract.

Prepared for the Senate Committee on Agriculture and Forestry, 94th Congress, 1st session.

Department of Agriculture Cong Rpt. Y 4.Ag8/2:R 88/35, 1975, 359 pp, Refs.

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO

ORDER FROM: GPO

S/N-052-070-02729-1

25 163303

## TOLLS: EFFICIENCY AND EQUITY ISSUES FOR INLAND WATERWAYS

Transportation requires large amounts of capital in fixed facilities such as roads, tracks, or canals. Inland waterway transport is unique among modes, since it neither owns its right-of-way nor pays taxes to support its construction and maintenance. Although user charges are widely employed to recover the costs of publicly provided investments, proper theoretical foundation has not been made for their application to inland waterway transport. In this paper a foundation is provided which focuses on efficiency of allocation of resources, on equity of taxation, and on administration simplicity of each toll scheme.

Case, LS (Carnegie-Mellon University); Lave, LB *Management Science* Vol. 23 No. 8, Apr. 1977, pp 811-819, 9 Ref.

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

DOTL JC

25 163766

## RAIL, MOTOR, AND SHIPPER OPINIONS ON REGULATORY ISSUES

The historical and legal foundations of the right of eminent domain and its specific relevance to coal slurry pipelines, when such operations are not common carriers in the traditional sense, are investigated.

Constantin, JA (Oklahoma University); Jerman, RE Anderson, RD (Indiana University, Indianapolis) *Transportation Journal* Vol. 17 No. 1, Sept. 1977, pp 40-50, 2 Tab., 10 Ref.

ORDER FROM: ESL

DOTL JC

25 163769

## MICHIGAN RAILROAD PLAN. ANNUAL UPDATE, AUGUST 1977

The requirement for a State Rail Plan and annual updates resulted from the 3R Act and the 4R Act which establish eligibility for federal subsidy funds for designated light-density lines. As an alternative to immediate discontinuance of service on nearly 900 miles of track, Michigan has participated in a subsidy program since April 1976. While emphasis in state rail planning continues to be on light density lines, overall rail industry concerns and problems are also dealt with to a limited degree. Lines presently being subsidized are analyzed in detail, along with lines for which abandonments are pending. A summary of the nature of service and major commodities shipped in Michigan is also included.

Michigan Department of State Highways & Transport Aug. 1977, 348 pp, 10 Fig., 15 Tab., 2 App.

ORDER FROM: Michigan Department of State Highways & Transport, State Highways Building, P.O. Drawer K, Lansing, Michigan, 48904

DOTL RP

25 163867

## URBAN TRANSPORT APPRAISAL

The book examines the methods developed for evaluating urban transport projects and policies. The author discusses the characteristics of the demand for transport and the way in which they determine how travel behaviour is analysed. The object of the appraisal being to ensure that value for money is obtained either with respect to the development of transport systems or the use of existing capacity. The book emphasises the economic aspect of policies on which a monetary value can be placed. The subject is discussed in the following chapters: (1) An appraisal framework; (2) Introduction to the analysis and forecasting of travel demand; (3) Some alternative approaches to the analysis of travel demands; (4) The analysis and forecasting of trip generation and attraction. (5) A digression-the specification of travel costs in the analysis of travel demand; (6) Trip distribution; (7) Modal choice; (8) assignment; (9) Economic evaluation: the benefit algorithm; (10) Evaluation criteria and their implications for benefit estimation; (11) Some problems in economic evaluation and (12) Conclusion. /TRRL/

Jones, IS (Department of the Environment, England) Macmillan Press Limited Monograph 1977, 144 pp, 39 Fig., 3 Tab., Refs.

ACKNOWLEDGMENT: TRRL (IRRD 226459)

ORDER FROM: Macmillan Press Limited, 4 Little Essex Street, London WC2R 3LF, England

25 163875

## THE ROLE OF BRITISH RAIL IN PUBLIC TRANSPORT

In the report the select committee seeks to provide information for the House of Commons to judge the government's policy on transport. Although the committee have concentrated on the role of British Rail, their findings are concerned with all forms of public transport. The findings are based on evidence submitted by government departments, nationalised industries, local authorities, private transport organisations, unions and consumer organisations, and are presented under the following headings: the present state of British Rail; likely pattern of future demand; the future form and size of the rail network; manpower; co-ordinated passenger transport; competition on trunk routes; co-ordination of other services outside major conurbations; the conurbations; freight; expenditure on railways and public transport by central and local government; allocation of benefits derived from public expenditure to users of transport services; pricing; fiscal policy; investment; consumer organisations; exports; property; railway unions; statistics; national transport planning. Conclusions compare BR with similar Western European systems and also makes recommendations concerning the correct use of railway investment, and also the co-operation between all forms of public transport. /TRRL/

House of Commons Select committee on Nationalised Industries, Report and Proceedings of the Committee, Volume 1.

Her Majesty's Stationery Office Monog Rpt. Apr. 1977, 136 pp

ACKNOWLEDGMENT: TRRL (IRRD 226474)

ORDER FROM: Pendragon House, Incorporated, P.O Box 255, Old Mystic, Connecticut, 06372

25 164184

## THE USES AND LIMITATIONS OF COST BENEFIT ANALYSIS

The author suggests that in all the European countries, government intervention in the operation of the free market is increasing, either by direct state intervention or alternatively, by the formulation of rules restricting the freedom of both individuals and companies. Cost benefit analysis as an aid to decision making by government was introduced into Europe in the mid-sixties, and in this paper the author examines the potential benefits that cost benefit methods might achieve. Such benefits are considered to be of particular importance in the field of transport planning, and examples are quoted to indicate the importance of correct factual relationships between economist, administrator and politician. The reasons why the benefits that could be derived are not obtained is discussed, and it is suggested that most of the difficulties seem to stem from lack of research on two levels: (a) basic research on the evaluation of intangibles "the human factors involved in the design and construction and use of roads and urban areas", and on obtaining a reasonable degree of consensus on the framework to be used in analysis. (b) practical use of methods with a view to obtaining the necessary interface with politicians and other decision-makers. A technical description of cost benefit analysis is given in an appendix. /TRRL/

Frost, MJ (Metropolitan Consulting Group Limited, London) Centre for Management Studies, (Oxford) Monograph Mar. 1976, 67 pp, 1 Tab., 167 Ref.

ACKNOWLEDGMENT: TRRL (IRRD 225448)

ORDER FROM: Centre for Management Studies, (Oxford), Kennington Road, Kennington, Oxford, Oxfordshire, England

7704051

25 164343

## TRANSPORT POLICY

This white paper sets out the government's approach to transport policy and some of the specific decisions it has made. The three principal objectives of transport policy are identified as: (1) to contribute to economic growth and higher national prosperity. (2) to meet social needs by securing a reasonable level of personal mobility, particularly by maintaining public transport for those without the use of a car. (3) to minimise the harmful effects of transport (road accidents, damage to the environment etc.). The subject matter is treated under the following chapter headings: (1) objectives, (2) the role of government, (3) local planning and choice, (4) transport in towns, (5) the rural areas, (6) inter-urban passenger transport, (7) freight, (8) the public sector, (9) roads, (10) implications for public expenditure, (11) consultation and policy-making, (12) summary of decisions. The white paper concludes with details of transport resources budget, the purpose of which is to show what users, including those providing their own transport spend on different forms of surface transport by road and rail, the value of resources that go

into providing transport and how they are paid for- whether entirely by users, entirely from public expenditure or a mixture of the two. /TRRL/ Her Majesty's Stationery Office Monograph CMND 6836, June 1977, 76 pp, 3 Tab.

ACKNOWLEDGMENT: TRRL (IRRD 226882)

ORDER FROM: Pendragon House, Incorporated, P.O. Box 255, Old Mystic, Connecticut, 06372

7707010

25 165040

**"OPTIMIZATION" OF PUBLIC TRANSPORT NETWORKS [Zur "Optimalitaet" oeffentlicher Verkehrsnetze]**

The author explains the difference between the criteria of private and public enterprise, and concludes by criticizing the contradictory nature of a policy which views railways as an agent in the transport market, while denying them a social role, yet continuing to regard them as public enterprises. [German]

Oettle, K. *Glaser's Annalen ZEV* Vol. 101 No. 6, June 1977, pp 174-178, 10 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: ESL

DOTL JC

25 166318

**BIBLIOGRAPHY OF STATE-DIRECTED RESEARCH FOR ECONOMIC DEVELOPMENT, 1970-1976**

This publication is a bibliography of state-directed studies in the various areas related to economic development. It includes those subjects related directly to economic development and those directed by a state's economic development department. This work is divided into six sections. Section I is the main part of the bibliography and is a subject listing of abstracts of research studies conducted by the states. Section II lists the addresses and research personnel of state development agencies. Section III is organized by State and lists the titles of the States' industrial directories and includes information on how to obtain them. Section IV is similar to Section III except that it covers the statistical abstracts of the various states. Section V consists of miscellaneous publications. Section VI is a listing of additional sources of economic development research information for each state. A state index concludes the Bibliography.

Prepared in cooperation with Research Services, Des Moines, Iowa, and National Association of State Development Agencies, Washington, D.C. Supersedes PB-254 231.

Iowa Development Commission, Research Services, National Association of State Development Agencies, Economic Development Administration, (EDA-OER-99-7-13356) Final Rpt. EDA/OER-77/014, Apr. 1977, 185 pp

Grant EDA-OER-549-G-76-33

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-267771/4ST, DOTL NTIS

25 166770

**NEED TO RESOLVE METRO FUNDING: DEPARTMENT OF TRANSPORTATION. WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY**

The report describes the problems facing the Congress, the Office of Management and Budget, the Department of Transportation, the Washington Metropolitan Area Transit Authority, and the local jurisdictions in funding the construction of the METRO subway system, bond interest costs, and bus and rail operating deficits.

Report to the Congress.

General Accounting Office PSAD-77-123, June 1977, 44 pp

ACKNOWLEDGMENT: NTIS

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DOTL NTIS

25 167131

**RE-USE PLANNING OF TRANSPORTATION PROPERTY ABANDONMENTS**

The report describes means by which re-use considerations can be incorporated into decisions to abandon transportation properties, and

presents legal, technical, and institutional means of assessing re-use potential for abandoned rail rights-of-way. The project suggests a planning and legislative paradigm by which state agencies can coordinate inevitable abandonment decisions with re-use strategies.

Ducker, KJ Zimmerman, R

Iowa University, Department of Transportation Final Rpt. DOT/TST-75/146 N13, Feb. 1975, 334 pp

Contract DOT-OS-40019

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-271836/9ST, DOTL NTIS

25 167382

**DEEP-DRAFT NAVIGATION USER CHARGES: RECOVERY OPTIONS AND IMPACTS**

Alternative cost recovery options for Federal deep-draft navigation expenditures are investigated and the impacts of user charges on waterborne trades and commodity traffic, both foreign and domestic (Great Lakes and coastwise), are assessed. In addition, the foreign experience in port governance, pricing, and investment policies is examined, including representative levels of port-use fees. A detailed commodity traffic analysis for petroleum, grain, coal, iron ore, and general cargo has revealed that 100-percent recovery of total Federal deep-draft costs by uniform (on vessel or cargo tonnage for example) user charges will not substantially disrupt domestic or foreign waterborne traffic levels or patterns. However, port-specific user charges can significantly affect future port development and traffic levels in certain smaller and more costly ports, and encourage port consolidation. Action by domestic overland carriers, waterborne carriers, and shippers may act to minimize any adverse impacts. For traffic which navigates both inland river and coastal ports, effects of potential double (shallow-and deep-draft) user charges are examined. In general, a vessel-based system use-recovery approach will tend to minimize impacts across waterborne trades and commodity flows as well as traffic using both shallow-and deep-draft systems.

Anderson, DL Schuessler, RW Cardellicchio, PA

Transportation Systems Center Final Rpt. DOT-TSC-OST-77-45, Aug. 1977, 244 pp

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

PB-272951/5ST

25 167388

**REGIONAL MARKET, INDUSTRY, AND TRANSPORTATION IMPACTS OF WATERWAY USER CHARGES**

The objective of the report is to analyze the impacts on water-served economic markets and water transportation of the imposition of user charges designed to recover Federal outlays for the operation, maintenance, and repair of the U.S. waterways and ports (OM&R). The report describes the development of a preliminary impact model based on an analysis of waterway network operations and a stage-of-processing analysis of markets dependent on water carriage. Initial results from the models are based on the assumption that 100 percent of the operations and maintenance costs of waterways and ports will be recovered. The models calculate the differential impacts between segment-specific and uniform-fuel tax-collection options for a variety of commodity groups and markets, using 1972 waterway traffic data.

Anderson, DL Schuessler, RW Cardellicchio, PA

Transportation Systems Center Final Rpt. DOT-TSC-OST-77-41, Aug. 1977, 111 pp

ACKNOWLEDGMENT: NTIS

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PB-273041/4ST

25 167389

**ANALYSIS OF A STATEWIDE INTEGRATED TRANSPORTATION SYSTEM**

The University Transportation Study Consortium recommends that the Mississippi Legislature create an umbrella, multimodal transportation agency for the coordination of transportation within the state. At present Mississippi's transportation system has no formalized, intermodal coordination for planning and no common reporting or focal point. Each mode operates autonomously, and balanced planning among the modes does not exist.



Smith, M Peterson, JR Baird, H  
Mississippi Research and Development Center, Department of Transportation  
Final Rpt. DOT-TST-77/16, Feb. 1977, 85 pp

Contract DOT-OS-40089

ACKNOWLEDGMENT: NTIS  
ORDER FROM: NTIS

PB-273066/1ST

25 167533

**TRANSPORTATION POLICY IN THE EIGHTIES**

Urban transportation policy during the nineteen seventies has been characterized by attempts to deal with four major problems: the minimization of environmental impacts of transport investments, the alleviation of inequities in mobility, and financial burdens imposed upon some groups by earlier investments in capital intensive highway networks, the accommodation of demands for public participation in transport decision-making, and the precipitous rise of public transit operating costs. Examples are given of policies which have been pursued in attempting to solve each of these problems. It is shown that policies designed to solve one of them have often intensified others.

Wachs, M (California University, Los Angeles) *Transportation (Netherlands)* Vol. 6 No. 2, June 1977, pp 103-119, 14 Ref.

ACKNOWLEDGMENT: EI  
ORDER FROM: ESL

DOTL JC

25 167916

**THE RAILROAD REVITALIZATION AND REGULATORY REFORM ACT OF 1976**

The changes in the Interstate Commerce Commission's procedures for abandonments and discontinuances under the Railroad Revitalization and Regulatory Reform Act of 1976 are discussed. The approach of the Regional Rail Reorganization Act of 1973 in solving the problems of unprofitable branch lines and assuring adequate rail service has been continued and expanded. The new statutory plan recognizes that it may not be in the public interest to require railroads to operate without expectation of reasonable profits, but does attempt to protect the interests of shippers and communities.

Johnson, WH *ICC Practitioners' Journal* Vol. 45 No. 1, Nov. 1977, pp 27-49, 1 App.

ORDER FROM: Association of Interstate Commerce Comm Pract, 1112 ICC Building, Washington, D.C., 20423

DOTL JC

25 167956

**TRANSPORT POLICY IN THE UNITED KINGDOM**

The authors describe the recent White Paper as a "pretentious failure" to secure allocational efficiency between road and rail. It recognizes the need for "unorthodox" rural transport and for better subsidy management, but the problems of railway finance and local public transport are fundamentally untouched.

Beesley, ME Gwilliam, KM *Journal of Transport Economics and Policy* Vol. 11 No. 3, Sept. 1977, pp 209-223, 8 Ref.

ACKNOWLEDGMENT: International Union of Railways, BD  
ORDER FROM: London School of Economics and Political Science, Houghton Street, Aldwych, London WC2A 2AE, England

DOTL JC

25 168091

**URBAN ROAD AND RAIL POLICY**

The expectations inherent in legislation concerned with urban transport policy since the 1968 Transport Act are reviewed, and the reasons why these objectives are considered not to have been achieved are discussed. It is suggested that the main reasons for this situation are: institutional flexibility has been more apparent than real, the dearth of really attractive urban public transport capital projects, the apparent irrelevance of public transport subsidy to the congestion issue, the weakness of parking restraint policy, and the inadequate arrangements for administration coordination. The degree of importance placed on urban transport policy in the consultation document (no more than part of a chapter) is shown to indicate a reduction of emphasis on such problems, and the implications of such a philosophy are considered

in relation to such topics as car-restraint policies, measures to reduce the public transport peak, taxation, business cars and problems of management. It is concluded that the change of emphasis-towards a concern for the transport provision for those without a car available-has implications for public transport policy differing from those appropriate to treating public transport as a way of combating congestion.

Gwilliam, K (Leeds University, England) *Chartered Institute of Transport Journal Analytic* Vol. 37 No. 11, July 1977, p 336

ACKNOWLEDGMENT: TRRL (IRRD-228895)

ORDER FROM: Chartered Institute of Transport, 80 Portland Place, London W1N 4DP, England

25 168092

**THE DECLINE IN PUBLIC TRANSPORT-CAN WE ARREST IT?**

The article considers the effect of some aspects of rail transport planning policy upon major conurbations. Commuters are the most important single consumer group, about 63 per cent of the LTE revenue and 77 per cent of British rail revenue in peak hour travel. The author discusses the basis used to determine the level of fare increases on commuter routes. The related issues of subsidies and staffing are examined; conditions vary considerably over the country but it is apparent that often labor and other resources are misdeployed. There is still a lack of co-ordination between surface British rail services and LTE buses and tub trains. A full study into the cost-effectiveness of subsidies for commuter fares is needed. It is explained how even small savings on subsidies could have serious implications on public revenue and expenditure accounts in large conurbations. Reasons are given why public transport should play a much greater role in the planning of conurbations and travel patterns within them. Greater emphasis should be put on the importance of commuter traffic.

Millman, R (North London Polytechnic, England) *Planner Analytic* Vol. 63 No. 5, Sept. 1977, p 134, 3 Phot.

ACKNOWLEDGMENT: TRRL (IRRD-228912)  
ORDER FROM: ESL

25 168105

**THE IMPACT OF THE 4-R ACT RAILROAD RATEMAKING PROVISIONS**

This study, prepared in accordance with Section 202(g) of the 4R Act, examines changes in rate regulation aimed at developing an efficient and financially stable railway system. Studies include effects on shippers and carriers in all modes and proposes further regulatory and legislative changes. Evaluations are made of market dominance; of distinct services; of seasonal, peak and regional rates; of the Seven Percentum provision; and of carrier and shipper responses. It is concluded that different portions of Section 202 vary in their potential effect and are unlikely to cause fundamental ratemaking changes until carriers have time to adopt innovative pricing policies; that general rate increases discourage experimental ratemaking; that information Requirements may delay use of 202 provisions; and that so far railroads have taken few actions under the experimental rate provisions.

A Report to Congress as Directed by Section 202 of the Railroad Revitalization and Regulatory Reform Act of 1976.

Interstate Commerce Commission Oct. 1977, 172 pp, Tabs.

ACKNOWLEDGMENT: Interstate Commerce Commission

ORDER FROM: Interstate Commerce Commission, 1112 ICC Building, Washington, D.C., 20423

DOTL RP

25 168107

**NORWEGIAN TRANSPORT PLAN, A MILESTONE IN THE TRANSPORT POLICY [Norsk samferdselsplan, en milepæl i samferdselspolitikken]**

No Abstract [Norwegian]

Hiorth, O *Samferdsel-Transport* Vol. 16 No. 5, 1977, pp 6-10

ACKNOWLEDGMENT: International Union of Railways, BD

ORDER FROM: Ingenioerforlaget A-S, Ingenioerenes Hus, Kronprinsensgt 17, Oslo 1, Norway

25 170282

**RHODE ISLAND STATE RAIL PLAN**

This is the second annual update of the State Rail Plan filed as a requirement of the Regional Rail Reorganization Act of 1973. The 1977 status of the

eight agencies providing rail service in the state and of the various line segments is detailed.

Rhode Island Statewide Planning Program Project No. FRC-IGA-01-07, Task 04027.

Rhode Island Statewide Planning Program Rpt No. 31, Aug. 1977, 202 pp, Figs., Tabs., 4 App.

ORDER FROM: Rhode Island Statewide Planning Program, 265 Melrose Street, Providence, Rhode Island, 02907

DOTL RP

**25 170450**

**RAIL SERVICE CONTINUATION ASSISTANCE**

No Abstract.

Federal Railroad Administration Prog Rpt. 1976, 137 pp

ACKNOWLEDGMENT: Monthly Catalog of US Government Publications, GPO

ORDER FROM: FRA

26 158597

**FINANCING URBAN TRANSPORTATION. PART 1. GENERAL STUDIES (A BIBLIOGRAPHY WITH ABSTRACTS)**

Financing methods are presented to show the various ways in which urban transportation systems can be supported by communities, metropolitan areas, and regions. Systems such as bus lines, subways, rapid rail, and taxis are discussed, as well as dial-a-ride operations and transit for the elderly. Some attention is given to urban airports, fare structures, and ridership. A few case studies are reported for specific cities if they would be of general interest to other areas.

Supersedes NTIS/PS-76/0231 and NTIS/PS-75/200.

Lehmann, EJ Adams, GH

National Technical Information Service Bibliog. May 1977, 121 pp, 116 Ref.

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

NTIS/PS-77/0379/6ST, DOTL NITS

26 158598

**FINANCING URBAN TRANSPORTATION. PART 2. LOCAL STUDIES (A BIBLIOGRAPHY WITH ABSTRACTS)**

The financing of urban transportation in local areas is documented. Although these studies may be of interest to a number of metropolitan localities, they were originally prepared to study the fiscal planning of transit and travel systems for specific areas. Cities covered include Atlanta, New York City, Washington, D.C., Philadelphia, Houston, Baltimore, San Francisco, Minneapolis, Milwaukee, and many smaller localities. Among the systems involved are rapid transit rail, bus, shared taxicab, dial-a-bus, dial-a-ride, and subway. Some attention is given to metropolitan airports.

Supersedes NTIS/PS-76/0232 and NTIS/PS-75/201.

Lehmann, EJ Adams, GH

National Technical Information Service Bibliog. May 1977, 164 pp, 159 Ref.

ACKNOWLEDGMENT: NTIS

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NTIS/PS-77/0380/4ST, DOTL NITS

26 158736

**SURVEY OF DATA BASES AT THE TRANSPORTATION SYSTEMS CENTER, U.S. DEPARTMENT OF TRANSPORTATION. PART 2. DETAILED DATA BASE DESCRIPTIONS**

Lawrence Livermore Laboratory (LLL) surveyed transportation-related data bases in conjunction with the Transportation Systems Center of the U.S. Department of Transportation (DOT/TSC). This survey contributes to a nationwide data base directory that will help DOT/TSC users identify data resources. The data bases are described in a detailed form suitable for the

DOT/TSC programmer. Data base formats plus record and field descriptions are provided to permit DOT/TSC analysts to access these data bases. (ERA citation 02:020401)

Birss, EW Yeh, JW

California University, Livermore, Energy Research and Development Administration Nov. 1976, 141 pp

Contract W-7405-ENG-48

ACKNOWLEDGMENT: NTIS

ORDER FROM: NTIS

UCID-17315(PT.2), DOTL NTIS

26 163258

**BIBLIOGRAPHY AND INDEX OF U.S. GEOLOGICAL SURVEY PUBLICATIONS RELATING TO COAL, JANUARY 1971-JUNE 1974**

This bibliography and index contains about 200 reports and maps relating to coal published by the U.S. Geological Survey in the 3-1/2-year period, January 1971 through June 1974. It is supplementary to Geological Survey Publications Relating to Coal. 1882-1970.

Walker, FK

Geological Survey Circular 709, 1975, 18 pp

ACKNOWLEDGMENT: EI

ORDER FROM: ESL

26 164457

**INTERNATIONAL RAILWAY STATISTICS--STATISTICS OF INDIVIDUAL RAILWAYS--YEAR 1975**

No Abstract.

Raczkiewicz, M

International Union of Railways Jan. 1977, 225 pp, Tabs.

ACKNOWLEDGMENT: UIC

ORDER FROM: International Union of Railways, BD, 14 rue Jean Rey, 75015 Paris, France

DOTL RP

26 167500

**BIBLIOGRAPHY AND INDEX OF UNITED STATES GEOLOGICAL SURVEY PUBLICATIONS RELATING TO COAL, JANUARY 1971-JUNE 1974**

This bibliography and index contains about 200 reports and maps relating to coal published by the U.S. Geological Survey in the 3-1/2-year period, January 1971 through June 1974.

This article is supplementary to Geological Survey Publications Relating to Coal, 1882-1970.

Walker, FK *Geological Survey Circular* Bibliog. No. 709, 1975, 18 pp

ACKNOWLEDGMENT: EI

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# Ongoing Research Summaries

## 00 Right-of-Way

00 048898

### MUCK UTILIZATION IN THE URBAN TRANSPORTATION TUNNELING PROCESS

The objective of this contract is to assess the problem of muck disposal as it emanates from the urban transportation tunneling process. An assessment was completed based on case histories of materials handling and muck utilization, possible uses of muck, interactions with subsurface investigations and muck properties. A draft handbook of guidelines was prepared and implemented in order to develop a muck utilization plan for the Mass Transit Administration (MTA) of Baltimore, Md. A final technical report and guidelines will be printed at the end of the contract. A Handbook has been printed, Number UMTA-MA-06-0025-77-11, May 1977.

PERFORMING AGENCY: Haley & Aldrich, Incorporated

INVESTIGATOR: Liu, TK Tel (617) 492-6460

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Saulnier, G Tel (617) 494-2006

Contract DOT-TSC-836 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1974 COMPLETION DATE: July 1977 TOTAL FUNDS: \$191,728

ACKNOWLEDGMENT: TRAIS (PR# TM-0013), TSC

00 058470

### ASSESSMENT OF DISRUPTIVE EFFECTS ASSOCIATED WITH URBAN TRANSPORTATION TUNNEL CONSTRUCTION

Effects of constructing both bored and cut and cover tunnels was considered. Effects from bored tunnels center on the impact of the construction of access shafts and cut and cover stations. The extent of the impact will depend on the spacing and the location of these relative to community services. Effects from cut and cover stations tend to follow a surface route within the urban area. Disruptive effects, therefore, may tend to be more concentrated in the former, but distributed in the latter. For each disruptive effect identified the currently used method(s) of measurement for determining that impact was identified. A preliminary approach to predicting and assessing the degree of each disruptive impact was developed. The study was expanded to collect real data and assess the completeness and validity of the approach developed by conducting a case study of tunnel construction on the MARTA system in Atlanta, Georgia.

Final Report: Phase A-No. UMTA-MA-06-0025-76-5, June 1976 is available from NTIS PB-256858 and Phase B-No. UMTA-MA-06-0025-77-14, July 1977.

PERFORMING AGENCY: ABT Associates, Incorporated

INVESTIGATOR: Wolff, PC Tel (617) 492-7100

SPONSORING AGENCY: Transportation Systems Center, UM-704

RESPONSIBLE INDIVIDUAL: Saulnier, G Tel (617) 494-2006

Contract DOT-TSC-1018

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1975 TOTAL FUNDS: \$110,320

ACKNOWLEDGMENT: TRAIS

00 058758

### DESIGN METHODOLOGY FOR SOFT GROUND GROUTED TUNNELS

This research is for development and experiments to determine a rational basis for the design of grouted tunnels. Objectives are: 1. Perform field grouting trials using several different grouts, in varying soil conditions, to determine the degree to which the grout spreads, field strengths of the grouted soil, and aging effects of grouted soils. 2. Perform laboratory tests

of soils grouted in the field trials to identify the soils, establish stress strain properties and strength, and determine permeabilities. 3. Develop a finite element program to analyze movements and stresses around grouted tunnels. 4. Apply the finite element analysis to a field case history. STATUS: Laboratory testing, field testing, and analytical studies are involved in the work, and all of these phases are currently under way. Specific results to date include: 1) A fully developed finite element program capable of realistically modelling the problems of tunneling and excavation through or adjacement to chemically stabilized zones of soil. 2) Parametric studies using the finite element program showing the effects of growth zone size, and strength of surface subsidence above tunneling operations. 3) Development of a laboratory procedure for creating consistent samples of chemically stabilized soils. 4) 80 laboratory load tests on chemically stabilized soil samples illustrating the effects of confining pressure, soil water content, and rate of loading. 5) Publication of a report describing European and English stabilization techniques, costs and quality control procedures. 6) Field grouting trials involving injection of different types of grouts. Sampling and testint of grouted zones is underway. 7) Development of on-site testing equipment, and the use of this equipment in monitoring grouting work for Washington, D.C.'s Metro System and Baltimore Metro System.

Update information not available as of August 1977.

#### REFERENCES:

Observations of Chemical Stabilization Practice in England and Europe, Clough, GW, Report to DOT, July 1976

European Practice in the Use of Chemical Stabilization Systems for Soft Grout Tunneling, Clough, GW, Rapid Excavation & Tunneling Conf, Proc, Las Vegas, Nev., July 1976

PERFORMING AGENCY: Stanford University, Department of Civil Engineering

INVESTIGATOR: Clough, GW

SPONSORING AGENCY: Department of Transportation, Office of University Research

RESPONSIBLE INDIVIDUAL: Butler, GL Tel (202) 426-0090

Contract DOT-OS-50123

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1975 COMPLETION DATE: June 1978 TOTAL FUNDS: \$117,119

ACKNOWLEDGMENT: TRAIS, OST

00 059406

### TRANSIT INDUSTRY INPUT ON THE TUNNELING TECHNOLOGY PROGRAM

The American Public Transit Association will provide transit industry input, advice, and consensus on the Tunneling Technology Program. A review program will be established to review each of the UMTA/TSC R&D Contracts. Each panel will be comprised of experienced technical representatives of the transit industry. The areas include subway system maintenance, subway station design and construction, and tunnel standardization.

Although under separate contract to UMTA, U.S. DOT, this project relates to ongoing research performed by the National Academy of Sciences' U.S. National Committee on Tunneling Technology.

PERFORMING AGENCY: American Public Transit Association

SPONSORING AGENCY: Urban Mass Transportation Administration, DC-06-0129

RESPONSIBLE INDIVIDUAL: Butler, GL Tel (202) 426-0090

Contract DOT-UT-60016T (CR)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1976 COMPLETION DATE: July 1978 TOTAL FUNDS: \$49,054

ACKNOWLEDGMENT: TRAIS (DC-06-0129)

00 082313

**PRETHAWING PERMAFROST AND CONSOLIDATION IN PREPARATION FOR CONSTRUCTION**

The aim of this study is to develop efficient and economical methods of prethawing permafrost, and establish criteria for preconsolidation and stabilization of such soils to achieve range of bearing capacities applicable to roads, airfields, pipelines and foundations, including dams and bridges. Literature and data from related research will be reviewed and analyzed. Theoretical and laboratory studies will be conducted to optimize methods of pre-thawing, facilitate heat transfer, remove excess pore pressure and consolidate the soils. Field and laboratory studies will be conducted on stabilization, shear strength and bearing capacity of thawed soils, with and without surcharge loadings, and treatment with chemical and cement grouts.

PERFORMING AGENCY: Cold Regions Research and Engineering Laboratory, AT06-04-002

INVESTIGATOR: Crory, FE

SPONSORING AGENCY: Army Corps of Engineers, Department of the Army, DAOJ8151

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 COMPLETION DATE: June 1978 TOTAL FUNDS: \$195,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA108151)

00 109558

**ACCELERATED CURING TEST FOR LIME AND LIME-FLYASH STABILIZED SOILS**

The purpose of this project is to develop an accelerated curing test procedure to determine the most advantageous lime and lime-flyash percentages and the stabilization susceptibility of troublesome soils. Guidelines concerning performance and durability aspects of these stabilized materials will be evaluated. Existing published information concerning methods for rapidly determining optimum lime and lime-flyash stabilization percentages of soils will be collected, reviewed, and analyzed. A laboratory testing program will be conducted to evaluate the effects of time, temperature, and PH on the developed strengths of various soil-lime mixtures. /SIE/

PERFORMING AGENCY: Waterways Experiment Station

INVESTIGATOR: Townsend, FC Gilbert, PA

SPONSORING AGENCY: Waterways Experiment Station, DA05F8182

STATUS: Active NOTICE DATE: Feb. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA 681821)

00 110156

**ADHESION IN ROCKS**

An attempt is made to study and explain the mechanism of adhesion or cohesion at zones of weakness inside rocks. These forces operate at interfaces and indicate a relationship between fracture and the physical chemistry of surfaces. Initial efforts include an intensive review of pertinent literature including that relating to binding concrete and commercial adhesives and the study of grain boundaries in ceramics and metals which may also apply to rocks. The strength of adhesion at grain boundaries will be studied to determine if mechanical interlocking is the predominant mode of intragranular binding in igneous rocks. Variations in hardness at grain boundaries and cleavage planes will be determined and compared with similar measurements away from these areas. The relationship of grain size to the mechanical strength of a rock will be investigated by use of compression and tensile strength tests.

PERFORMING AGENCY: Bureau of Mines, Department of the Interior

INVESTIGATOR: Savanick, GA

SPONSORING AGENCY: Department of Defense, Advanced Research Projects Agency, DD220089

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1972

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GTP 31 1)

00 111514

**STRENGTH OF REPAIRED REINFORCED CONCRETE STRUCTURAL MEMBERS**

This research project will investigate the properties of repaired reinforced concrete structural members. A series of structural members that have been severely damaged in earlier experimental investigations will be repaired using

methods and materials considered to be the best available in the current state of the art. These members will then be retested to ascertain the effectiveness of the repair in restoring the original properties. The project will be accomplished in four steps: A study of information about available materials and techniques for repair; retesting of present specimens to obtain a comparison of load-displacement properties and degradation properties with those of the virgin specimens; testing of a new series of original, repaired and retested similar members; testing of a new column series. /SIE/

PERFORMING AGENCY: Michigan University, Ann Arbor, Department of Civil Engineering

INVESTIGATOR: Hanson, RD

SPONSORING AGENCY: National Science Foundation, Division of Engineering

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1976 TOTAL FUNDS: \$43,700

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 6251)

00 115950

**A COMPREHENSIVE PROGRAM ON ROCK PROPERTIES, TUNNELING AND EXCAVATION TECHNOLOGY AND NUCLEAR BLAST EFFECTS ON EARTH MEDIA**

Fifth-year funding of continuation grant GI-34608x1 The goal is to establish a data center on properties of geological substances of interest to the geosciences in a manner useful for applications and research concerned with the use of underground space. The data center will be within the Thermophysical Properties Research Center. Data tables will be compiled, using published literature and reports, on thermal, mechanical, magnetic and electrical properties of geologic materials. Periodic data tables will also be produced on unconventional methods of tunneling and underground excavation technology as well as complete information on the methods, equipment, rates and costs for excavation of tunnels and underground openings. A minimal effort will be maintained in collecting data on blast effects on soils and rocks. One product will be an annotated bibliography of publications related directly to underground excavations in soil and rock.

PERFORMING AGENCY: Purdue University, School of Civil Engineering

INVESTIGATOR: Touloukian, YS

SPONSORING AGENCY: National Science Foundation, Division of Advanced Technology Applications, GI-34608X2; Department of Transportation

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STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1976 COMPLETION DATE: 1978 TOTAL FUNDS: \$62,800

ACKNOWLEDGMENT: National Science Foundation

00 129709

**GUIDELINES FOR EXISTING SUBWAY MAINTENANCE**

The objective of this contract is to assess current subway system tunnel maintenance practices and problems and to perform an initial evaluation of new equipment, materials, and techniques that can be utilized on operational systems and to help eliminate, at the design state, those situations which have contributed to subway system deterioration and maintenance problems. Two sets of guidelines, one for subway system operators and one for designers, will result from the contract.

PERFORMING AGENCY: Bechtel Corporation

INVESTIGATOR: Birkmyer, J Tel 415-768-1009

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Saulnier, G Tel (617)494-2006

Contract DOT-TSC-1078

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1975 TOTAL FUNDS: \$198,248

ACKNOWLEDGMENT: TSC

00 129710

**ECONOMIC FACTORS IN TUNNEL CONSTRUCTION**

Develop a tunnel construction cost data base and cost estimating and systems analysis methodologies founded on this base.

PERFORMING AGENCY: Underground Technology Development Corporation

INVESTIGATOR: Foster, E Toporoff, I

SPONSORING AGENCY: Urban Mass Transportation Administration  
RESPONSIBLE INDIVIDUAL: Sluz, A Tel (617)494-2431

Contract DOT-TSC-1106

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Dec. 1975 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$130,000

ACKNOWLEDGMENT: TSC

00 130495

#### **BALLAST AND FOUNDATION MATERIALS RESEARCH PROGRAM**

This research study is concerned with development of a better methodology for considering ballast and foundation soils in the overall analysis and design of a railway support structure. A theoretical analysis model is being developed which is based on finite element theory and which will be able to more realistically consider the "stress-dependent" behavior of ballast and foundation materials. A number of different types of ballast and foundation materials will be subjected to various types of laboratory testing including repeated load triaxial testing. Laboratory test results and the theoretical analysis model will be used to identify material properties that are meaningful for evaluating potential material performance and to identify appropriate testing procedures for determining these properties. Ultimately, the research program will lead to development of rank ordering of ballast, subballast and foundation materials according to their potential in-service performance.

#### **REFERENCES:**

Material Evaluation Study FRA-ORD-77-02, Jan. 1977

PERFORMING AGENCY: Illinois University, Urbana, Department of Civil Engineering

INVESTIGATOR: Thompson, MR Tel (217)333-3930 Ireland, HO Hay, WW

SPONSORING AGENCY: Association of American Railroads Technical Center

RESPONSIBLE INDIVIDUAL: Garg, VK Tel (312)567-3596

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1974 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (BG 885)

00 130952

#### **UNDERGROUND EXCAVATION AND ROCK PROPERTIES INFORMATION**

The goal is to establish a data center on properties of geological substances of interest to the geosciences in a manner useful for applications and research concerned with the use of underground space. The data center will be within the Thermophysical Properties Research Center. Data tables will be compiled, using published literature and reports, on thermal, mechanical, magnetic and electrical properties of geologic materials. Periodic data tables will also be produced on unconventional methods of tunneling and underground excavation technology as well as complete information on the methods, equipment, rates and costs for excavation of tunnels and underground openings. A minimal effort will be maintained in collecting data on blast effects on soils and rocks.

This is a continuation of Grant No. GI-34608X2.

PERFORMING AGENCY: Purdue University, School of Engineering, Department of Mechanical Engineering

INVESTIGATOR: Touloukian, YS

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR75-15710

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 TOTAL FUNDS: \$31,400

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 213 3)

00 130960

#### **EFFECTS OF TIME, TEMPERATURE, AND CONCENTRATION ON THE ENGINEERING PROPERTIES OF POZZOLANIC STABILIZED SOILS**

Time, temperature, and percentage of pozzolanic stabilizer, i.e., lime and/or lime-flyash, greatly affect the stabilization response of troublesome soils. The objective of this investigation is to evaluate the effects of these variables on the stabilization response of various soils. It is anticipated that this research will permit rapid strength estimates of pozzolanic stabilized soils for mix

designs and construction times. Existing published information concerning the effects of time, temperature, and percent additive on the strength of soils and current mix design procedures will be collected, reviewed, and analyzed. A laboratory program will be conducted to evaluate the effects of these variables and ph on the developed strengths of various soil-lime and soil-lime-flyash mixtures.

PERFORMING AGENCY: Waterways Experiment Station

INVESTIGATOR: Townsend, FC Gilbert, PA

SPONSORING AGENCY: Waterways Experiment Station, DAOF8182

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA 68182 2)

00 130961

#### **ENGINEERING CLASSIFICATION OF COHESIONLESS SOILS**

To develop correlations between engineering properties and quantitative descriptions to provide meaningful classifications of cohesionless soils. The indexes and correlations would be relatable to shear strength, compressibility, and other engineering properties. The development of the system should permit a more rapid and valid evaluation of the on-site selection and the utilization of these materials. A literature review of previous work will be conducted to select variables thought to exert the greatest influence on the engineering properties of cohesionless soils. A laboratory testing program would be initiated to evaluate the significance of these variables on various engineering properties-i.e., shear strength, compressibility, and copaction. Subsequently, the data would be analyzed to provide correlations which would form the nucleus of a classification system and permit rapid estimations of the anticipated engineering properties.

PERFORMING AGENCY: Waterways Experiment Station

INVESTIGATOR: Townsend, FC

SPONSORING AGENCY: Waterways Experiment Station, DAOG8186

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA 78186 1)

00 130962

#### **THEORY AND PRINCIPLES OF REINFORCED EARTH**

Study the theory and principles of reinforced earth relevant to military construction and develop guidelines for the construction of reinforced earth structures. Materials such as metal reinforcement and dry granular soil have been used to form reinforced earth. Previous investigations will be extended to include materials such as membrane reinforcement and cohesive soil backfill. The phenomena associated with soil reinforcement will be studied experimentally, both in the laboratory and in the field, and analytically.

PERFORMING AGENCY: Waterways Experiment Station

INVESTIGATOR: Alhussanini, MM Perry, EB

SPONSORING AGENCY: Waterways Experiment Station, DAOG8187

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA 78187 1)

00 133589

#### **SCOUR RESEARCH**

There is lack of any accepted method of predicting the depth of scour around bridge piers and abutments. The amount of scour to be expected may critically affect the design of bridge structures. The aim of this project is to observe and record magnitude of those most significant factors believed to be related to scours, such as: (A) contraction in the case of general scour or abutment scour; (B) depth of flow and mean velocity of flow that characterize the flow approaching the scour location; and (C) characteristics (mean diameter) of bed material particle size in the approach; observe and record the magnitude of scour, both general and local, during significant floods at selected bridges; analyze recorded scour and scour related data. Analysis would hopefully verify or help to modify presently available analytic techniques for evaluating probable scour at bridge crossings. Most of the effort during the fiscal year was directed toward completing analytical work on past data, reviewing recent works of other researchers, and in writing the final project report. Significant conclusions from the study are: (1) general scour formulas for long contractions proposed by Griffith (1939), Straub (1940), and Laursen (1958) compare favorably with measured values on gravel and cobble bed streams; (2) bed material size and pier width appear



to be the dominant parameters in describing maximum equilibrium scour depth for piers with round or pointed noses.

PERFORMING AGENCY: Geological Survey, Water Resources Division  
 INVESTIGATOR: Norman, VW  
 SPONSORING AGENCY: Geological Survey, Water Resources Division, AK 64-036

In-House

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZUA 2849 1)

00 134775

#### MECHANICAL TUNNEL BORING PREDICTION AND MACHINE DESIGN

Research during the first two years has shown small-scale testing of small samples to be a valid representation of full-scale rock cutting. Thus samples from along a proposed tunnel alignment can be tested at a reduced scale and the results used to predict machine boring performance and to specify machine design parameters. These studies show that cutting performance is affected by factors such as cutter edge angle, wear and cutter size. Further testing is necessary to formulate the relationships between the factors affecting cutting performance, and to correlate laboratory and field data. Extensive laboratory tests will be conducted on factors affecting cutting performance, including cutter edge angle, cutter size, depth of cut, cutter wear, and multi-kerf cutters. Also tested will be cutter pattern, spacing, thrust, torque and speed of cutting. The results of these tests will be combined with field boring data to develop the scaling relationships. In addition, a theory will be developed with the verification from experimental data to describe the effect and interrelationship of factors which affect cutting performance. This research will result in a practical means of predicting tunnel boring performance and will provide characteristic performance relationships valuable for machine design and field tunneling operations.

PERFORMING AGENCY: Colorado School of Mines, Department of Mining Engineering

INVESTIGATOR: Wang, FD

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR73-07776 A03

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Feb. 1976 TOTAL FUNDS: \$73,300

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1467)

00 134940

#### SUBGRADE STABILITY

The general objectives of the study are to: 1) determine required levels of subgrade stability; and 2) to develop recommendations and procedures for more adequately considering subgrade stability during the project design state, establishing improved quality control and specifications for subgrade and embankment construction, and correcting subgrade stability problems. Current activity is directed toward identifying the major factors that influence subgrade stability.

PERFORMING AGENCY: Illinois University, Urbana, Department of Civil Engineering

INVESTIGATOR: Thompson, MR Tel (217)333-3930 Figueroa, JL Kinney, TC Traylor, ML

SPONSORING AGENCY: Illinois Department of Transportation, IHR-605

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$85,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (YIL 676), Illinois University, Urbana

00 135095

#### PHOTOELASTIC STUDY OF BLASTING PROCEDURES IN URBAN AREAS

The objective of the program is to improve hard rock blasting procedures to effect cost reductions in urban projects and to improve the safety of the blasting process. The general research approach involves the use of scale models to examine the phenomena of stress wave propagation, crack initiation, crack propagation and the fragmentation process. Scale models of full-planes, half-planes, half-spaces and bench faces will be examined in the

laboratory where advanced optical methods are employed to make the various dynamical processes visible over the entire field of the model. Excellent progress during the first year was made in the application of dynamic photoelasticity and holographic interferometry to problems related to surface excavation and tunneling. Dynamic surface motion in rock models caused by explosives will continue to be studied utilizing holography. A detailed design will be made of three charge holders which were demonstrated to be advantageous (during the first year of study) for presplitting and smooth blasting. Dynamic photoelasticity will be employed to examine stress wave propagation and fracture extension and fragmentation in producing tunnel sections.

PERFORMING AGENCY: Maryland University, College Park, Department of Mechanical Engineering

INVESTIGATOR: Dally, JW

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR73-07908 A01

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1974 TOTAL FUNDS: \$79,950

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 639 1)

00 135249

#### EVALUATION OF REMOTE SENSING APPLIED TO CIVIL WORKS PROJECTS

The objective is to determine the feasibility of assessing civil works sites by measuring soil moisture using remote sensing in the 0.4 to 14 microns wavelength region. The approach was to perform investigations to determine the conditions under which soil moisture can be correlated with remotely sensed reflected energy (0.4 to 2.5 microns) and emitted energy (8 to 14 microns). Apply these results to civil works sites to evaluate their usefulness to field conditions. Applications to be studied include: landslides, levees, highways, ground water localities and dams. Application studies will be cooperative efforts with USACE and California State agencies.

PERFORMING AGENCY: Ames Research Center, Aeronautics and Space Technology Office, NASA

INVESTIGATOR: Chapman, DR

SPONSORING AGENCY: Ames Research Center, Aeronautics and Space Technology Office, NASA, 177-53-13 7570511

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZH 41637)

00 135290

#### STRESS-STRAIN BEHAVIOR OF COHESIONLESS SOIL DURING UNLOADING AND RELOADING

The objectives of this research are: (1) To study the stress-strain characteristics of cohesionless soil during unloading and reloading using conventional triaxial tests, plane strain tests, triaxial tests with independent control of all three principal stresses on cubical specimens, and simple shear tests in which the principal axes of stress can be rotated. (2) To evaluate the procedures used for characterization of soil stress-strain behavior during unloading and reloading, and alternatively to develop improved procedures for this characterization.

PERFORMING AGENCY: California University, Los Angeles, Department of Mechanics and Structures

INVESTIGATOR: Lade, PV

SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG75-05325

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1975 TOTAL FUNDS: \$27,600

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5511)

00 135296

#### THERMOCORER FOR RAPID TUNNELING AND EXCAVATION

The feasibility of using a dynamic rock melting method to increase advance rates will be determined. Static melting rates are limited by the relatively thick layer of molten material between the penetrator and the rock. Theoretical calculations show that circulating the molten material has the potential of reducing the thickness of the lava layer, thus permitting much greater advance rates. The fluid dynamic performance of a dynamic melter

(Thermocorer) will first be optimized by analysis and experiment. To avoid the use of refractory metals in the penetrator, the feasibility will be found by melting glass (which has a lower melting temperature than rocks) dynamically and comparing the advance rates to that using static melting procedures. A preliminary cost/benefit study will be made for the Thermocorer.

PERFORMING AGENCY: Energy Research and Generation, Incorporated  
INVESTIGATOR: Benson, GM

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR73-03322 A02

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1975 TOTAL FUNDS: \$40,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1022 2)

#### 00 135514

##### RAPID ASSESSMENT OF ROCK MASS CONDITIONS

To develop a technique for the rapid assessment of the integrity of rock slopes, tunnel rock, dam abutments, and embankments. Thermal anomalies associated with known structural defects will be studied and their significance with respect to the behavior of the structure determined. Anomalies investigated will include loose tunnel rock, voids behind shotcrete and/or concrete structures, and leakage through dam abutments or embankments.

PERFORMING AGENCY: Waterways Experiment Station

INVESTIGATOR: Huie, JS

SPONSORING AGENCY: Waterways Experiment Station, DA0M8183

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA138183)

#### 00 135516

##### RAPID EXCAVATION WITH EXPLOSIVES-EXPLOSIVE EXCAVATION IN DIFFERING GEOLOGIC MEDIA AND TOPOGRAPHY

Purpose of study/investigation: To develop improved techniques of excavation with explosives for civil engineering projects that lead to cost stabilization or reduction. This program provides salary and travel funds for planning, executing and reporting field experiments at Corps project sites.

PERFORMING AGENCY: Waterways Experiment Station, Explosive Excavation Research Laboratory

INVESTIGATOR: Mills, RR

SPONSORING AGENCY: Army Corps of Engineers, Department of the Army

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZTK 356)

#### 00 135518

##### RAPID EXCAVATION WITH EXPLOSIVES; CHARGE SHAPE, EMPLACEMENT PATTERNS AND FIRING TECHNIQUES

Purpose of study/investigation: To develop controlled Project Lost Creek and the measurements made to get a large structural excavations where some cost advantage would result from the use of larger charges.

PERFORMING AGENCY: Waterways Experiment Station, Explosive Excavation Research Laboratory

INVESTIGATOR: Mills, RR

SPONSORING AGENCY: Army Corps of Engineers, Department of the Army

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZTK 358)

#### 00 135550

##### RATIONAL DESIGN OF TUNNEL SUPPORTS

The objective is to develop reliable design procedures & to encourage the adoption of improved construction techniques for tunnel support systems that satisfy structural and economic requirements. Various analytical solutions applicable to tunnels constructed by the Corps and other agencies will be documented and/or developed and checked for performance adequacy. The check will be accomplished by the review of instrumentation data from selected projects and follow-through construction and performance appraisal. Corrections will be made to the theoretical analysis for the

purpose of arriving at reliable design approaches and construction procedures for tunnel support systems.

PERFORMING AGENCY: Department of the Army, Missouri River Engineering Division

INVESTIGATOR: Redlinger, JF Underwood, LB

SPONSORING AGENCY: Army Corps of Engineers, Department of the Army, 31214

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZTK 529 2)

#### 00 136026

##### RUNOFF SIMULATION

Few long-term runoff records exist for small drainage basins. The need for long-term records for small basins is great. The records are used in the design of highway crossings, in urban planning, and in water-resource development. The development of computer simulation models, such as rainfall-runoff relations and multivariate generating processes, will provide means for synthesizing long-term runoff records. Some of these models will permit simulation of basin response to varying environmental conditions. The emphasis will be to study and develop, as feasibility and needs dictate, runoff simulation models to provide synthetic data for specific applications such as flood investigations, urban storm runoff, and mean monthly flows. The emphasis has been to synthesize flood peaks for rural drainage basins. Future work will encompass more complex models to synthesize urban storm runoff, daily discharge in rural basins, and combining subbasin runoff to estimate basin outflow. In areas where rainfall-runoff relations are impracticable, models such as multivariate generating processes will be developed. Operational versions of runoff simulation models will be programed for a variety of environmental conditions. Criteria for selection and delineation of input data for models will be developed. Methods of climate-record transposition will be investigated. Limitations in the application of each model will be explored. Approaches to the synthesis of large basin runoff through distributed routing of synthesized small basin records will be initiated. Multivariate generating processes will also be utilized to synthesize runoff. Synthetic flood frequency data derived by rainfall-runoff modeling and continued evaluation of information content of rainfall-runoff model output (long-term synthetic flood frequency statistics). Develop "optimum" model calibration procedures (computer programs) in relation to the worth of synthetic data.

PERFORMING AGENCY: Geological Survey, Water Resources Division

SPONSORING AGENCY: Geological Survey, Water Resources Division, NR 70-069

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973 TOTAL FUNDS: \$52,500

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZUA 2685 1)

#### 00 136152

##### THE U.S. NATIONAL COMMITTEE ON TUNNELING TECHNOLOGY

The U.S. National Committee on Tunneling Technology was established in 1972, at the request of the Chairman of the Federal Council for Science and Technology, to assess the broad range of activities and related technologies pertaining to the use of subsurface space and to stimulate improvements in underground construction technology. Improvements are needed to meet increasing national demands for providing life-support functions in urban areas and recovery of resources (mining and drilling) with minimum environmental impact. The committee's work for 1977 and 1978 is focused on subjects considered by the committee to be of highest priority with respect to improvement of the art of underground construction and tunneling, and improvement of conditions to accelerate the use of improved technology throughout the United States. These include both technical and nontechnical activities. The committee will continue its work in encouraging governmental agencies and industry to adopt practices in contracting for underground construction which are more appropriate for this type of work than those which have been traditionally used in this country and to improve the education of engineers, both in the university programs and in continuing education programs, with the long range goal being the general upgrading of planning, design, and construction of underground works. The committee will undertake tasks to review sectors of underground construction technology development and to recommend to government, to industry, and

to the universities, actions which should be taken to upgrade both the state of the art in that sector and the application of the most advanced and appropriate technologies in the national interest. Sectors to be reviewed in the 1977-78 period include site investigation capabilities and applications and deep cavity and tunnel support systems. The Committee also participates in the activities of the International Tunneling Association (ITA) on behalf of the scientists, engineers, and technologists of the United States. The ITA was formed in 1974, and five cooperative projects are underway on the subjects planning use of the subsurface, research needs, and standardization, safety and contractual sharing of risk.

PERFORMING AGENCY: National Academy of Sciences; National Academy of Engineering

INVESTIGATOR: Bangert, RL Tel (202) 389-6155

SPONSORING AGENCY: Bureau of Mines

RESPONSIBLE INDIVIDUAL: Schmidt, WB Tel (202) 634-1249

Contract JO 177032

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Mar. 1972 COMPLETION DATE: Dec. 1978

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 803 2)

00 136165

#### US COMMITTEE FOR ROCK MECHANICS

The aims of the project are to review new developments and trends in rock mechanics; research, implement and enhance exchange of technical information among scientists; identify and encourage research activities that will advance rock mechanics technology; and participate for the United States in the International Society for Rock Mechanics and assist with international efforts to coordinate rock mechanics research. The Committee's activities include identification of research needs, preparation of advisory reports, coordination and participation in domestic and international professional conferences and symposia, and periodic reviews and surveys of national research efforts in rock mechanics and related fields.

Also sponsored by 11 Federal agencies and 10 professional societies.

PERFORMING AGENCY: National Academy of Sciences; National Academy of Engineering

INVESTIGATOR: Bangert, RL Tel (202) 389-6155

SPONSORING AGENCY: Bureau of Mines

RESPONSIBLE INDIVIDUAL: Schmidt, WB Tel (202) 634-1249

Contract JO 177031

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Dec. 1967 COMPLETION DATE: Dec. 1978

00 138468

#### ECONOMIC FACTORS IN TUNNEL CONSTRUCTION

Analysis of tunnel case histories as an aid in formulation of a tunnel cost data base, and development of systems analysis methodologies related to tunnel cost estimations.

PERFORMING AGENCY: Bechtel Corporation

INVESTIGATOR: Gin, E

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Sluz, A Tel (617) 494-2432

Contract DOT-TSC-1104

STATUS: Active NOTICE DATE: July 1977 START DATE: Jan. 1976 COMPLETION DATE: Aug. 1977

ACKNOWLEDGMENT: TSC

00 138477

#### EVALUATION OF REPAIR TECHNIQUES FOR DAMAGED STEEL BRIDGE MEMBERS

The first phase of this project will identify and categorize common types of accidental damage to steel bridges and the frequencies of their occurrence; analyze the state of the art of present practice and equipment used for assessing damage and repairing highway and railroad bridges and other steel structures (including heating temperatures, jacking methods, straightening tolerance and degradation of steel's mechanical properties and service life); evaluate techniques that have been applied or may be applied for correcting structural damage; preparation of report of Phase I and outline Phase II research.

PERFORMING AGENCY: Battelle Columbus Laboratories, NCHRP 12-17

INVESTIGATOR: Mishler, HW Tel (614) 424-7378

SPONSORING AGENCY: American Assn of State Hwy and Transp Officials; Federal Highway Administration

RESPONSIBLE INDIVIDUAL: Reilly, RJ Tel (202) 389-6741

Contract HR-12-17

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Nov. 1976 COMPLETION DATE: May 1978 TOTAL FUNDS: \$50,000

ACKNOWLEDGMENT: National Cooperative Highway Research Program

00 138478

#### SCANNED ACOUSTICAL HOLOGRAPHY FOR GEOLOGIC PREDICTION

One of the costly aspects of underground excavation is the uncertainty of the ground conditions ahead of the tunnel face and how it will react when "opened". Prediction of poor rock, water, faulting, etc., is needed to prevent costly delays. Rapid tunneling techniques increase the need for accurate prediction. A multi-phased project for producing a means of "seeing" into the rock using Scanned Acoustical Holography has been initiated. The final objective of the project is to install an Acoustical Holography inspection system on a rapid tunneling machine in such a manner that "real-time" presentation of the observed geologic and rock conditions 30 to 100 feet ahead of the machine is made available to the machine operator in a simple, usable format, without delaying the tunneling operation. Phase I, the preliminary demonstration of the feasibility of using scanned acoustical holography on a rock model has produced successful results. In Phase II the project moves from a small-scale laboratory model through intermediate steps to a full-scale system and finally the use of Acoustical Holography will be demonstrated on an actual tunnel heading.

#### REFERENCES:

Scanned Acoustical Holography for Geological Prediction in Advance of Rapid Underground Excavation. Phase 2 Intrm Rpt., Price, TO; Fitzpatrick, GL; Brennan, JM, NTIS, PB-260768/7ST, May 1976, RRIS 00 150947 7801

PERFORMING AGENCY: Holosonics, Incorporated

INVESTIGATOR: Price, TO

SPONSORING AGENCY: National Science Foundation, APR 73-03200 A01

Contract NSF-APR75-16376

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 TOTAL FUNDS: \$423,500

ACKNOWLEDGMENT: National Science Foundation (GSQ 1279)

00 138502

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

A full scale hydraulic water jet assisted tunnel boring machine will be designed and field tested with the support of laboratory experiment and testing. The objective of this investigation is to verify the concept and laboratory projection of increasing the rate of underground excavation several fold through the application of high pressure hydraulic water jets to assist the conventional mechanical method of tunneling. The project consists of (1) the design and fabrication of the full scale equipment, and, the complete prototype water jet assisted tunnel boring machine, (2) field testing of the prototype system, (3) laboratory equipment and testing to guide and assist the full scale design and field test, and (4) engineering analysis and economic evaluation of the hydraulic mechanical method of excavation. This research will further tunneling technology through the design and testing of a full scale machine to provide engineering and cost-performance data for improving rate of excavation, the reduction of cutter and labor costs and thus, the overall tunneling cost.

PERFORMING AGENCY: Colorado School of Mines

INVESTIGATOR: Wang, FD

SPONSORING AGENCY: National Science Foundation

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1975 TOTAL FUNDS: \$257,200

ACKNOWLEDGMENT: National Science Foundation

00 138532

#### TUNNELING

To use underground space as an effective means of meeting the increasing needs of urban transportation systems, this program seeks to improve the social, economic and environmental impacts of tunneling processes, reduce costs of construction, improve tunnel design and maintenance procedures,

and alter materials handling and utilization procedures. In the DOT Transportation Tunneling Program, UMTA is the lead administration in the following categories: Interactions with society, maintenance modal problems and materials handling.

PERFORMING AGENCY: Transportation Systems Center; Transit Development Corporation, Incorporated

SPONSORING AGENCY: Urban Mass Transportation Administration  
RESPONSIBLE INDIVIDUAL: Butler, GL

Contract UM-604

STATUS: Active NOTICE DATE: July 1976 START DATE: 1970 COMPLETION DATE: 1981 TOTAL FUNDS: \$30,000,000

ACKNOWLEDGMENT: UMTA

#### 00 139169

#### ENGINEERING AND GEOPHYSICAL STUDIES OF KANSAS TEST TRACK

During the design, construction and operation of the Kansas Test Track, vibroseismic tests were performed to determine elastic properties of the subgrade. After the premature failure of KTT, an additional objective was to determine the failure mechanisms, appraise validity of built-in instrumentation's data and perform static and dynamic response investigations of unconventional track structures for validating analytical models of such construction. This includes nondestructive testing, other field testing and laboratory testing.

##### REFERENCES:

Vibroseismic Survey, Railway Test Embankment, Aikman, Kansas  
Curro, JR, Jr, WES Mis. Paper S-72-36

PERFORMING AGENCY: Waterways Experiment Station

INVESTIGATOR: Ballard, RF Tel (601) 636-3111

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Moody, HG Tel (202) 426-4377

Contract DOT-AR-30025

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Nov. 1972 COMPLETION DATE: Mar. 1978

ACKNOWLEDGMENT: FRA

#### 00 141172

#### COMPARATIVE COSTS OF TUNNELS WITH DEPTH OF CONSTRUCTION IN URBAN AREAS

This research will include a study of the relative costs of tunnels as a function of construction depth in a number of major U.S. urban areas. Such tunnels may be used for urban and intercity highways, railroads, urban mass transportation utilities (utiladors), sewage and storm water runoff, etc. Construction cost estimates that incorporate the effects of local conditions such as soil and rock characteristics, and of systematic factors such as inflation and construction technology will be prepared. The results will be useful to planners, engineers, and government officials who require meaningful construction cost estimates to properly evaluate alternative tunnel location strategies. The research team consists of an interdisciplinary team made up of engineers and geologists who will (1) evaluate local soil and rock conditions in key urban areas (2) use existing tunnel computer cost models to compare alternative underground placement strategies for tunnels and (3) generalize findings into key criteria to guide decisions for the best placement of underground systems.

PERFORMING AGENCY: Illinois University, Chicago, Department of Materials Engineering, P.O. Box 4348

INVESTIGATOR: Silver, ML

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR76-00315

STATUS: Active NOTICE DATE: June 1976 START DATE: May 1976 COMPLETION DATE: Oct. 1977 TOTAL FUNDS: \$135,200

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1558)

#### 00 148317

#### IMPROVED DESIGN PROCEDURE FOR TUNNEL SUPPORTS

The proposed research intends to improve the present design procedure for tunnel supports. Toward this end, the research will: 1) Introduce a support design which takes ground-structure interaction into account, and which is based on the concept of optimization. 2) Develop analytical design

techniques that simulate the ground-structure interaction in a rational manner and are flexible enough to permit the inclusion of improved knowledge as it becomes available. The New Austrian Tunneling Method (NATM) will be studied in detail, with particular emphasis on obstacles that were overcome with its implementation in Europe. NATM is an observational technique where detailed load deformations are constantly monitored and the appropriate design changes are made. The possibility of instituting observational techniques in the United States will be investigated in detail.

PERFORMING AGENCY: Massachusetts Institute of Technology, Department of Civil Engineering

INVESTIGATOR: Einstein, HH

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Chin, A Tel (617) 454-2006

Contract DOT-TSC-1489

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1976 TOTAL FUNDS: \$95,000

ACKNOWLEDGMENT: DOT

#### 00 148333

#### FIELD RESEARCH EXPERIMENT FOR EVALUATION OF GEOLOGIC STRUCTURE AND ENGINEERING PROPERTIES OF GROUND USING NEW SITE EXPLORATION TECHNIQUES

Boreholes available for new site exploration techniques such as: low-frequency Surface Profiling Radar; Borehole Radar; a Pulsed Acoustic System; and the use of advanced Data Processing Techniques.

PERFORMING AGENCY: Washington Metropolitan Area Transit Authority

INVESTIGATOR: Garrett, VK, Jr Tel (202) 637-1158

SPONSORING AGENCY: Federal Highway Administration

RESPONSIBLE INDIVIDUAL: Linger, D Tel (202) 557-5272

Contract DOT-FH-11-9248

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1977 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$46,900

ACKNOWLEDGMENT: Washington Metropolitan Area Transit Authority

#### 00 153558

#### DEVELOPMENT OF COLORADO LAND USE DATA SYSTEM

To develop technical criteria for identifying potential areas of natural hazard; e.g., floods, landslides, etc. Assess legal requirements of physical data for the designation of natural hazard areas. Develop the process of land use capability classification. Develop a technique for assessing the "environmental carrying capacity" as a land use planning tool. Assess the data system needs for a state land use data bank and develop appropriate software compatible with these needs.

##### REFERENCES:

The River Environment Simons, DB; Lagasse, PF; Chen, HH; Schumm, SA, Dept of Intl, Fish & Wildlife Serv, Twin Cities, Minn, Reference Document, Dec. 1975

Identification of Landslides and Mudflow Hazards Related to Land Utilization Development, Simons, DB, Reference Document, 1975

PERFORMING AGENCY: Colorado State University, Fort Collins, Department of Civil Engineering, CSRS COL

INVESTIGATOR: Simons, DB Wengert, NI Heil, R

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: July 1975 COMPLETION DATE: June 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0068159)

#### 00 156203

#### THE MANAGEMENT OF MAJOR UNDERGROUND CONSTRUCTION PROJECTS

The objective is to recommend measures which will enable those responsible for management of major underground construction projects to complete them on time and at a reasonable cost. All aspects of decision making practices and program implementation control procedures at all involved agency levels are being reviewed and analyzed. The multidisciplinary committee is conducting interviews, employing questionnaires, and conducting workshops to develop and test recommendations.

This project also has received funding, under separate contracts, from the National Science Foundation and the Office of the Secretary, U.S. DOT. See also RRIS 059406.

PERFORMING AGENCY: National Academy of Sciences, United States  
National Committee on Tunneling Technology  
INVESTIGATOR: Bangert, RL Tel (202) 389-6155  
SPONSORING AGENCY: Urban Mass Transportation Administration;  
Transportation Systems Center  
RESPONSIBLE INDIVIDUAL: Butler, GL Transportation Systems Center  
Tel (202) 426-0090 Chin, A Tel (617) 494-2006 Hakala, WW Tel  
(202) 634-7183

Contract DOT-OS-70030

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan.  
1977 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$241,800

ACKNOWLEDGMENT: National Academy of Sciences-Natl Research Council

00 170632

## FATIGUE PHENOMENA IN WELDED CONNECTIONS OF BRIDGES AND CRANES

Size effects shown by earlier ORE studies (D 86) are to be checked by fatigue tests on I beams and box girders, incorporating butt welds as made in a workshop and as made at a construction site. Tests also on smaller beams appropriate to use in cranes and vehicles (co-ordination with B 12) are made. Final tests to be under load spectrum (co-ordination with D 128). Object is to show possible inadequacy of some design rules for structures subject to fatigue. At this time constant amplitude tests on I beams and on box beams have been completed. Tests using load spectrum are still in progress.

Five reports have been published to date.

PERFORMING AGENCY: International Union of Railways  
RESPONSIBLE INDIVIDUAL: Thiele Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1973

ACKNOWLEDGMENT: UIC

00 170633

## STATISTICAL DISTRIBUTION OF AXLE LOADS AND STRESSES IN RAILWAY BRIDGES

Calculation of the dynamic response of bridges under high speed train running (mathematical models, field tests, parameter studies, irregularities), traffic load induced bridge component fatigue (load and moment spectra are determined from traffic and track loading; counting methods, fatigue calculation). Stochastic studies of the movement of a random individual load and of continuous loading on the bridge beam have been made. Measurements on bridges have been obtained for comparison with the calculations.

Six reports have been published to date

PERFORMING AGENCY: International Union of Railways  
RESPONSIBLE INDIVIDUAL: Thiele Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1972

ACKNOWLEDGMENT: UIC

00 170634

## INVESTIGATION OF BRIDGE DECKS WITH CONCRETE ENCASED GIRDERS

Testing of six different laboratory models statically, to be followed by tests on similar models first loaded dynamically to produce realistic cracking before loading statically to failure. A 40 m double span bridge deck to be tested after dynamic pre-loading to failure under static load. After failure, anticipated at the central support, a simple span of 18 m taken from the remaining, undamaged portion is to be tested similarly. Object is possible revision of design rules. At this time tests have been completed. Two new design methods are proposed in the final report, which will be presented to the Control Committee in April 1978.

Eight reports have been published to date.

PERFORMING AGENCY: International Union of Railways  
RESPONSIBLE INDIVIDUAL: Thiele Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1971

ACKNOWLEDGMENT: UIC

01 038973

**RAILROAD TRACK STRUCTURES RESEARCH**

The Federal Railroad Administration (FRA) and the Association of American Railroads (AAR), the contractor, enter into a program to perform specific Railroad Track Structures Research. The program is expected to encompass a number of tasks for research into a variety of technical factors affecting railroad track and related systems and subsystems. The Railroad Track Structures Research Program consists of Four Tasks: Mathematical Modeling, Ballast and Subgrade Material Performance Tests, Rolling Load Facility Tests and Track Research Laboratory Facility. Work continues only on Ballast and Subgrade Material Performance Tests and on the Rolling Load Facility Tests.

**REFERENCES:**

- Technical Data Base Report (Task 2) July 1975, PB-251771
- Functional Requirements for a Facility for Accelerated Service testing (task 4), Sept. 1976, PB-263605
- Structural Model and Materials Evaluation Procedures (task 2), Sept. 1976, PB-262987
- Track Support Systems Parameter Study (Task 2) Sept. 1976, PB-263370
- Finite Element Analysis of a Railway Track Support System - User's Manual (task 2), Sept. 1976, PB-262988
- Material Evaluation Study (Task 2) Jan. 1977, PB-264215
- Lateral Stability of Ballast (Task 2) Sept. 1977, PB-275035
- A Study of Railroad Ballast Economics (Task 2) Sept. 1977, PB-275102

PERFORMING AGENCY: Association of American Railroads; Illinois University, Urbana, Department of Civil Engineering

INVESTIGATOR: Lundgren, JR Tel (312) 567-3588 Thompson, MR Tel (217) 333-3930

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Moody, HG Tel (202) 426-4377 Putukian, J Tel (617) 494-2206

Contract DOT-FR-30038 (CR)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1973 COMPLETION DATE: June 1979 TOTAL FUNDS: \$673,029

ACKNOWLEDGMENT: FRA

01 038974

**CONTINUOUS MEASUREMENT OF DYNAMIC COMPLIANCE CHARACTERISTICS OF RAILROAD TRACK. PHASE 3**

The contract is for the design, fabrication, demonstration and furnishing of equipment for the continuous measurement of dynamic compliance characteristics of railroad track.

**REFERENCES:**

- A Review of Measurement Techniques, Requirements and Available Data on the Dynamic Compliance of Railroad Track, Kaiser, WD, May 1975, PB-250547/AS

PERFORMING AGENCY: Battelle Memorial Institute

INVESTIGATOR: Prause, RH Tel (614) 299-3151

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: O'Sullivan, WB

Contract DOT-FR-30051 (CPFF)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: May 1973 COMPLETION DATE: 1979 TOTAL FUNDS: \$332,110

ACKNOWLEDGMENT: TRAIS (PR# RP-39)

01 058458

**FABRICATE, TEST, EVALUATE, AND DELIVER AN ULTRASONIC WHEEL PROBE INSPECTION SYSTEM**

Objectives are: 1. To provide ultrasonic wheel probes for an ultrasonic inspection system which can detect all potentially dangerous defects. Particular emphasis shall be given to the detection of vertical split heads and the inspection of welded joints in continuously welded rail. The capabilities of these components will improve the detectability of ultrasonic inspection and also provide additional defect information needed to facilitate automatic data processing. 2. To test and evaluate the ultrasonic system in the field by comparing the inspection results with that of a magnetic inspection system.

PERFORMING AGENCY: DAPCO Industries, Incorporated

INVESTIGATOR:

SPONSORING AGENCY: Transportation Systems Center, RR-519

RESPONSIBLE INDIVIDUAL: Cecon, H Tel (617) 494-2000

Contract DOT-TSC-995

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Apr. 1975 TOTAL FUNDS: \$75,552

ACKNOWLEDGMENT: TRAIS (RR-519)

01 058644

**RAIL FLAW OCCURRENCE SURVEY**

Objectives are: 1. Develop the data base from a review of available failure records from which statistical evaluations can be made. 2. Develop and apply statistical procedures which will determine interrelationships of rail failure and train derailment occurrence. 3. Calculate severity indices for difference types of rail defects as causes of train derailments from this analysis of the data base. 4. Ascertain, for defects of important severity, the relationships between flaw occurrence, load environment and characteristics of track locations, construction, maintenance, and inspection. 5. Propose one or more approaches for the reliability analysis of rail-in-service utilizing the information generated.

PERFORMING AGENCY: Midwest Research Institute

SPONSORING AGENCY: Transportation Systems Center, RR-519

RESPONSIBLE INDIVIDUAL: Karlin, A Tel (617)494-2092

Contract DOT-TSC-1061 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$64,195

ACKNOWLEDGMENT: TRAIS (RR-519), FRA

01 058673

**SLEEVE EXPANSION OF BOLT HOLES IN RAILROAD RAIL**

Objectives are: 1. To ascertain by laboratory testing that the sleeve expansion process is likely to be an effective means of reducing the bolt hole failure rate under railroad loading conditions. 2. Having accomplished this, to devise and implement a test plan for a preliminary field evaluation defining costs and time required to implement the plan.

PERFORMING AGENCY: Boeing Company

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development, RR-519

RESPONSIBLE INDIVIDUAL: Steele, RK Tel (617) 494-2457

Contract DOT-TSC-1048

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1975 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$238,681

ACKNOWLEDGMENT: TRAIS (RR-519), FRA

01 058698

**INSTRUMENTATION AND DATA PROCESSING EQUIPMENT ON RAIL VEHICLES FOR MEASURING TRACK GEOMETRY AND RAIL FLAW DETECTION**

Tasks include: 1. Refurbish a rail hospital car for track inspection applications. 2. Install a vehicle track geometry measurement system and install rail flaw detection instrumentation. 3. Furnish and install an on-board digital computer system for system control, data recording and data processing. 4. Develop and implement the necessary computer programs for performing on-board track geometry defect analysis and rail flaw analysis. 5. Survey the market for availability of a high railer-type motor vehicle and track geometry instrumentation for the purpose of providing unloaded measurements. 6. Carry out validation and acceptance testing of the completed track inspection vehicle. 7. Conduct a training program for operation and maintenance personnel.

PERFORMING AGENCY: ENSCO, Incorporated

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Mould, J Tel (202)426-1682

Contract DOT-FR-54190 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1975 COMPLETION DATE: Dec. 1978 TOTAL FUNDS: \$2,900,000

ACKNOWLEDGMENT: TRAIS

01 058728

**ANALYSIS AND DESIGN REQUIREMENTS FOR IMPROVED CROSS TIE TRACK SYSTEMS**

The emphasis is on applying existing data, analyses, and instrumentation to a characterization of the response and deterioration of track structures under typical wheel/rail loads. In addition, studies of the influence of tie/fastener characteristics on track performance and the adequacy of 'synthetic' tie



fastener assemblies for mainline application under typical North American loadings will be coupled with an economic study to investigate the feasibility of 'synthetic' cross ties for U.S. usage. Additionally, FAST data on concrete vs wood tie track performance will be analysed to conduct a relative performance assessment.

PERFORMING AGENCY: Battelle Memorial Institute  
SPONSORING AGENCY: Transportation Systems Center, RR-519  
RESPONSIBLE INDIVIDUAL: Kish, A Tel (617) 494-2649

Contract DOT-TSC-1044

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1975 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$575,884

ACKNOWLEDGMENT: TRAIS (RR-519), FRA

#### 01 059223

##### STATISTICAL REPRESENTATIONS OF TRACK GEOMETRY

The objective is to conduct analyses of existing track geometry data in order to provide power spectral density and/or other statistical characterizations of the universe of track geometry conditions and to identify fundamental processes.

PERFORMING AGENCY: ENSCO, Incorporated  
SPONSORING AGENCY: Transportation Systems Center, R6321  
RESPONSIBLE INDIVIDUAL: Weinstock, H Tel (617)494-2000

Contract DOT-TSC-1211 (CPF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$87,792

ACKNOWLEDGMENT: TRAIS (R6321)

#### 01 059227

##### USE OF SURFACE ELECTROMAGNETIC WAVES TO DETECT RAIL JOINT FAULTS

The objective of this study is to determine experimentally the characteristics of surface electromagnetic waves (SEW)--transmission, reflection and radiation due to various defective and nondefective rail joints. These experiments are designed to verify the theoretical results for an ideal rail joint and to measure the effects of various perturbations of the rail joint. Also suitable techniques for coupling surface electromagnetic waves to the rail will be investigated. One outcome of this study will be a realistic evaluation of the applicability of the SEW technique to the detection of rail joint faults from a track-guided vehicle.

PERFORMING AGENCY: Missouri University, Rolla  
SPONSORING AGENCY: Transportation Systems Center, R6357  
RESPONSIBLE INDIVIDUAL: Yoh, P Tel (617)494-2000

Contract DOT-TSC-1217 (CR)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1976 COMPLETION DATE: July 1977 TOTAL FUNDS: \$56,690

ACKNOWLEDGMENT: TRAIS (R6357)

#### 01 059295

##### TRACK GEOMETRY MEASUREMENT BY HIGH RAIL VEHICLE

The need for increased track surveillance capability and data collection capability for transportation planning and rail assistance programming has led Iowa's Department of Transportation to purchase a high rail track geometry measuring vehicle. The objective is to examine the capabilities of this vehicle to assist in the improvement of track safety inspection and in data collection for transportation planning and assistance programming. The project will examine both technical and operational aspects of Track Geometry Car usage as an inspection device and as a data collection device.

PERFORMING AGENCY: Iowa Department of Transportation  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Liang, RT

Contract DOT-FR-64243 (CR)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1976 COMPLETION DATE: May 1978 TOTAL FUNDS: \$273,415

ACKNOWLEDGMENT: TRAIS

#### 01 059371

##### IMPROVEMENT OF MAGNETIC TECHNIQUES FOR RAIL INSPECTION

The objective is to improve the magnetic inspection techniques through improvement of the sensing and signal processing methods. The opinion in

the railroad industry is that although the ultrasonic systems appear to have the greater potential, it requires further development before it can perform a thorough and complete inspection. Until these techniques are upgraded and proven in the field, magnetic inspection methods offer a good supplementary inspection. The intent is to improve magnetic inspection techniques and equipment so that the performance is improved when operated as an independent system or when providing supplementary support to ultrasonic systems.

PERFORMING AGENCY: Battelle Memorial Institute  
SPONSORING AGENCY: Transportation Systems Center, R6345  
RESPONSIBLE INDIVIDUAL: Ceccon, H Tel (617)494-2000

Contract DOT-TSC-1244 (CPF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Aug. 1976 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$97,994

ACKNOWLEDGMENT: TRAIS (R6345)

#### 01 059681

##### TEST AND EVALUATION OF THE TRACK GEOMETRY MEASUREMENT SYSTEM (TGMS)

The objectives are to: (1) Demonstrate the TGMS on the selected transit property. (2) Evaluate the TGMS under real world operating conditions on the selected transit property. (3) Collect track geometry data on the selected property. (4) Develop a Ways and Structures Maintenance Plan utilizing the TGMS. (5) Determine minimum requirements for real-time output from the TGMS to support Ways and Structures inspection under the Maintenance Plan, and identify the minimum component parts and operating characteristics of TSCs TGMS needed to achieve the minimum real-time output requirements.

PERFORMING AGENCY: Systems Technology Associates, Incorporated  
SPONSORING AGENCY: Transportation Systems Center, R6732  
RESPONSIBLE INDIVIDUAL: Nickles, JE Tel (617) 494-2302

Contract DOT-TSC-1285 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1976 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$282,109

ACKNOWLEDGMENT: TRAIS (R6732)

#### 01 081797

##### INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II: TASK 1--TRACK STRUCTURES

Task objectives are development of recommended performance specifications and maintenance and geometric design guidelines for conventional railroad track and related track structures and components. This activity is intended to quantify the adequacy of a guideway that yields an acceptable level of ride quality and safety with minimization of first cost, maintenance costs, and secondary costs such as loss and damage, and wear and fatigue to vehicles. Task will recognize that load environment is a function of track parameters, wheel load, and level of maintenance. The Track Structures Dynamic Test Facility, developed under separate AAR/FRA contract, has the capability of determining the basic structures as affected by different subgrade materials, different types of ballast, various types of ties, spacing and rail sizes. A moving load allows for compaction of ballast subgrade material. Also sensitivity studies of track parameters, including basic alignment of the structure with such factors as minimum length of tangent between curves and deviation from theoretical line and surface, have been made using computer modeling techniques developed in Phase I.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 576-3584

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyer, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1975 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

#### 01 099369

##### OPERATION OF TEST TRACK AND RAIL INSPECTION EQUIPMENT

Because of the interdependence between each of the newly developed components for track and rail inspection, a critical test and evaluation must

be carried out on each to assess its contribution to the total system. From the results of the tests and evaluations, an assessment of the developments can provide the information needed to generate work statements for future developments. In order to facilitate an effective test and evaluation, qualified technical personnel and testing facilities are required. The facilities primarily consist of an NDT laboratory, two test tracks, and a rail inspection vehicle. The NDT laboratory contains the instrumentation needed to perform the commonly used NDT techniques. The test tracks contain machined and natural rail defects on which inspection equipment can be tested up to speeds of 40 mph. The rail inspection vehicle is a hi-rail vehicle and currently uses ultrasonics exclusively to perform the rail inspection. The hi-rail vehicle provides the mobility required for a test vehicle and has ample space to house newly developed equipment. The staff presently consists of two technicians and two engineers.

PERFORMING AGENCY: Transportation Systems Center

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

RESPONSIBLE INDIVIDUAL: Ceccon, H Tel (617) 494-2000

In-House

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Mar. 1974

ACKNOWLEDGMENT: FRA

#### 01 099378

##### IMPROVED INSPECTION, DETECTION AND TESTING RESEARCH

The objectives of this program are to provide engineering and field test support services to FRA-sponsored programs and to develop additional track inspection vehicles for the Office of Safety. In the process of collecting data for Amtrak, the Northeast Corridor Project and the Office of Safety, as well as for other FRA R&D programs, 260 tests on some 25 different railroads covered approximately 100,000 miles of track. The track geometry measurement system previously developed can now be utilized to detect safety-related defects. To provide the Office of Safety with three track inspection systems, an existing vehicle is being rebuilt and a new unit is being built.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Peterson, LA Tel 202-426-2965

STATUS: Active NOTICE DATE: Feb. 1978 TOTAL FUNDS: \$6,245,000

ACKNOWLEDGMENT: FRA

#### 01 099393

##### PROGRAM FOR INVESTIGATION OF RAIL FAILURES

The objective of this program is to evaluate the metallurgical and applied stress environment coincident with failures in conventional carbon steel rail and in other types. The following steps are involved: (A) Characterize in the laboratory, service-developed defects resulting in field failures in carbon steel rails with emphasis on short service life or premature failures; (B) Determine in the laboratory the chemistry, metallography and mechanical properties of carbon steel rails in service; (C) Determine in the field the state of stress in carbon steel rails in service under a wide range of conditions track and loadings; (D) Establish possible interrelationships of material properties, service stresses and service failures; (E) Promote similar laboratory and service evaluations of economically attainable variations in rail steel and treatments, consistent with progress of work performed on carbon steel rail. Specimens supplied consist of 8-foot rail sections containing a detected defect. These specimens are used to determine the spectrum of properties which possibly may be associated with each type of defect. Selected in-track sites are instrumented to determine service stresses associated with fatigue crack initiation. Relation between service-initiated failures and attendant stress is correlated. Work with steels other than the conventional carbon type is to be undertaken.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; American Iron and Steel Institute; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Garg, VK Tel (312) 567-3596

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: AAR

#### 01 099394

##### RAIL FLAW DETECTION SYSTEMS

The detector car section of the AAR Technical Center has constantly worked on materials and systems for upgrading the privately-owned and operated rail detector cars using the residual magnetic method as developed and built by the AAR. Along with this, studies of advanced technologies of rail flaw detection, such as ultrasonics, have been conducted. An ultrasonic rail test system and recording equipment to meet FRA track inspection requirements was initially tested under one of the standard magnetic detector cars. The ultrasonic system significantly increased flaw detection due to its greater sensitivity in the web area. This was followed by construction of a new detector car equipped exclusively with ultrasonics which will be used in refining techniques using this rail flaw detection system.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads

RESPONSIBLE INDIVIDUAL: Garg, VK Tel (312) 567-3596

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: AAR

#### 01 099396

##### ACOUSTICAL EMISSION MONITORING OF FIELD AND PLANT WELDS

Acoustical emissions in the ultrasonic range can be monitored with appropriate equipment to determine the soundness of field and plant welds made in steel rails. The investigation has shown that good and bad welds can be detected by the procedure. Additional development is directed to the refinements necessary for a production installation.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads

RESPONSIBLE INDIVIDUAL: Garg, VK Tel (312) 567-3596

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: AAR

#### 01 131759

##### FUNDAMENTAL PROBLEMS OF RAILROAD TRACK MECHANICS

This research program consisted of several projects: (1) the determination of the effect of various assumptions for the lateral track resistance on track buckling analyses, (2) development of a consistent analysis for track buckling in the vertical plane, (3) determination of the effect of foundation stiffness on track buckling analyses, (4) a study of the contact between elastic and elastic-rigid media, (5) an improved rail stress analysis, and (6) a study of the effect of track length on the results of track buckling tests.

##### REFERENCES:

The Effect of Lateral Resistance on Track Buckling Analyses, Kerr, AD, Rail International, pp 30-38, Jan. 1976

Effect of Foundation Stiffness on Track Buckling El-Aini, YM, ASCE Journal of Engineering Mechanics Division, pp 531-545, June 1976

Determination of Admissible Temperature Increases to Prevent Vertical Track Buckling, Kerr, AD; El-Aini, YM, Princeton University, Civil Engineering Dept., Res Rpt. 75-SM-11, 40 pp, Dec. 1975

On the Unbonded Contact Between Elastic and Elastic-Rigid Media, Kerr, AD, Princeton University, Civil Engineering Dept., Res Rpt. 76-SM-3, 19 pp, Jan. 1976

On Thermal Buckling of Straight Tracks and the Effect of Track Length on its Response, Princeton University, Civil Engineering Dept., Res Rpt. 76-TR-19, Nov. 1976

Problems & Needs in Track Structure Design & Analysis Kerr, AD, Princeton University Civil Engineering Dept., Res Rpt. 77-TR-7, Sept. 1977

PERFORMING AGENCY: Princeton University, School of Engineering and Applied Science

INVESTIGATOR: Kerr, AD Tel (609) 452-5424

SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG74-19030

RESPONSIBLE INDIVIDUAL: Babendreier, CA Tel (202) 632-5787

Contract ENG 74-19030

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: Feb. 1975 COMPLETION DATE: July 1977 TOTAL FUNDS: \$60,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5107)

#### 01 138467

##### MECHANICS OF BALLAST COMPACTION

Formulation of ballast compaction guidelines based on a review of the theory on the compaction of ballast sized, non-cohesive materials, laboratory and field measurements. Measures of the degree of ballast compaction are being developed. Field tests being run at FAST track in Pueblo, Colorado.

PERFORMING AGENCY: State University of New York, Buffalo  
INVESTIGATOR: Selig, ET Tel (716) 831-3113  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Sluz, A Tel (617) 494-2432

Contract DOT-TSC-1115

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Jan. 1976 COMPLETION DATE: June 1978 TOTAL FUNDS: \$350,000

ACKNOWLEDGMENT: TSC

#### 01 138535

##### TRACK GEOMETRY MEASUREMENT

This project is to produce a real-time track geometry measurement system which includes on-line data processing capability and may be used at revenue speeds without requirement for a special vehicle.

PERFORMING AGENCY: Transportation Systems Center  
SPONSORING AGENCY: Urban Mass Transportation Administration  
RESPONSIBLE INDIVIDUAL: Spencer, PR Tel (202) 426-0090

Contract UM-504

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1974 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$1,600,000

ACKNOWLEDGMENT: UMTA

#### 01 138560

##### TRACK INSPECTION AND TESTING

Develops, recommends, implements and promotes an improved inspection and detection project in support of the FRA National Track Inspection Program. Provides for support of test activities and data collection and coordinates support with the Office of Safety, other FRA elements, government agencies, railroads and support contractors. Makes provisions for operation, maintenance and transportation of inspection vehicles and for data processing services.

PERFORMING AGENCY: Federal Railroad Administration, Improved Inspection, Detection and Testing Research Division  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Winn, JB Tel (202) 426-1682

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1975

ACKNOWLEDGMENT: FRA

#### 01 138561

##### AUTOMATED TRACK INSPECTION, SYSTEM DEVELOPMENT

The objective of this program is to provide automated equipment to assist the FRA Track Inspectors in monitoring the National track network. A fleet of vehicles will be procured to measure track geometry and internal rail flaws. This fleet includes three existing measurement vehicles which provide real time data to both the inspector and the host railroad. Measurement systems will be developed and tested for potential use in the inspection vehicle.

PERFORMING AGENCY: Federal Railroad Administration, Improved Inspection, Detection and Testing Research Division  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Winn, JB Tel (202) 426-1682

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1975

ACKNOWLEDGMENT: FRA

#### 01 138562

##### IMPROVED TRACK STRUCTURES RESEARCH PROGRAM

The Improved Track Structures Research Program has been established to achieve improvements in the safety of train operations by reducing the frequency of train derailments through the use of guidelines, standards and techniques for achieving safer track structures and to improve the service-

ability of the track structures through more effective maintenance techniques and with more durable, yet economic track structure designs. The program will accomplish these objectives through a series of contract research efforts and research at the Transportation Systems Center addressing both analytical studies and field test verification.

For subprograms see RRIS Nos. 01A 138563 and 01A 138564.

PERFORMING AGENCY: Federal Railroad Administration, Improved Track Structures Research Division

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Krick, RL Tel (202) 426-4377

STATUS: Active NOTICE DATE: July 1976 START DATE: July 1975

ACKNOWLEDGMENT: FRA

#### 01 138563

##### TRACK ACCIDENT REDUCTION RESEARCH SUBPROGRAM

The Track Accident Reduction Research Subprogram is directed toward improvement in the number and frequency of train accidents related to track structure causes by identification of operating limits for existing rolling stock running on contemporary track based on limiting adverse wheel/rail dynamic interaction and by specification of the safe structural load bearing limits of existing track systems and required inspection demands.

PERFORMING AGENCY: Federal Railroad Administration, Improved Track Structures Research Division

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Krick, RL Tel (202) 426-4377

STATUS: Active NOTICE DATE: July 1976 START DATE: July 1975

ACKNOWLEDGMENT: FRA

#### 01 138564

##### IMPROVED TRACK PERFORMANCE RESEARCH SUBPROGRAM

The Improved Track Performance Research Subprogram is directed toward improvement in track stability and life by development of cost effective guidelines for upgrading current track systems, for designing affordable track system alternatives and for making cost effective maintenance decisions. The following technical areas are being considered: new rail quality, improved rail joining techniques, analysis and design for improved cross tie-track systems, ballast selection-material performance studies, soil stabilization studies, ballast tamping and consolidating equipment performance maximization and track maintenance studies.

PERFORMING AGENCY: Federal Railroad Administration, Improved Track Structures Research Division

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Krick, RL Tel (202) 426-4377

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: FRA

#### 01 138568

##### COOPERATIVE RESEARCH PROGRAM ON TIMBER CROSS TIE DEVELOPMENT

A variety of particle board specimens involving variations in geometry, orientation and binding resins for the fibers have been investigated for the production of a reconstituted cross tie. The design with seven laminated particle boards with the external laminates featuring fiber orientation have been subjected to laboratory tests showing them having characteristics much like sawn hardwood ties. Production of several hundred ties for service testing and economic analysis of the feasibility of such a product are being made.

PERFORMING AGENCY: Forest Products Laboratory; Association of American Railroads Technical Center

SPONSORING AGENCY: Forest Products Laboratory; Association of American Railroads; Federal Railroad Administration

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1973

#### 01 139163

##### ENGINEERING ANALYSIS OF STRESS IN RAILS

This program is to analyze procedure for predicting stresses in rails; to provide a description of stresses required for prediction of rail degradation and rail failure due to fissures, split heads and bolt hole cracks; to assess design and operational trade-offs on thermal, flexural, residual and contact stresses and to provide input to a rail reliability model. The goal is an

analytical model where factors in rail degradation may be determined.

**REFERENCES:**

Preliminary Description of Stresses in Rails Johns, TG; Davies, KB, Report FRA-ORD-76-294

PERFORMING AGENCY: Battelle Columbus Laboratories

INVESTIGATOR: Johns, TG Tel (614)424-4569

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development; Transportation Systems Center, Office of Ground Systems

RESPONSIBLE INDIVIDUAL: McConnell, DP Tel (617)494-2699

Contract DOT-TSC-1038

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1975 COMPLETION DATE: May 1978 TOTAL FUNDS: \$429,000

ACKNOWLEDGMENT: FRA

**01 139165**

**COLLECTION AND ANALYSIS OF TEST DATA**

Because of the premature failure of the Kansas Test Track, the contractor is to complete analysis of available data and to conduct a post mortem study of the instrumentation originally installed in concrete cross tie and concrete slab track. Premature termination of traffic meant that all of the data sought will not be obtained. Remaining instruments are to be examined for condition and environment with the aim of determining if the data that was obtained was valid. Reports describing track performance using the available data will be completed.

**REFERENCES:**

Kansas Test Track Instrumentation Internal Report Internal Letter Report, July 1976

PERFORMING AGENCY: Portland Cement Association

INVESTIGATOR: Colley, BE Tel (312)966-6200 Hanson, NW

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Moody, HG Tel (202)426-4377

Contract DOT-TSC-FR-90043

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1971 COMPLETION DATE: Mar. 1978

ACKNOWLEDGMENT: FRA

**01 139167**

**MEASUREMENT OF VERTICAL TRACK STIFFNESS**

The objective is to demonstrate the feasibility of stiffness measurement using the Kansas Test Track and the FRA track measurement cars equipped with existing track surface measurement systems and then develop and demonstrate software to support real-time measurement of stiffness using Southern Railway's Track Measurement Car R-1. Soft spots may be determined before they develop into serious geometric defects and it can be found if an existing geometric defect is related to track stiffness.

PERFORMING AGENCY: ENSCO, Incorporated

INVESTIGATOR: Corbin, JC Tel (703) 321-9000

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: O'Sullivan, WB Tel (202) 426-4377

Contract DOT-FR-54174

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug. 1975 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: FRA

**01 148355**

**ROAD MAINTENANCE COST MODEL**

The road maintenance cost model project is directed towards the construction of a large computer model which will simulate the processes by which rail, ties and ballast in a length of track deteriorate under a selected traffic of varied composition to levels which necessitate their periodic replacement. The model is designed to estimate the impact of given traffic mixes on track component replacement cycles in a specified type of track through the employment of a series of theoretical/empirical wear models. Incremental costs are to be determined by a routine that deletes each segment of the traffic mix in turn, converting the estimated service life differential to an appropriate annual charge which reflects the simulated "consumption" of the track asset. The ultimate objective of the road maintenance cost model research is the formulation of a total framework for the conversion of ongoing research efforts into a methodology for the estimation of route-and

service-specific unit costs for road maintenance. Progress to date has seen the construction of a first generation rail wear/cost model, with a second generation model currently in the calibration and validation stage

**REFERENCES:**

Road Maintenance Cost Model Roney, MD; Lake, RW, Canadian Institute of Guided Ground Transport, Interim Report, Mar. 1977

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport

INVESTIGATOR: Roney, MD Tel (613) 547-5777 Turcot, MC

SPONSORING AGENCY: Canadian National Railways; Canadian Pacific

RESPONSIBLE INDIVIDUAL: Hanks, WG Tel (514) 877-5771

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Mar. 1976 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$13,250

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

**01 160047**

**DEVELOPMENT OF AN AUTOMATIC TRACK INSPECTION (ATI) RAIL FLAW DETECTION STUDY**

No Abstract

PERFORMING AGENCY: Sperry Univac Computer Systems

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Mould, JC RRD-31 Tel (202) 426-1682

Contract DOT-FR-74297 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Mar. 1977 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$121,867

ACKNOWLEDGMENT: TRAIS

**01 170600**

**THE ELECTROSLAG WELDING OF ALLOY RAIL STEELS**

In the first year of research, it is hoped to establish preparation, set-up and operating conditions that are necessary to produce sound electrosag welds in both standard carbon and 1% chromium rail steels. Particular emphasis will be placed on the quality of the bottom of the weld and on the influence of preheat and postheat treatment on the microstructure of the rail steel adjacent to the weld, correlating any structural changes to possible changes in mechanical properties. The longer term objectives include optimization of the metallurgy of the weldment, reduction in the time required to complete a weld, and the introduction of further degrees of process automation. Ultimately, conversion to the fully-automated mode appears to hold the key to development of a cost-effective method of producing high-quality rail welds in track without the high degree of operator-induced variance characteristic of the thermit welding method.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 2.75.77

INVESTIGATOR: Cameron, J Tel (613) 547-5908 Mackay, WBF

SPONSORING AGENCY: Canadian National Railways, Canadian Pacific; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Rennie, RP Tel (514) 877-4337 Tufts, LD Tel (514) 861-6811 McLaren, W Tel (514) 283-4536

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Nov. 1977 COMPLETION DATE: July 1979 TOTAL FUNDS: \$138,000

ACKNOWLEDGMENT: CIGGT

**01 170606**

**PROBLEMS IN TRACK STRUCTURES DESIGN AND ANALYSIS**

Contract provided support for: (1) writing part of a report "Problems and Needs in Track Structure Design and Analysis" which reviews the immediate and future needs for research in track design and describes the status of various track analyses, (2) a study of the effect of the rotational resistance of ties, about their long axes, on rail stresses and rail-tie contact forces caused by vertical wheel loads, and (3) initiation of buckling analyses for curved tracks due to a temperature increase.

**REFERENCES:**

Problems and Needs in Track Structure Design and Analysis-Princeton Univ, Dept of Civil Engineering Research Report, Kerr, AD, Research Report No. 77-TR-7, Sept. 1977

The Effect of Tie Resistance on Rail Stresses and Rail-Tie Contact Forces Caused by Vertical Wheel Loads, Kerr, AD, AAR/Princeton Univ Res Rpt., (In Preparation)

PERFORMING AGENCY: Princeton University, School of Engr/Appl Sciences, Dept of Civil Engineering  
 INVESTIGATOR: Kerr, AD Tel (609) 452-5424  
 SPONSORING AGENCY: Association of American Railroads Technical Center  
 RESPONSIBLE INDIVIDUAL: Lundgren, JR Tel (312) 567-3588

Contract RD 5087

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: June 1977 COMPLETION DATE: Jan. 1978

ACKNOWLEDGMENT: Princeton University

#### 01 170607

##### STANDARD SPECIFICATIONS FOR RAPID TRANSIT CONCRETE TIES-TEST AND EVALUATION

Preliminary specifications have previously been developed for the use of concrete ties for rapid transit. The purpose of this contract is to manufacture both monoblock and duoblock ties in accordance with these specifications and to laboratory test them following established test procedures. Based on the results of these tests, modified preliminary specifications will be developed.

PERFORMING AGENCY: Portland Cement Association, Construction Technology Laboratories

INVESTIGATOR: Hanna, A Tel (312) 966-6200

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Saulnier, G Tel (617) 494-2006

Contract DOT-TSC-1442

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1977 COMPLETION DATE: Oct. 1978 TOTAL FUNDS: \$98,917

ACKNOWLEDGMENT: TSC

#### 01 170616

##### TRACK STRENGTH CHARACTERIZATION PROGRAM

The purpose of the track strength characterization program is to develop a technique for the determination of the ability of track to withstand anticipated service loads and to utilize this technique for the development of recommended track strength requirements and/or wheel force restrictions for the different categories of track. This program will feature the ability to examine and classify existing tracks with non-destructive methods and with a minimum occupation of the track.

##### REFERENCES:

Preliminary Outline Track Strength Characterization Program, Zarembski, AM, Sept. 1977

PERFORMING AGENCY: Association of American Railroads Technical Center, K103

INVESTIGATOR: Karembski, AM Tel (312) 567-3622

SPONSORING AGENCY: Association of American Railroads Technical Center, Track Train Dynamics

RESPONSIBLE INDIVIDUAL: Moyer, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978

ACKNOWLEDGMENT: Association of American Railroads Technical Center

#### 01 170618

##### A THEORY FOR TRACK MAINTENANCE LIFE PREDICTION

Over a period of time, railroad track will settle as a result of permanent deformation in the ballast and underlying soil layers produced by traffic loading. After some period of time, maintenance will be needed to resurface and line the track. Suitable methods do not presently exist for predicting the maintenance life, which is a function of many factors. This study shall develop a theory for prediction of track settlement which is applicable to estimating maintenance life for new or existing track. The research approach, focusing on the inelastic behavior of soil, involves: (1) establishing required characteristics for the track system components, (2) setting up a computer model, (3) studying the behavior of ballast and soil under representative cyclic loading, and (4) validating the model using available field experience, including data from FAST in Pueblo, Colorado.

PERFORMING AGENCY: State University of New York, Buffalo, Department of Civil Engineering

INVESTIGATOR: Selig, ET Tel (716) 831-3113

SPONSORING AGENCY: Department of Transportation, Office of University Research

RESPONSIBLE INDIVIDUAL: Ravera, RJ Tel (202) 426-0190

Contract DOT-OS-70058

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 COMPLETION DATE: July 1978

ACKNOWLEDGMENT: DOT

#### 01 170625

##### UNCONVENTIONAL TRACKS

Development of track on concrete base. Various types of rail fastenings are tested in laboratory and on concrete slabs of both in-situ and pre-cast construction. Noise and vibration measurements are made under dense traffic and at high speed. Results obtained from laboratory tests and test track at Radcliffe-on-Trent include vibration and noise comparisons. Apart from experience being compared from main line installations in France, England, Switzerland and Germany, ORE has sponsored tests under high speed at Oelde and tests on sharp curve under dense traffic at Velim. These tests have been completed. A new programme of work is being prepared. Until this has been completed and approved, the committee is meeting once a year to study the experience gained by the railways.

Sixteen reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Wattecamps Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1966

ACKNOWLEDGMENT: UIC

#### 01 170636

##### UNIFICATION OF THE GEOMETRY OF POINTS WITH RAILS OF 60 KG/M PERMITTING HIGH SPEEDS ON THE DIVERGING TRACK

The object of this study is to obtain uniformity of turnouts and crossover design with 60 kg/m rails, especially those permitting high speed running on the diverging track. Measurements of a switch with a parabolic transition curve for 160 km/h on the diverging track are currently being taken on the system of SNCF. It is intended to incorporate the results in report RP 3. The Committee will then formulate its conclusions and recommendations for the standardization.

Two reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Thiele Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1973

ACKNOWLEDGMENT: UIC

#### 01 170649

##### OPTIMUM ADAPTATION OF THE CONVENTIONAL TRACK TO FUTURE TRAFFIC

The relationship between traffic and track geometry is studied, along with the optimization of levelling and alignment operations and a definition of track supporting structures is given. A report on the analysis of the work of tamping machines is being prepared. Research will now be focused on the durability of the results obtained and also on the phenomena bringing about compaction and loosening of the ballast. The tests to improve ballast performance were continued in 1977, and a report is being prepared on the tests to attain an improvement by means of chemical products. The research which had been initiated towards the end of 1976 into track supporting structures was continued in 1977: hydraulic performance and filtering by means of synthetic fabrics, mechanical tests (these will be started with the placing into operation of the cell in Vienna-Arsenal in 1978), field tests regarding the performance of the structures at various levels. Reports on track supporting structures will be presented in 1978.

Nine reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Wattecamps Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1970

ACKNOWLEDGMENT: UIC

#### 01 170782

##### STRESSES AND DEFORMATIONS IN TRACK STRUCTURES AND SUPPORT 1977/78

The original full application for research was to cover five years and involved a study of the stresses and deformations under dynamic and static load

systems in railway track structure and support. The primary financing was awarded in 1971 for a study of the geotechnical properties of different ballast materials. Vibration characteristics, strength, stress strain characteristics, density and disintegration of the ballast are the main soil properties being studied. Expansion of the project to involve a more complete study of soil layer interaction when placed in the form of a track support was later approved and commenced. This involves large scale testing. The equipment for this testing has been assembled and the first tests commenced.

**REFERENCES:**

A Study of Stresses and Deformations under Dynamic Static Load Systems in Track Structure and Support, Raymond, GP, Report N 75-10, Sept. 1975

Stresses and Deformations in Railway Track Raymond, GP; Lake, RW; Boon, CJ, Report N76-11, Nov. 1976

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 2.22.77

INVESTIGATOR: Raymond, GP Tel (613) 547-5904

SPONSORING AGENCY: Transport Canada Research and Development Centre; Canadian Pacific; Canadian National Railways

RESPONSIBLE INDIVIDUAL: Boon, C Tel (613) 547-5777

Contract 105-324

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1977 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$90,000

ACKNOWLEDGMENT: CIGGT

**01 170783**

**DOCUMENTATION AND FIELD VALIDATION OF  
MULTILINEAR PORTION OF FINITE ELEMENT PROGRAM  
CIGGT 3D**

The objective of the research program is the development of a three dimensional finite element program suitable as a tool for optimizing the design of a ballasted track structure. The work being carried out under the current contract involves the testing, debugging and validation of the linear portion of the computer program. A draft user's manual will be forthcoming in early 1978. The multi-linear portion will be completed during 1978.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 5.38.77

INVESTIGATOR: Turke, DJ Tel (613) 547-5714 Raymond, GP

SPONSORING AGENCY: Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Rowan, WG

Contract D 500-372-3

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Aug. 1977 COMPLETION DATE: Jan. 1979 TOTAL FUNDS: \$82,550

ACKNOWLEDGMENT: CIGGT



02 055835

## ENGINEERING DATA ON RAIL SYSTEM DYNAMICS

The efforts of the contractor are expected to result in: 1--A computer program to be operational on TSC equipment for predicting the forces and tracking errors of a slowly moving rail car or six axle locomotive negotiating curves and traveling over track with specified track irregularities and alignment variations. 2--Analytical tools and computations subroutines for extension of linearized model response programs existing at TSC for predicting rail vehicle vibration and track forces in response to statistical and deterministic descriptions of track geometry and track irregularities to include the influence of significant rail system non-linearities. 3--Definition of Test Requirements for validation of the analysis tools developed above for prediction of rail system dynamics. 4--Definition of the influence of axle load, gauge and flange clearance on the critical speed of a suspended wheelset with selected new and worn profiles. 5--Analysis of six axle locomotives curving performance.

PERFORMING AGENCY: Clemson University, Department of Mechanical Engineering

INVESTIGATOR: Law, EH Cooperrider, NK Hedrick, JK

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Di Masi, FP Tel (617) 494-2210

Contract DOT-TSC-902

Status: Completed NOTICE DATE: Feb. 1978 COMPLETION DATE: Sept. 1974 TOTAL FUNDS: \$95,000

ACKNOWLEDGMENT: FRA

02 058257

## TRACK-TRAIN DYNAMICS RESEARCH PROGRAM, PHASE II

In a joint international Government-industry program, the Federal Railroad Administration in cooperation with the Association of American Railroads, the Railway Progress Institute, and Transport Canada Research and Development Centre has undertaken a ten-year comprehensive Track-Train Dynamics Research Program to develop a better understanding of the kinematics of railroad performance. This joint research effort is divided into three phases, the first of which has entailed the collection and analysis of data that is necessary to define quantitatively the characteristics of the present railroad system in North America. In the second phase (3 years) this data is to be applied to the development of requirements and interim performance specifications that will lead eventually to the development of improved equipment in the third (5 years) phase of the program. Initially in Phase II investigations will be conducted in the following areas: track structures, wheel-rail contact, trucks and suspension, carbody, couplers and draft gear and the brake system. The descriptive data in this research listing pertains only to that portion of the overall program that is sponsored by the Federal Railroad Administration. This support amounts to approximately one-third of the total resources dedicated to the TTD Research Program.

PERFORMING AGENCY: Association of American Railroads

INVESTIGATOR: Moyar, GJ Tel (312) 567-3602

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Dancer, DM Tel (202) 426-1227

Contract DOT-FR-64228 (CR)

Status: Active NOTICE DATE: Feb. 1978 START DATE: July 1976 COMPLETION DATE: July 1979 TOTAL FUNDS: \$1,900,000

ACKNOWLEDGMENT: FRA

02 058263

## ROLL DYNAMICS UNIT/VIBRATION TEST UNIT FOR U.S. DEPARTMENT OF TRANSPORTATION RAIL DYNAMICS LABORATORY

The U.S. Department of Transportation Rail Dynamics Laboratory (RDL) will house the Roll Dynamics Unit (RDU) and Vibration Test Unit (VTU) at the Transportation Test Center, Pueblo, Colorado. The RDL will permit analytical and experimental studies of railroad and transit vehicles, systems, and components in a controlled, reproducible lab environment with minimal risk to equipment and personnel. Through the study of vehicle dynamics in the RDL, the number of dynamic related accidents and derailments and their attendant costs should be reduced significantly. The contractor is responsible to deliver a functional RDU and VTU. The RDU will be capable of simulating speeds of approximately 200 mph and will accommodate vehicles up to 108 feet long, 12 feet, weighing 200 tons. The VTU will subject rail equipment to vertical and lateral vibrations experienced on typical track

and handle vehicles up to 90 feet long, 12 feet wide and weighing 160 tons.

PERFORMING AGENCY: Wyle Laboratories

INVESTIGATOR: de Benedet, D Tel (303) 597-4500

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Gross, A Tel (202) 755-1877

Contract DOT-FR-64200

Status: Active NOTICE DATE: Feb. 1978 START DATE: July 1975 COMPLETION DATE: June 1978 TOTAL FUNDS: \$7,617,311

ACKNOWLEDGMENT: FRA

02 058461

## INVESTIGATION OF THE AERODYNAMIC DRAG OF CONTAINERS AND TRAILERS ON FLATCARS

Wind tunnel tests have been conducted on one fortythird scale models of trailers on flatcars (TOFC) and containers on flatcars (COFC). Various configuration changes to reduce aerodynamic drag were explored. Experiments on very simplified models were also conducted to obtain a fundamental understanding of the phenomena involved. Full scale experiments will be conducted at the DOT Test Center in Pueblo in order to validate the wind tunnel results. Additional wind tunnel measurements at high Reynolds number were performed as a check on scaling effects.

PERFORMING AGENCY: Hammitt (Andrew G) Associates

INVESTIGATOR: Hammitt, AG Tel 213-541-1328

SPONSORING AGENCY: Transportation Systems Center, 612-0278-AT; Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Koper, JM Tel (202) 426-0808

Contract DOT-TSC-1002 (FFP)

Status: Active NOTICE DATE: Feb. 1978 START DATE: Mar. 1975 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$78,000

ACKNOWLEDGMENT: TRAIS (612-0278-AT)

02 058465

## WAYSIDE DERAILMENT INSPECTION REQUIREMENTS STUDY

The main objective is to establish the impact and causes of railroad derailments and derailment-related accidents, and to assess existing and possible new wayside inspection means for preventing or reducing the occurrence of these events. It is also the objective to produce an analysis and presentation of derailments and pertinent related matters organized in a manner to facilitate understanding, identification of common characteristics and ultimately, effective methods of correction. Finally, the effort seeks to establish a posture on future action with respect to wayside detection and prevention of derailments: what changes and improvements should be made, and what innovations can best effect improvement with respect to wayside detection and prevention of accidents.

REFERENCES:

Wayside Derailment Inspection Requirements Study for Railroad Vehicle Equipment, Frarey, JL; Smith, RL; Krauter, AI, FRA/ORD-77-18, May, 1977, RRIS 7801 167080

PERFORMING AGENCY: Shaker Research Corporation

INVESTIGATOR: Frarey, JL

SPONSORING AGENCY: Transportation Systems Center, RR-523

RESPONSIBLE INDIVIDUAL: Ehrehbeck, R Tel (617) 494-2273 X2046

Contract TSC-1029 (CPF)

Status: Active NOTICE DATE: Feb. 1978 START DATE: May 1975 TOTAL FUNDS: \$77,114

ACKNOWLEDGMENT: TRAIS, FRA

02 058508

## GUIDEWAY VEHICLE COST REDUCTION

This research project addresses the problem of providing a well designed transportation system that provides acceptable comfort at the lowest possible cost. The primary objective is to determine whether installation of more sophisticated suspension systems in rail cars and urban buses will reduce the overall cost of those transit systems significantly. The scope of the research is confined to the guideway-vehicle suspension system. In the first year of this project, vehicle and guideway models were developed, cost data assembled, and active suspension feasibility studied. Research ongoing in the current year involves cost/performance tradeoff studies for the various suspension and guideway alternatives, continued development of advanced suspension concepts, and a study of active guidance feasibility.

## REFERENCES:

A review of Bus and Passenger Railcar Dynamical Models White, RC, Jr, Arizona State University, Dec. 1975  
 Guideway Vehicle Cost Reduction Klinger, DL, Final Report, July 1976

PERFORMING AGENCY: Arizona State University, Tempe, Department of Mechanical Engineering

INVESTIGATOR: Cooperrider, NK Tel (602) 965-3291

SPONSORING AGENCY: Department of Transportation, Office of University Research; Arizona State University, Tempe, Department of Mechanical Engineering

RESPONSIBLE INDIVIDUAL: Ravera, RJ Tel (202) 426-0190

Contract DOT-OS-50107 (CS)

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: June 1975 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$153,615

ACKNOWLEDGMENT: TRAIS (PUR-50175), OST

## 02 059427

## FREIGHT CAR DYNAMICS RESEARCH PROGRAM

Develop mathematical models that may be used to understand the dynamic behavior of freight cars and the effects of various truck, car and track design parameters on their behavior. Validate these models with data gathered by the Track-Train Dynamics Program.

PERFORMING AGENCY: Clemson University

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Tsai, N Tel (202)755-1877

Contract DOT-OS-40018 (CR)

STATUS: Active NOTICE DATE: July 1977 START DATE: Nov. 1973 COMPLETION DATE: June 1978 TOTAL FUNDS: \$313,787

ACKNOWLEDGMENT: TRAIS

## 02 081796

## INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II

The objectives of this program are the development of recommended performance specifications and design guidelines for railroad freight cars, track structures, and their components and subsystems. Performance specifications are to coincide with the demands of the dynamic operating environment to which such systems are subjected. Details of methods and scope are included under specific task references.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyar, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1975 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

## 02 081799

## INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 2--WHEEL/RAIL

Overall task goals are to improve knowledge of the mechanics of wheel/rail interactions and to establish recommended performance specifications and design guidelines for wheels and rail. Task will involve applied research in wheel and rail metallurgy in order to determine requirements for improved performance. Research will also be conducted in stress analysis and fracture mechanics with the goal of developing improved design techniques and life cycle prediction methods. Stress analysis will especially concentrate on the contact stresses at the wheel/rail interface. Wear research conducted under Task 9, Advanced Analytical Techniques, will supply important input to this task. Rail corrugation, with initial effort by Canadian participants in TTD, has been studied. The rail stress analysis investigation, with particular effort on determining the stresses within rails as developed by passage of a vehicle, is progressing. In the wheel area, present effort is on developing an elastic-plastic stress analysis because mechanical and thermal stresses can go beyond the yield point of steel.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, K Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyar, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1975 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

## 02 081803

## INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 7--TEST MANAGEMENT

Task objectives is to coordinate and conduct such tests as are necessary for the pursuit of Tasks 1-6 of Track Train Dynamics, Phase II. Task will provide clearinghouse function for data requests and will design and conduct appropriate laboratory and field tests.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyar, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1975 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

## 02 081804

## INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 9--ADVANCED ANALYTICAL TECHNIQUES

Task objective is to assure that Track Train Dynamics-Phase II, Tasks 1-6 are equipped with the latest advances in applicable analytical techniques. Task will essentially be performed through contract efforts in such areas as stress analysis, fracture mechanics, and wear properties of ferrous materials.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyar, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1975 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

## 02 081805

## INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 8--PROGRAM ANALYSIS

The objective of this task is to assure economic justification of recommendations which result from research activities conducted in Tasks 1-6 of Phase II of the Track Train Dynamics Program. Task will include prior evaluation of research and implementation strategies to forecast potential economic benefits as an aid to priority determination. Areas selected for priority determination will be selected by program management. The principal technique for priority determination will be lifecycle costing based on data accumulated through existing industry channels supplemented by field surveys. Task will supply economic justification package for final recommendations based on industry status and forecasts and time of release.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyar, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1975 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

02 099367

#### PILOT STUDY FOR THE CHARACTERIZATION AND REDUCTION OF WHEEL/RAIL LOADS

This project will be carried out in two phases, with the first phase developing a method for the analytic and experimental characterization of wheel/rail loads. In addition, this phase will provide a detailed program plan and a W/R load field measurement and data reduction plan for a specified track route that will then be implemented in Phase II. During Phase II, the W/R loads on selected track sections will be determined through implementation of the field measurement plan. These loads will be compared with those predicted through application of the analytical methodology. After modification and/or validation, the prediction method will be used to extrapolate W/R load data to alternative track, vehicle and operating conditions. This is intended to identify alternate strategies for reducing those W/R loads which are most closely associated with track degradation.

#### REFERENCES:

Evaluation of Analytical and Experimental Methodologies for the Characterization of Wheel/Rail Loads, Ahlbeck, D; Harrison, H; Prause, R; Johnson, M, FRA-OR&D 76-276, Intrm Rpt., Nov. 1976

PERFORMING AGENCY: Battelle Memorial Institute

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

RESPONSIBLE INDIVIDUAL: McConnell, DP Tel (617) 494-2649

Contract DOT-TSC-1051

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1975 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$583,000

ACKNOWLEDGMENT: FRA

02 099388

#### FREIGHT LOSS AND DAMAGE PROGRAM

This program is based on the evaluation of cost-effective means of damage control and a study of commodities to which various cost effective methods are applicable. It is planned to develop an industry approach to damage control by establishing coordinated programs to demonstrate and evaluate control procedures. The program will be directed toward the control of damage to lading and the economics of such control. Adequate background data is necessary to clearly define any damage problem. It is necessary in certain cases to define the fragility of the product and design laboratory tests to simulate the train environment and produce the same type of damage experienced in transit. Some areas of experimental research provide data on over-the-road shock and vibration and distribution of forces and accelerations in loaded cars under end impact conditions. In cooperation with the Railroad Truck Safety Research and Test Project, the environment during over-the-road operation of a 60-foot box car was determined by extensive instrumentation and recording equipment. This test covered a distance of 5,000 miles over five different railroads. The data, recorded on 22-3600 foot magnetic tapes in analog form was later digitized and sampled in a mini-computer and printed out in a teletypewriter. The data was sampled at the rate of ten times per second or 36,000 times per hour. It describes vertical, floor and roof lateral acceleration occurrences at both ends of the car and speed occurrences. The data is presented in RMS (root-mean-square) format. Statistical computer programs have been written to provide additional analyses such as combining data on a hour by hour basis. Data on freight car vibration will serve as input to the Rail Dynamics Simulator at the Transportation Test Center at Pueblo, Colo. At the request of the National Freight Loss and Damage Prevention Committee, and working with the Transportation Committee of the U.S. Brewers Association, a program was undertaken to understand and alleviate the damage to beer in aluminum cans. This was a pilot program in the can damage area. AAR has also provided funds to the Illinois Institute of Technology for research on freight damage with objectives of establishing analytical methods of predicting vibration and shock and then to design cost-effective methods for control. A report covering the first year of the two year program has been published. A program recently completely under the AAR University Support Program was directed toward a mathematical computer study of a freight car and lading during impact.

#### REFERENCES:

Study on Beer Can Damage-Strength and Dimensional Characteristics of Aluminum, Tin Plate & Tin Free Steel Cans, AAR Rpt R-230, RRIS 02

138569, 7702

Dynamic Simulation of Freight car and Lading During Impact AAR Rpt R-249, RRIS 02 147705, 7701

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads

STATUS: Active NOTICE DATE: Feb. 1978

ACKNOWLEDGMENT: AAR

02 099390

#### INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS. PHASE II. TASK 10--SPECIAL PROJECT, LOCOMOTIVES

The objective of this task is to review accident statistics relating to derailments due to, or related to, locomotives for the purpose of determining whether or not six-axle locomotives are more prone to derailment than four-axle locomotives. Should the data reveal correlation between truck types and accidents, existing and/or newly developed computer models of locomotive trucks will be utilized for developing strategies for alleviating the problems.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel 312-225-9600 X-862

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyar, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

02 099434

#### DEVELOPMENT OF A TRAIN HANDLING CONTROL MODEL FOR FREIGHT TRAIN LOCOMOTIVE ENGINEER PERFORMANCE

The objective of this effort is to reduce data taken in locomotive cabs on revenue freight runs to the form of a mathematical model of the train handling performance of a locomotive engineer. As a minimum, the following phases of freight train handling will be modeled: starting the train from rest, controlling the train through changes in grade, and stopping the train. The data records include settings of locomotive controls, speed, accelerations, motor load, brake system pressures, wheel slip, drawbar force, slack condition, drawbar angle, and main generator voltage. Also available are supervisor ratings of each engineer's performance on each recorded test run. The development of this model is expected to contribute to the understanding and improvement of selection, training, and evaluation of engineers and to support the development of improved locomotive operating controls and displays.

Funds for this project are administered by DOT/Transportation Systems Center, Cambridge, Mass.

PERFORMING AGENCY: Turpin Systems Company

INVESTIGATOR: Birdsall, JB Tel (213) 998-1404

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Sussman, ED Tel (617) 494-2041

Contract DOT-TSC-1037

STATUS: Inactive NOTICE DATE: Feb. 1978 START DATE: May 1975 TOTAL FUNDS: \$37,204

ACKNOWLEDGMENT: FRA

02 128041

#### CALCULATION OF TRAIN AERODYNAMIC DRAG (FOR ENERGY MANAGEMENT PROGRAM)

The purpose of this project is to: 1. Calculate the steady and unsteady aerodynamic drag of vehicles in tunnels and free air. 2. Modify and/or develop computer programs for the calculation of the aerodynamic drag of vehicles as required by the energy management program. A literature survey and review of the aerodynamics of trains in tunnels under project 3603 is well underway. Also, a computer program has been acquired to estimate the unsteady aerodynamic drag of vehicles in tunnels. With this program, it is now possible to start to perform the drag calculations for the purpose of obtaining preliminary power profile and energy loss estimates. It is anticipated that the program will have to be modified to incorporate the

latest information obtained in the literature review. This project covers the calculation of aerodynamic drag for the three cases of deep tunnel, cut and cover, and free air, and studies on propulsion systems with and without energy storage. The result, conceptual designs on a total energy basis. /RTAC/

PERFORMING AGENCY: Ontario Ministry of Transportation & Communication, Can, 3605

INVESTIGATOR: Colavincenzo, O

SPONSORING AGENCY: Ontario Ministry of Transportation & Communication, Can

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1975

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

#### 02 138469

##### TRUCK DESIGN OPTIMIZATION PROJECT, PHASE II

Phase II of the Truck Design Optimization Project (TDOP) will finalize the performance and testing specifications and economic methodology generated in Phase I; characterize the performance and economics of Type II, special service freight car trucks; develop performance and testing specifications as well as the economic methodology for Type II trucks incorporating wear and performance indices; provide related economic and analytical models of freight car trucks; and determine the feasibility of advanced designs and integrated carbody support systems.

PERFORMING AGENCY: Wyle Laboratories

INVESTIGATOR: De Benedet, D Tel (303) 697-4500 Cappel, K

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Fay, GR Tel (202) 426-0855

Contract DOT-FR-742-4277

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1977 COMPLETION DATE: Dec. 1980 TOTAL FUNDS: \$2,639,100

ACKNOWLEDGMENT: FRA

#### 02 138566

##### LOCOMOTIVE TRUCK DYNAMICS

The purpose of this study is to establish the dynamic performance criteria of locomotive trucks. NASA will obtain experimental parameters, such as stiffness and mass property data, in a format useable for direct application to various dynamic truck models being developed by industry and government.

PERFORMING AGENCY: Marshall Space Flight Center, National Aeronautics and Space Administration

INVESTIGATOR: Furman, J Tel (205) 453-2521

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Levine, D Tel (202) 426-1227

Contract DOT-AR-64231

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Apr. 1976 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: FRA

#### 02 138799

##### INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS. PHASE II. TASK 11. FAST COORDINATION

The Facility for Accelerated Service Test (FAST) has been established at the Transportation Test Center at Pueblo, Colo., and the AAR and industry have given a considerable amount of input and support to developing types of tests and assisting in acquisition of materials and equipment. This task provided coordination between FRA, TTC and industry personnel.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyar, GJ Tel (312) 567-3602

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: Oct. 1975 COMPLETION DATE: 1978

ACKNOWLEDGMENT: Association of American Railroads Technical Center

#### 02 139171

##### VEHICLE/GUIDEWAY INTERACTIONS

Improved understanding of vehicle/guideway interactions can lead to improved guideway designs. Since guideway often represents the major portion of initial capital investment and subsequent maintenance for a transportation system, improved design based on sound theoretical and engineering analysis can lead to lower overall system costs. Results should be useful to system planners, public and private operators and construction contractors.

Contract not yet awarded.

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Ravera, RJ Tel (202) 426-9364

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1977

ACKNOWLEDGMENT: OST

#### 02 139177

##### DYNAMIC PERFORMANCE CRITERIA FOR RAIL VEHICLE SAFETY

As part of an overall approach to assessment of track geometry standards and development of a core technology base for vehicle/track interaction, some work has been done on the effects of gage and cross level errors on dynamic performance. Efforts have been directed at derailment reduction dynamics with in-house work done on simplified wheelset models for defining influence of various factors on hunting instability. Algorithms and mathematical models of this phenomenon are being developed. Rock and roll stability has also been studied. The effect of track roughness on car dynamics is being studied.

PERFORMING AGENCY: Transportation Systems Center

INVESTIGATOR: Weinstock, H Tel (617) 494-2038

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: O'Sullivan, WB Tel (202) 426-4377

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1975 COMPLETION DATE: 1977

ACKNOWLEDGMENT: FRA

#### 02 139178

##### FACILITY FOR ACCELERATED SERVICE TESTING (FAST)

Accelerated life testing of track structures and certain components of rolling stock. A 4.8 mile loop of track, divided into 22 sections, with experiments on rail metallurgy, ties (hardwood, soft wood, concrete, steel), ballast (different materials, depths, shoulder width), etc. Four 2,000 HP locomotives pulling more than 80 cars (hoppers, tanks, flats) each grossing over 100 tons, at average speed of 42 MPH for a period not to exceed 16 hrs/day five day/week. Measurements taken during other 8 hours. Started operation in September 1976; approximately 170 million gross tons and 90,000 miles have been accumulated thru December 31, 1977. Experiments which have been completed include those involving wheel wear, steel ties, frogs and fabricated trucks. Reports covering the results on these completed experiments are currently in preparation.

PERFORMING AGENCY: Federal Railroad Administration, Office of Research and Development

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Spanton, DL Tel (202) 426-0850

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1976

ACKNOWLEDGMENT: FRA

#### 02 148322

##### APPLICATIONS OF DISTURBANCE ACCOMMODATING CONTROL THEORY TO VEHICLE ACTIVE RIDE CONTROL PROBLEMS

"Active ride control" is an important aspect of high-speed transportation systems since irregularities of motion produce distress to occupants and increased wear on the vehicle and/or guideway. Active ride control is achieved through the application of compensating forces in response to disturbances detected through the use of electronic sensing devices. The primary objective of the research is to explore the application of the theory of "disturbances accommodating controllers" (DAC) to the active ride control problem. A suitable mathematical model of a vehicle suspension system shall be chosen, and a DAC shall be designed as an active ride

controller for the mathematical model. The DAC ride controller derived in this study shall be in mathematical equation form and will be compared to derived statistical types and other known forms of active ride controllers. The comparison will involve various aspects of the DAC's performance. Evaluations of DAC feasibility will result. As electronic information processing becomes progressively less expensive, it becomes worthwhile to investigate these techniques as an alternative to expensive structural solutions based in materials improvement.

PERFORMING AGENCY: Alabama University, Huntsville, Department of Electrical Engineering  
 INVESTIGATOR: Johnson, CD  
 SPONSORING AGENCY: Transportation Systems Center  
 RESPONSIBLE INDIVIDUAL: Mengert, PH

Contract DOT-OS-60126  
 STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$26,121  
 ACKNOWLEDGMENT: DOT

#### 02 148330 FUNDAMENTAL STUDIES OF PHENOMENA RELATED WHEEL-RAIL CONTACT STRESSES

The research will provide a better understanding of several important problems in railroad technology related to stresses in the wheel-rail contact area. Problems include wheel and rail fractures, excessive wear, wheel screech, and deteriorating ride quality. The research is a logical extension of work done. Contract DOT-OS-40093, (RRIS 02A 099380). Initial efforts will be directed toward improving the cost effectiveness of the numerical analysis methods developed under that contract. To optimally utilize these methods, it becomes necessary to fully understand the dynamics and physical behavior in the "contact patch" between rail wheel and track. Emphasis will be placed on developing mathematical approximations for both singly and doubly curved, elastic surfaces. Such surfaces provide an accurate model for the rail wheel "contact patch", and the techniques developed promise to be less costly than the more standard finite element method. The surface approximations, or influence curves will be computerized during a later phase of this research. It is anticipated that the methods developed in this research will be useful in the analysis of both new and worn wheel/track surfaces.

PERFORMING AGENCY: Pennsylvania University, Philadelphia, Department of Mechanical Engineering and Applied Science  
 INVESTIGATOR: Paul, B  
 SPONSORING AGENCY: Department of Transportation, Office of University Research; Pennsylvania University, Philadelphia, Department of Mechanical Engineering and Applied Science  
 RESPONSIBLE INDIVIDUAL: Ravera, RJ Tel (202) 426-0190

Contract DOT-OS-60144  
 STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: June 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$39,565  
 ACKNOWLEDGMENT: DOT

#### 02 148342 PROFILE MEASUREMENTS OF RAILS AND WHEELS

Objective is the measurement of profiles of subway rails and wheels. This information will be translated into effective conicities for the system and used for vehicle dynamics studies.

PERFORMING AGENCY: Ontario Ministry of Transportation & Communication  
 INVESTIGATOR: Young, J Tel (416) 248-3771  
 SPONSORING AGENCY: Ontario Ministry of Transportation & Communication  
 RESPONSIBLE INDIVIDUAL: Jackson, JD Tel (416) 248-3771  
 STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$25,000  
 ACKNOWLEDGMENT: Ontario Ministry of Transportation & Communication, Can

#### 02 148358 EXPERIMENTAL RESEARCH ON RAIL VEHICLE SAFETY USING DYNAMICALLY SCALED MODELS

The objective of this research is to develop experimental techniques for the study of rail vehicle dynamics. Through the use of scaled models, a structural experimental data base on the characteristics of rail car trucks will be assembled. The establishment of this data base (more complete and

systematically structured than that feasible from large scale testing) will enable the validation of analytical tools useful in the design of railroad components. An 800 foot test track has been installed and experiments have been conducted on single wheelsets. These confirm predictions from a theoretical model developed for this project. Additional experiments will focus on the dynamics of a complete freight truck.

PERFORMING AGENCY: Princeton University, Department of Aerospace and Mechanical Sciences  
 INVESTIGATOR: Sweet, LM Tel (609) 452-5305  
 SPONSORING AGENCY: Department of Transportation, Office of University Research  
 RESPONSIBLE INDIVIDUAL: Barrows, TM

Contract DOT-OS-60147  
 STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 COMPLETION DATE: June 1979 TOTAL FUNDS: \$203,000  
 ACKNOWLEDGMENT: TSC

#### 02 157664 EXPERIMENTAL MEASUREMENTS OF NORMAL SHOCK AND VIBRATION ENVIRONMENTS

Extract and document, in a usable format, the current information on normal shock and vibration loading experienced by radioactive material shipping containers. This will involve: (1) Extraction of data from existing data banks; (2) Conducting of dynamic analysis of switching and coupling shocks; (3) Participation in appropriate test programs.

REFERENCES:  
 Shock and Vibration Environments for Large Shipping Containers on Rail Cars and Trucks, Magnuson, C, SAND-76-0427; NUREG-76-6510, May 1977

PERFORMING AGENCY: Sandia Laboratories, A-1049  
 INVESTIGATOR: Magnuson, C Tel (505) 264-2765  
 SPONSORING AGENCY: Nuclear Regulatory Commission  
 RESPONSIBLE INDIVIDUAL: Lohs, W Nuclear Regulatory Commission Tel (301) 427-4356

Contract B&R-60190504  
 STATUS: Active NOTICE DATE: July 1977 START DATE: Dec. 1975 COMPLETION DATE: Oct. 1978 TOTAL FUNDS: \$365,000  
 ACKNOWLEDGMENT: Nuclear Regulatory Commission

#### 02 160409 TESTING TRAILER AND CONTAINER ON FLAT CAR

The objective is to determine dynamic mechanical response lading parameters such as force constants and damping coefficients. Engineering data of this type is necessary to determine the response of various lading as it is influenced by vibration, variations in shipping containers and pallet configurations and in the development of predictive models to be used in optimizing the rail transportation system comprised of lading, rail cars and track structures.

PERFORMING AGENCY: Rutgers University, New Brunswick  
 SPONSORING AGENCY: Federal Railroad Administration

Contract DOT-FR-767-4323 (CC)  
 STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1977 COMPLETION DATE: May 1978 TOTAL FUNDS: \$65,253  
 ACKNOWLEDGMENT: TRAIS

#### 02 170591 EXPERIMENTAL DETERMINATION OF COEFFICIENT OF ROLLING ADHESION IN RAIL TRACTION AND BRAKING

The coefficient of rolling adhesion is strongly a function of speed and material, but also is influenced by other parameters, such as surface condition, curvature, traction or braking in the stress contact area. It has never yet been well-determined in these respects, and a VPI test rig of my design has now produced some definitive results never before achieved.

PERFORMING AGENCY: Virginia Polytechnic Institute & State University, 808440-1  
 INVESTIGATOR: Whitelaw, RL Tel (703) 951-6801  
 SPONSORING AGENCY: Federal Railroad Administration  
 STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1976 COMPLETION DATE: Aug. 1979 TOTAL FUNDS: \$67,000  
 ACKNOWLEDGMENT: Virginia Polytechnic Institute & State University

02 170594

**INVESTIGATION OF THE AERODYNAMIC CHARACTERISTICS OF RAIL FREIGHT ROLLING STOCK**

The objective of this project is to obtain information on the aerodynamic characteristics of a variety of standard railroad freight rolling stock and of selected configurations, modified to improve their aerodynamics, by means of a series of scale-model wind tunnel investigations. The final report shall indicate applicability and limitations of the test data to full-scale railroad operations.

Contract to a performing organization has not yet been awarded.

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Koper, JM Tel (202) 426-0808

Contract RFP-DOT-FR-4318/CS

STATUS: Programmed NOTICE DATE: Feb. 1978 START DATE: Mar. 1978 COMPLETION DATE: Mar. 1979 TOTAL FUNDS: \$100,000

ACKNOWLEDGMENT: FRA

02 170595

**TRAIN RESISTANCE**

Investigations and analyses of rail freight train aerodynamic and mechanical resistances are being conducted to assist the FRA/OR&D in developing an overview of both near-term and long-range considerations of energy requirements for improved rail freight service. This effort will utilize results of on-going FRA aerodynamic research on various types of rail rolling stock and previous rail energy-related studies conducted by government and industry. Potential energy benefits resulting from freight car design or operational modifications will be assessed from technical and economic considerations.

Train Resistance in Rail Freight service, 1977. Paper presented at 4th National Conference: Effects of Energy constraints on Transportation Systems. Union College, Schenectady, NY. John Koper, Office of Res & Dev/FRA, DOT.

**REFERENCES:**

Resistance of a Freight Train to Forward Motion Muhlenberg, JD

PERFORMING AGENCY: Mitre Corporation, Metrek Division, 06.30.09.200  
INVESTIGATOR: Muhlenberg, JD Tel (703) 790-6692

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Koper, JM Tel (202) 426-0808

30000

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1977 COMPLETION DATE: Sept. 1978

ACKNOWLEDGMENT: FRA

02 170642

**ADHESION OF LOCOMOTIVES FROM THE POINT OF VIEW OF THEIR CONSTRUCTION AND OPERATION**

Adhesion problems with motive power units and adhesion measurement methods; influence of the speed, the axle load, the wheel diameter, the wheel profile, the elasticity of the traction force transmission, the type and the characteristics of the electric traction motors, the regulating systems, the track characteristics, sanding, the types of wheel tire steel, the driving axle arrangement and the flexibility of the suspension. Problems studied through field tests using a special "Test machine 18,000". Present State: The final report (summarising report) is being prepared for presentation in April 1978.

Thirteen reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Osuch, K Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1963 COMPLETION DATE: 1977

ACKNOWLEDGMENT: UIC

02 170644

**PREVENTION OF DERAILMENT OF GOODS WAGONS ON DISTORTED TRACKS**

In April 1975 the B 55 Specialists Committee presented report RP 6 "Conditions for negotiating track twists. Calculation and measurement of important vehicle parameters" which gives guiding principles to the vehicle designer. These will enable him to examine new rolling stock for its safety against derailment on track twists as early as the design stage. In addition,

the methods of measurement and the evaluation of the principal vehicle parameters are specified. It is planned to incorporate these conditions in the specifications and the programme of tests for new rolling stock. Further work of the Committee will aim at supplementing the recommendations given in report RP 6 by guiding principles for the cant dependent on the radius of the curve. This still requires the study of its effects on the guiding force. The studies were initiated by a detailed inquiry among the ORE administrations and they are, at present, continued by extensive tests on 2 administrations. Publication of a report of inquiry RE 7 with requisite conclusions is scheduled for April 1978. The final report, RF 8, which summarises the work of the committee and supersedes report RP 6, will be presented in October 1978.

Seven reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Jutte, H Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1965 COMPLETION DATE: Apr. 1978

ACKNOWLEDGMENT: UIC

02 170645

**BRAKING AND ACCELERATION FORCES ON BRIDGES AND INTERACTION BETWEEN TRACK AND STRUCTURE**

Study of braking and starting forces on bridges, is now expanded to interaction between long welded rails and bridges. Initial program included tests on plain line to evaluate magnitude and sequence of tractive and braking reactions, tests on steel bridges with and without ballast, and multiple span bridges, to develop theory and recommendations for code of practice. Tests on steel bridges and plain line together with theoretical studies have provided basis for provisional recommendations. Further work is needed to verify reactions on a bridge with continuous deck. The theoretical and experimental methods already developed by the Committee will contribute towards study of temperature reactions from long welded rails, and appropriate arrangements will be combined in future testing.

Ten reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Savarit Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1968

ACKNOWLEDGMENT: UIC

02 170648

**INTERACTION BETWEEN VEHICLES AND TRACK**

Track irregularity spectra, setting up a mathematical model (track and vehicle), specification of vehicle/track conditions for ensuring adequate contact, extending knowledge about the wheel/rail contact zone. At this time, work is being done on: 1. Further development and finalisation of the mathematical model for bogie vehicles; 2. Improvement of data inputs; and 3. Optimisation of track parameters.

Seven reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Pettelat, A Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1970

ACKNOWLEDGMENT: UIC

02 170657

**EFFECT ON THE TRACK OF RAISING THE AXLE LOAD FROM 20 TO 22 T**

It is intended to study the effect of raising the axle load through simulation tests and full scale tests on the Velim test loop. At this time track tests are at present being carried out in varying the values of different parameters such as rails, sleepers and ballast, and for each axle load. Ballast settlement tests are also being made for symmetric and asymmetric wheel loading. In addition, in cooperation with the B 142 Committee, tests are being conducted on the Velim loop with a test-train with 22 t axle load. A first series of tests, corresponding to 50 million tonnes of traffic, has now been terminated.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Jutard, M Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: Apr. 1976

ACKNOWLEDGMENT: UIC



02 170660

**PERMISSIBLE MAXIMUM VALUES FOR THE Y AND Q FORCES AS WELL AS THE RATIO Y/Q**

The studies are being carried out in 3 directions: 1) Track displacement forces S: the quasi-static tests carried out at Bucharest on a specially fitted track are practically terminated as are the line tests with measurements of dynamic forces being carried out by FS, which will be continued by measurements on the test rig by PKP. 2) Criterion of derailment: new series of tests will be made in Derby and in Bucharest toward the end of the year, and also on SBB. 3) Limiting values for Y and Q: The additional calculations and the practical work of verifying them will be undertaken by PKP and CFR.

One report has been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Pettelat, A Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977

ACKNOWLEDGMENT: UIC

02 170661

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS: PHASE III**

This phase contains new tasks not dependent on completion of Phase II work, as well as some of the longer range subtasks of Phase II that were not yet undertaken. The Phase III program, projected to cover a period of 5 years, has as its goal the development of requirements for advanced-concept equipment, track and structures to meet the future needs of America's railroads, as well as the introduction of advanced technology to improve the safety and reliability of present systems. The first stage of Phase III will last about two years and has four major tasks: TTD technology sharing and implementation; advanced design methodology development; train operation aids; and future system studies.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyar, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1978 COMPLETION DATE: 1982

ACKNOWLEDGMENT: AAR

02 170663

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS: PHASE III. TASK 2--ADVANCED DESIGN METHODOLOGY DEVELOPMENT**

This task will integrate and apply analytical and experimental techniques to provide a validated design evaluation system to insure the prevention of catastrophic mechanical failures and support advanced system development in the railroad industry. The subtasks: (2.1) Adapt and illustrate a prototype

interactive graphics-supported design evaluation capability; (2.2) Use the Rail Dynamics Laboratory at Pueblo, Col., to validate structural dynamics, freight-car models and component design methods; (2.3) Complement load-environment data on track structures with investigations of ultimate track strength; (2.4) Conduct a controlled investigation of locomotive or heavy-vehicle/track interactions; (2.5) Provide up-to-date data on fatigue, fracture and wear for railroad materials in a form suitable for advanced design.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyar, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1978 COMPLETION DATE: 1979

ACKNOWLEDGMENT: AAR

02 170666

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS: PHASE II**

The overall goal is development of recommended performance specifications and relevant design guidelines to assure the safety of railroad operations with current generation track and equipment. Although originally programmed to end in 1977, many of its subtasks are not complete and some contracts will carry into and beyond 1978. Phase II work continues in these areas: Field testing, wheel/rail integrity studies, dynamic analysis, and specification guidelines. Field tests will complete wayside track data collection at six sites, implement an over-the-road load environment sampling with an instrumented six-car consist, measure wheel thermal/mechanical environment in typical revenue service, and use instrumented brake shoes in single-car stopping and drag brake testing. Wheel/rail integrity studies will publish findings of first-stage wheel/rail and centerplate laboratory wear research, determine residual stress states in rail, validate a risk model that relates rail inspection methods to probability of flaw propagation, develop cost-effective methods to detect damaged wheels. Dynamic analysis will complete final report on harmonic roll and bounce of freight cars due to track irregularities, complete the analytical representation and optimization of draft gear and cushioning units, evaluate results of auxiliary snubbing tests, complete evaluation of truck hunting, issue final evaluation report on instrumented-wheelset tests performed on Amtrak locomotive. Complete specifications for fatigue tests for couplers and truck bolsters; promote introduction of fatigue design guidelines and wheel stress limits into AAR specifications.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyar, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

## 03 025403

**URBAN RAPID RAIL VEHICLE SYSTEMS PROGRAM**

To enhance the attractiveness of rapid rail transportation to the urban traveler by providing existing and proposed transit systems with service that is comfortable, reliable, safe, and as economical as possible. Short range goals: Demonstration of the state-of-the-art in rapid rail vehicular technology. The Advanced Concept Train (ACT-1) phase calls for delivery of two next generation rail transit vehicles by August 1977 and Advanced Subsystems Development Program (ASDP) calls for component development for near-term industry application.

Subcontractors for the project are St. Louis Car Company, AiResearch Manufacturing Company, Delco Electronics, Westinghouse Air Brake and the Budd Company.

PERFORMING AGENCY: Boeing Vertol Company

INVESTIGATOR: O'Brien, T Tel (215) 522-3200

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Teel, SS Tel (202) 426-0090

Contract DOT-UT-10007

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1971 COMPLETION DATE: Dec. 1979 TOTAL FUNDS: \$45,700,000

ACKNOWLEDGMENT: UMTA (IT-06-0026)

## 03 046502

**RAILROAD WHEEL INVESTIGATION**

An analytical elastic solution to determine the stresses developed in a railway car wheel when subjected to axisymmetric heating is being used to evaluate different geometric designs. The theory is being extended to include inelastic analysis which should permit the determination of residual stresses developed in the wheel. When an adequate mathematical model is developed to predict the temperature influenced stresses in a car wheel, these stresses will be superimposed on the stresses developed by the railroad. These results should lead to a better understanding of the various types of failures experienced in service.

PERFORMING AGENCY: Illinois University, Urbana, Department of Theoretical and Applied Mechanics

INVESTIGATOR: Wetenkamp, HR

SPONSORING AGENCY: Griffin Wheel Company

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1971

ACKNOWLEDGMENT: Science Information Exchange (JGF 25)

## 03 050338

**ARTICULATED RAIL CAR TRUCK DEVELOPMENT**

Develop a dramatically improved freight car truck. Background information is also being applied to basic design of (a) locomotives, (b) rapid-transit cars, and (c) passenger cars. Design, build, and test 100 ton capacity freight car trucks based on retrofitting existing 3-piece freight car trucks to give radial-steering, referred to as the Type DR-1. Testing to 90 mph under empty and loaded car with worn wheels indicates that basic design and principles are sound. Curving tests indicate a dramatic improvement in rail and wheel life. Multiple units now being manufactured by Dofasco in Canada, and Dresser in the U.S. for actual service testing. AAR certification has been received. Several U.S. and Canadian railroads will conduct service tests.

## REFERENCES:

An Evaluation of Recent Developments in Rail Car Truck Design, List, HA, ASME #71-RR-1, Apr. 1971, RRIS #050340 in 7401

Proposed Solutions to the Freight Car Truck Problems of Flange Wear and Truck Hunting, List, HA; Cardwell, WN; Marcotte, P, American Society of Mechanical Engineers, ASME #75-WA/RT-8, July 1975, RRIS #128632 in 7601

The DR-1 Radial Truck, A Significant Advance in Freight Car Truck Technology, DOT Engineering Conference, Pueblo, Colorado, Oct. 1977

PERFORMING AGENCY: Railway Engineering Associates, Incorporated; Canadian National Railways; Dresser Transportation Equipment Division; Dominion Foundries and Steel, Limited

SPONSORING AGENCY: Railway Engineering Associates, Incorporated; Canadian National Railways; Dresser Transportation Equipment Division; Dominion Foundries and Steel, Limited

RESPONSIBLE INDIVIDUAL: List, HA Cope, GW Bexon, H

In-House

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1971 COMPLETION DATE: 1978

ACKNOWLEDGMENT: Railway Engineering Associates, Incorporated, Dresser Transportation Equipment Division, Dominion Foundries and Steel, Limited

## 03 055604

**A STRUCTURAL SURVEY OF CLASSES OF VEHICLES FOR CRASHWORTHINESS**

It is the purpose of this contract to provide the technical data required for the evaluation and improvement of the crashworthiness of several classes of rail vehicles as required in the rail safety effort. This contract is also to provide preliminary technical data for planning of possible future crashworthiness tests efforts.

PERFORMING AGENCY: Boeing Vertol Company

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Raab, AR Tel (617)494-2539

Contract DOT-TSC-856 (CPFF)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1974 COMPLETION DATE: June 1977 TOTAL FUNDS: \$239,139

ACKNOWLEDGMENT: UMTA, TRAIS

## 03 055636

**RAIL SAFETY/EQUIPMENT CRASHWORTHINESS**

The Transportation Systems Center (TSC) is providing technical assistance to the Federal Railroad Administration (FRA) in a program directed at improving railroad safety and efficiency by providing a technological basis for improvement and possible regulation in rail vehicle crashworthiness, inspection of equipment, surveillance of equipment, and other areas. As part of this program TSC is conducting technical analyses of passenger railcar collisions, derailments, and other accidents, directed toward minimizing occupant injuries.

PERFORMING AGENCY: Boeing Vertol Company

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Raab, AR Tel (617)494-2539

Contract DOT-TSC-821

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1974 TOTAL FUNDS: \$137,064

ACKNOWLEDGMENT: FRA

## 03 055774

**DEVELOPMENT OF DATA TO IMPROVE DESIGN CRITERIA OF RAILROAD WHEELS**

To measure the mechanical loads and thermal gradients due to tread braking on railroad wheels in actual service; to determine the major wheel stresses resulting from these loads and thermal effects; and to develop improved wheel service life criteria.

PERFORMING AGENCY: IIT Research Institute

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Steele, RK Tel (617)494-2457

Contract DOT-TSC-855 (CPFF)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1974 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$202,000

ACKNOWLEDGMENT: TSC (PR# TME-0120)

## 03 055916

**IMPROVEMENT OF RAILROAD ROLLER BEARING CERTIFICATION TEST PROCEDURES AND DEVELOPMENT OF ROLLER BEARING DIAGNOSTICS**

The problem of railroad roller bearing failure shall be reviewed giving consideration at a minimum to the effects of the following factors: 1. over and under lubrication. 2. loose bearing components (i.e. cap screws, seals, backing rings). 3. bearing component design. 4. adaptor condition. 5. rebuild procedures. 6. environment (speed, load, temperature). The interaction of factors leading sequentially to different modes of failure should be clearly established. An analytical model of the bearing may be useful in assessing the importance of interaction between these factors leading to bearing failure. Under a modification to the contract concepts for railroad roller bearing detection systems are to be evaluated. These systems are: 1. On-board Thermally Powered Transmitter Bolt; 2. Pulse Echo Ultrasonic Lubrication Detector, and 3. Shock Pulse Damage Detector.

A Final Report is in preparation.

PERFORMING AGENCY: SKF Industries, Incorporated  
 INVESTIGATOR: Allen, G  
 SPONSORING AGENCY: Transportation Systems Center, RR-523  
 RESPONSIBLE INDIVIDUAL: Yearwood, KW Tel (617)494-2046

Contract DOT-TSC-935 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Oct. 1974 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$113,885

ACKNOWLEDGMENT: TRAIS (RR-523)

03 058726

## PROCUREMENT OF AN IN-TRACK WHEEL RIM INSPECTION SYSTEM

Through transmission and pulse-echo ultrasonic techniques are used to detect rail cars and locomotive wheels for defects in the running surface. Wheels are tested in-motion, by two ultrasonic units which are installed in special rail assemblies, one for each rail of the track.

PERFORMING AGENCY: Scanning Systems, Incorporated  
 INVESTIGATOR: Cowan, G Tel (203) 748-6117  
 SPONSORING AGENCY: Transportation Systems Center  
 RESPONSIBLE INDIVIDUAL: Yearwood, KW Tel (617) 494-2046

Contract TSC-1070 (FFP)

STATUS: Completed NOTICE DATE: Feb. 1978 TOTAL FUNDS: \$113,426

ACKNOWLEDGMENT: TRAIS

03 059136

## ACOUSTIC SIGNATURE OF RAILROAD WHEELS

1) Develop a wheel exciter to assure reliable, uniform and repeatable impact of excitation at an optimum location of a passing railcar wheel and to achieve sufficient ruggedness of construction to withstand field conditions. 2) Develop and document data to permit discrimination between a defined flawed wheel and a non-flawed wheel, based upon the demonstrated ability of this technique to identify rim cracks, plate cracks, both in depth and size. A Final Report is in preparation.

PERFORMING AGENCY: Houston University  
 INVESTIGATOR: Finch, RD  
 SPONSORING AGENCY: Transportation Systems Center  
 RESPONSIBLE INDIVIDUAL: Thompsen, WI Tel (617) 494-2511

Contract DOT-TSC-1187 (CR)

STATUS: Active NOTICE DATE: Feb. 1978 COMPLETION DATE: May 1978 TOTAL FUNDS: \$73,000

ACKNOWLEDGMENT: TRAIS

03 059296

## METROLINER CAR TRUCK UPGRADING

The contractor shall design, fabricate, assemble and test improved Metro-liner trucks.

PERFORMING AGENCY: General Steel Industries, Incorporated  
 SPONSORING AGENCY: Federal Railroad Administration

Contract DOT-FR-64237 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$637,925

ACKNOWLEDGMENT: TRAIS

03 059345

## PROVIDE RESOURCES FOR TESTING OF THERMALLY SHIELDED TANK CARS

No Abstract.

PERFORMING AGENCY: Federal Railroad Administration, Department of Transportation  
 SPONSORING AGENCY: Transportation Systems Center

ID DOT-RA-76-44 (CR)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: June 1976 COMPLETION DATE: July 1976 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: TRAIS

03 059420

## PERFORMANCE EVALUATION OF LIGHTWEIGHT INTERMODAL FLAT CARS

Measurement of ride vibration and wear characteristics of two experimental lightweight skeleton TOGC and COFC flat cars in addition to standard TTAX car. Program includes 150,000 miles of revenue service with periodic measurements of ride vibration and wear.

Co-sponsored by an industry group including the Trailer-Train Company, Pullman-Standard Division, National Castings Division of Midland Ross, American Steel Foundries Company.

PERFORMING AGENCY: Atchison, Topeka and Santa Fe Railway; ENSCO, Incorporated

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Blanchfield, JR Federal Railroad Administration Tel (202)426-0808

Contract DOT-FR-65218

STATUS: Active NOTICE DATE: July 1977 START DATE: Aug. 1976 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$750,000

ACKNOWLEDGMENT: TRAIS

03 059965

## TEST PLAN FOR ASSESSING STRESS STATES AND TEMPERATURES OF NEW RAILROAD WHEELS

The objective is to develop a test plan for assessing the stress states and temperatures of new railroad wheels under the following conditions: 1) No external loads (residual stress state); 2) dynamic vertical loads; 3) dynamic lateral loads; 4) combined lateral and vertical dynamic loads; 5) normal slow down and drag braking; and 6) emergency braking from 60 mph and 100 mph.

PERFORMING AGENCY: Small Business Administration  
 SPONSORING AGENCY: Federal Railroad Administration  
 RESPONSIBLE INDIVIDUAL: Levine, D Tel (202) 426-1227

Contract DOT-FR-74288 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1977 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$97,993

ACKNOWLEDGMENT: TRAIS

03 081786

## RAILROAD COUPLER SAFETY RESEARCH AND TEST PROJECT

Because of the recognition of a general lack of knowledge regarding the environment to which couplers and yokes are subjected because of the increased power from modern locomotives, higher operating speeds and increased use of high capacity cars, this project has as its objectives: (1) Study the operating and service conditions of couplers and yokes; (2) Investigate the technical, economic and safety aspects of coupler failures in service; (3) Evaluate standard coupler and yoke designs; (4) Prepare detailed guidelines for the proposed performance and test specifications for couplers and yokes; (5) Conduct a preliminary evaluation of current standard designs of coupler components under conditions listed in Item 4. Data has been acquired from instruments installed in a special test box car which has operated in various services. With service testing nearly complete, attention is now being given to laboratory tests required for recommendations for purchase and acceptance specifications. Fatigue and fracture toughness characteristics of steels used in couplers and the stress levels in the components must be determined. Agreement has been given to merge this project into Phase II of the Track-Train Dynamics Project, Task 5. All of the objectives of the Coupler Safety Project will be retained.

PERFORMING AGENCY: Association of American Railroads Technical Center; Railway Progress Institute

INVESTIGATOR: Morella, NA Tel (216) 229-3400

SPONSORING AGENCY: Association of American Railroads Technical Center; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Morella, NA Tel (216) 229-3400

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1972

ACKNOWLEDGMENT: AAR

03 081787

## RAILROAD TRUCK SAFETY RESEARCH AND TEST PROJECT

This project has the objective of developing guidelines for new specifications for truck bolsters and side frames to meet the increasingly strenuous

demands of rail freight transportation. Road service environmental tests to measure loads/stresses to which components are subjected under all types of operating conditions are essentially complete. IITRI reduction and analysis of recorded data is being translated to methods of laboratory bolster dynamic tests. Initial lab tests of 1975 and 1976 were conducted at the Test Engineering Department of American Steel Foundries. Further lab testing started in November, 1976, and continues into 1977 at the Testing Laboratory of Dresser Transportation Equipment, Division of Dresser Industries. Additional lab testing is projected for 1978, at the AAR Technical Center, to broaden the experience base and to validate proposed guidelines for an interim bolster fatigue test specification. This work is to be used as environmental and physical test basis for the Track Train Dynamics Phase II task on trucks.

PERFORMING AGENCY: Association of American Railroads Technical Center; Railway Progress Institute

INVESTIGATOR: Evans, RA Tel (312)567-3598

SPONSORING AGENCY: Association of American Railroads Technical Center; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Evans, RA Tel (312)567-3598

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1973 TOTAL FUNDS: \$230,000

ACKNOWLEDGMENT: AAR

### 03 081798

#### INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 3--TRUCKS AND SUSPENSION

Overall task objectives are the development of recommended performance specifications and test specifications for conventional three piece trucks. Specifications will be developed through a comprehensive research project built upon the RPI-AAR Railroad Truck Safety Research and Test Project and utilizing dynamic simulation computer models developed in Phase I of the Track Train Dynamics Program. Test specification development will involve determination of service loading and development of techniques necessary for predicting failure under dynamic loads. Task will also involve developing capability to fatigue test truck components. Field testing will include validation of the truck stability model developed by Clemson University and Arizona State University in conjunction with FRA and the TTD program. The model evaluates dynamic stability of a truck under a wide variety of service conditions and validation will enable it to be used in the study of phenomena such as truck hunting. The Harmonic Roll Series computer programs have been used to show how suspension characteristics could be matched with the vehicle to alleviate problems related to rock and roll and harmonic bounce.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyer, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1975 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

### 03 081800

#### INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 4--CAR STRUCTURES

Task objective is the development of recommended performance specifications and design guidelines for railroad freight car structures. Method will involve development of suitable fatigue analysis approach coupled with evaluation of advanced structural analysis methods. Task will include establishing test program goals for environmental loading tests to be pursued during the program. Test plans will be developed and tests conducted to validate fatigue analysis methods for car structural components. The basic approach adopted is a cumulative damage approach using the methodology which has been used in the aerospace and heavy-equipment industries. Development of interim guidelines using this methodology and presently available load spectrum and material fatigue performance was made available to TTD by ACF Industries. Further work in fatigue methodology and acquisition of additional load spectra from environmental sampling is progressing.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyer, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1975 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

### 03 081801

#### INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK 5--COUPLERS, DRAFTGEAR, AND CUSHION UNITS

Task objectives are development of recommended performance and/or test specifications and design guidelines for railroad freight car couplers, draftgear, and cushion units. Task will build on current RPI-AAR Railroad Coupler Safety Research and Test Project and will utilize dynamic simulation computer models developed during Phase I of the Track Train Dynamics Program. Coupler effort will concentrate on stress and fatigue analysis. Draft gear and cushion unit efforts will be directed toward investigations of opportunities for improved train handling through optimized operating characteristics.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyer, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1975 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

### 03 099382

#### WHEEL RESEARCH PROGRAM

It is the objective of this program to prevent the formation of cracks in various wheel locations which can occur because of various conditions and can ultimately result in catastrophic failure. The initial step was a full review of wheel failure statistics to isolate wheel contours generating the most frequent failures. The problem is to be alleviated by considering changes in wheel design and wheel material, with emphasis on design. Finite element analysis is conducted on each characteristic shape of wheel involving stress due to tread loading, lateral loading and to thermal inputs resulting from drag or emergency braking. Such analysis would be followed by service or dynamometer tests to verify results. The initial phase of this involved the 28-inch wheel and was a joint project with Trailer Train Co. It involved cracked wheel plates and shattered rims, and indicated some solutions which would be generally applicable. In addition to the loading problems, generally applicable. In addition to the loading problems, with overheated wheels. It was initially found that criteria for rejecting such wheels were overly restrictive. Non-destructive residual stress measurement techniques, such as the Barkhausen method, are being evaluated for detecting thermally damaged wheels. The thermal fatigue behavior of wheel steels is also being investigated. Detection of rim thermal cracks, utilizing ultrasonic techniques like those used in AAR's rail test program, are also proceeding.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads

STATUS: Active NOTICE DATE: Aug. 1976

ACKNOWLEDGMENT: AAR

### 03 099426

#### RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 9-DESIGN STUDY-TANKS AND ATTACHMENTS

Phase 09 concerns the behavior of tank car tanks and their appurtenances (fittings and attachments) in the mechanical environment of railroad accidents. The objectives are to study designs of tank shells, fittings and attachments in relation to the potential of product loss under mechanical

impacts in accidents and to analyze, on a cost-effective basis, the feasibility of reducing losses through design improvements. This general area of study will continue under the Project. Currently, an extensive series of tests are underway. The tests will comprise impact testing of several bottom outlet configurations and protective skid proposals. The objectives are to develop design parameters for bottom fittings breakage grooves and protective skids.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Phillips, EA Tel (312) 567-3607

STATUS: Active NOTICE DATE: Feb. 1978 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

## 03 099430

### RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 14-STUB SILL TANK CAR BUCKLING

This phase concerns buckling which has occurred inboard of the stub still termination on certain designs of non-pressure stub sill cars in either compressive train action or yard impact situations. The problem has been limited to empty cars, indicating that for loaded cars the tensile stresses produced in the bottom fibers of the tank by the lading weight is sufficient to offset the otherwise critical compressive stresses. The primary objective is to determine quantitatively what design and test loads should be specified for such stub sill cars to assure that their resistance to buckling is at least as good as that of all other freight cars. A second objective is to develop data on the brittle lacquer or photostress techniques of experimental analysis, and on the electrical strain gage test procedures and interpretation methods, in order to improve specification requirements in these areas. This work, which has been completed involved static squeezing and dynamic impacting of nine stub sill cars of different designs, four of which have experienced various histories of buckling and five of which are of new improved design. Approximately 80 strain gage rosettes were employed on each car. Conclusions from this work will be made in report form to the AAR Car Construction and Tank Car Committees for their use in adopting specification changes, if deemed necessary.

See also RRIS 12A 081788.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Phillips, EA Tel (312) 567-3607

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: 1974 COMPLETION DATE: 1977

ACKNOWLEDGMENT: AAR

## 03 099432

### ADVANCED COUPLING CONCEPTS PROJECT

The objectives of the Advanced Coupling Concepts project are: 1) To determine areas in which safety and efficiency could be improved by changes in the coupling system. 2) To quantify value to be achieved by such improvements. 3) To define functional requirements in the form of a specification to guide development of improved systems. The scope includes all functional elements essential to interfacing of railroad cars and locomotives including mechanical couplers, train lines, etc. An economic model is to be developed and data collected to evaluate new coupling concepts individually and as logically assembled systems.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Punwani, SK

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

Contract TSC-1087 (CPFF)

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: 1974 TOTAL FUNDS: \$92,296

ACKNOWLEDGMENT: AAR

## 03 099435

### LOCOMOTIVE CAB DESIGN DEVELOPMENT

The objective of this effort is the development of a locomotive control compartment based on an evaluation of the operator's functional require-

ments and comprehensive human factors engineering studies. The contractor has developed specifications for the design, test, and evaluation of a locomotive cab which is in concert with all operational, human factors, safety, and occupant protection considerations. The cab design incorporates the predictable technical and operational progress, as well as 10 to 15 year projections of train handling and control requirements. In Phase I of the original contract, a number of potentially feasible conceptual alternative locomotive cab configurations were developed. The most suitable alternate was selected on the basis of human factors, structural integrity, and cost trade-off studies now in progress. In Phase II of the original contract, a detailed human factors design of the optimal locomotive cab was accomplished, and a full scale mock-up fabricated. Operational feasibility was determined in a limited series of performance tests utilizing the mock-up. Under the present contract modification, the scope of the test programs will be increased to include a nationwide sample of evaluators from heavy rail properties. The sample will consist of engineers and trainmen representing geographic, operational and experimental variables necessary to accomplish a broad based evaluation. As a result of the evaluation, human factors engineering functional specifications for a new locomotive cab will be written to include requirements for all man/software/hardware interfaces of the cab design. In addition, recommendations will be made on appropriate areas for further work, including suggestions for areas other than the immediate cab environment, such as the potential for new methods of train handling, communication techniques, and signalling systems.

Funds for this project are administered by DOT/Transportation Systems Center, Cambridge, Mass.

#### REFERENCES:

Human Factors Engineering Systems Functional Analysis Tech Rpt. No.

1

Locomotive Cab Design Dev: V1, Anal of Locomotive Cab Environment and Dev of Cab Design Alternatives, Robinson, J; Piccione, D; Lamers, G, FRA/ORD-76-275 I, Oct. 1976

Locomotive Cab Design Development: V2 Operators Manual Robinson, J; Piccione, D, FRA/ORD-76-275 II, Oct. 1976

Locomotive Cab Design Development: V3, Design Applications Analysis, Robinson, J, FRA/ORD-76-275 III, Oct. 1976

PERFORMING AGENCY: Boeing Vertol Company, D339-10044

INVESTIGATOR: Robinson, J Tel (215) 522-2760

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Devoe, DB Tel (617) 494-2199

Contract DOT-TSC-1330

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Mar. 1977 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$442,313

ACKNOWLEDGMENT: FRA

## 03 099439

### HOT JOURNAL SENSOR AND LOCAL DERAILMENT DETECTOR

This multi-year program is aimed at reducing the number of train derailments. Active anti-derailment devices are needed by the railroad industry which when installed on a train will automatically stop the train upon detection of a hot journal or a wheel on the ground. NAV-SURFWPNCEN/WOL will develop, install and initiate in-service demonstrations of the Hot Journal Sensor (HJS) & the Local Derailment Detector (LDD) on a limited number of railroad cars. Hot box tests, over-the-road shock tests and normal bearing tests have been conducted on the Duluth, Missabe & Iron Range Railway at Duluth, Minn. Data from these tests will establish a design base for both the LDD and HJS. Laboratory testings has been conducted on a piezo-electric power source for an electro-explosive HJS device.

PERFORMING AGENCY: Naval Surface Weapons Center

INVESTIGATOR: O'Steen, JK

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Levine, D Tel (202) 426-1227

IA AR54162

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: FRA

## 03 136342

### DESIGN OF AN ADVANCED CONCEPT TRAIN

Description: The object of this project is to demonstrate new concepts for the subway and commuter rail car industry. These concepts will reduce life

cycle costs; increase passenger appeal; and reduce the impact on the environment. Two vehicles are being built for test and evaluation at TSC. The methods for reducing life cycle costs are: 1. An efficient propulsion system which stores the vehicle braking energy in a flywheel to be used later to accelerate the vehicle. All accessories are shaft driven from this flywheel. 2. Reliability-Designing for reliability and designing parts out of the vehicle. 3. Designing more maintainable equipment. 4. Reducing operating personnel by automaticity and closed circuit T.V. monitors. 5. Reducing track wear thru a better slip-slid control and better ride quality. Less environmental impact thru: 1. Reduced noise using composite wheels. 2. Less thermal emission since the braking energy is stored as rotational energy interferences due to advanced propulsion design.

PERFORMING AGENCY: AiResearch Manufacturing Company; Boeing Vertol Company

INVESTIGATOR: O'Brien, T

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Tucker, HL Tel (202) 426-0090

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Mar. 1972 COMPLETION DATE: June 1978

### 03 138537

#### GAS TURBINE-ELECTRIC (GT-E) COMMUTER CARS

The objective is to develop advanced dual powered commuter cars capable of gas turbine or electric propulsion which is equivalent to all-electric car performance, and can provide a no-change ride to suburbs beyond electrified territory. Four GT/E cars were built by General Electric and four by Garrett AiResearch. Two Garrett cars were tested briefly at the DOT Transportation Test Center, Pueblo, Colo. All eight cars were tested in non-revenue service beginning in 1975 on the Long Island Rail Road, and entered revenue service in 1976 for a 12 month evaluation period.

Subcontractors are Garrett AiResearch and General Electric Company and Louis T. Klauder and Associates.

PERFORMING AGENCY: Metropolitan Transportation Authority of New York

SPONSORING AGENCY: Urban Mass Transportation Administration; Metropolitan Transportation Authority of New York

RESPONSIBLE INDIVIDUAL: Mora, J Tel (202) 426-0090

Contract DOT-UT-613

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1971 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$14,800,000

ACKNOWLEDGMENT: UMTA

### 03 138538

#### RAILCAR STANDARDIZATION--PHASE I

The objective of the combined UMTA/transit industry effort is to determine the feasibility of rail rapid transit car standardization, the appropriateness of various degrees of standardization, and the potential benefits to be derived therefrom. If standardization is found to be feasible, a second phase of the project will be initiated to develop a standardized family of specifications. The goal of the project is to achieve lower per unit cost (first cost and life cycle), reduced maintenance problems and costs, increased car availability, reduced requirements for car customization, and provision for evolutionary improvement in technology.

#### REFERENCES:

Determination of the Optimal Approach to Rail Rapid Transit Car Standardization, NTIS, Final Report 131 pp, PB-259363

PERFORMING AGENCY: International Research and Technology Corporation

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Mora, J

Contract

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: May 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$100,000

ACKNOWLEDGMENT: UMTA

### 03 138539

#### ADVANCED SUBSYSTEMS DEVELOPMENT PROGRAM (ASDP)

The objective of this investigation, a part of the Urban Rapid Rail Vehicle Systems Program, is to achieve transit vehicles that are as reliable, safe and economical as possible, choosing subsystems which reduce the cost of operation and maintenance, reduce energy requirements and/or improve

safety, comfort and performance. The components chosen for detailed development are the self-synchronous a-c traction motor, the monomotor truck with active suspension and the synchronous spin-slide control braking system with improved emergency stopping capability.

Subcontractors are Delco Electronics, Budd Company and Westinghouse Air Brake Division.

PERFORMING AGENCY: Boeing Vertol Company

INVESTIGATOR: O'Brien, T

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Tucker, HL Tel (202) 426-0090

Contract DOT-UT-10007

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Dec. 1976 COMPLETION DATE: June 1979 TOTAL FUNDS: \$9,200,000

ACKNOWLEDGMENT: UMTA

### 03 138559

#### VEHICLE INSPECTION

Provides surveillance and non-destructive inspection of both vehicle and components. Directs and monitors government and contractor development and evaluation efforts in the areas of automated vehicle on-board surveillance, wayside inspection, and non-destructive inspection of components. Provides for the design and fabrication of transducer, computerized data collection and automated detection systems.

PERFORMING AGENCY: Federal Railroad Administration, Improved Inspection, Detection and Testing Research Division

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Winn, JB Tel (202) 426-1682

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Oct. 1976

ACKNOWLEDGMENT: FRA

### 03 138565

#### ROLLING STOCK SAFETY

The goal of the Rolling Stock Safety Program is to improve railroad safety through the development of (a) performance criteria for vehicles and vehicle components which are less prone to failures, (b) techniques and mechanics for predicting, detecting, and reacting to the failures which do occur, and (c) concepts to increase the accident survivability of vehicle occupants. Work is being undertaken concerning locomotives, hazardous material tank cars, component failure prevention, and track-train dynamics.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Levine, D Tel (202) 426-1227

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1976

ACKNOWLEDGMENT: FRA

### 03 138796

#### RADIAL-AXLE FREIGHT CAR TRUCKS

Agreement with South African Inventions Development Corp. covers application of radial-axle freight car trucks in North America based on Scheffel principles originated on South African Railways. Special wheel tread profile and diagonal bracing between axles minimize flange guidance in curves. Reductions in truck hunting, and wheel and rail wear, and rolling resistance in curves are major objectives.

#### REFERENCES:

Self-Steering Wheelsets Will Reduce Wear and Permit Higher Speeds., Scheffel, H, Railway Gazette International, Vol. 132 No. 12, 453-456 pp, Dec. 1976

PERFORMING AGENCY: Standard Car Truck Company, Proj. No. 30000

INVESTIGATOR: Bullock, RL Tel (312) 427-1466

SPONSORING AGENCY: Standard Car Truck Company

In-House

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Oct. 1973 COMPLETION DATE: Dec. 1977

### 03 138797

#### RADIAL-AXLE PASSENGER CAR TRUCKS

Agreement with South African Inventions Development Corp. covers development and prototype testing in North America of radial-axle trucks



for main-line passenger, commuter and transit cars based on Scheffel principles organized on South African Railways. Objectives include improved running stability and riding comfort, and decreased wheel and rail wear.

See also 03A 138796 this bulletin.

PERFORMING AGENCY: General Steel Industries, Incorporated

INVESTIGATOR: Jackson, KL

SPONSORING AGENCY: General Steel Industries, Incorporated

STATUS: Active NOTICE DATE: Aug. 1976 START DATE: July 1976

03 148336

## HOPPER-BOTTOM BOXCAR FOR RAILROAD TRANSPORTATION

Two prototype hopper-bottom box cars will be evaluated in various shipping experiments. The economics, engineering and operation of the cars will be studied. The potential for relieving seasonal car shortages for grain and soybeans will be appraised. The cars will haul bulk grain in one direction and packaged or palletized products or lumber on all or most return trips. Costs of transportation with the two cars will be compared with costs of the same amount of service from conventional covered hopper cars or box cars.

PERFORMING AGENCY: Chicago, Milwaukee, St. Paul and Pacific Railroad

SPONSORING AGENCY: Agricultural Research Service, Department of Agriculture; Chicago, Milwaukee, St. Paul and Pacific Railroad

RESPONSIBLE INDIVIDUAL: Breakiron, PL

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1976 COMPLETION DATE: 1978 TOTAL FUNDS: \$60,000

ACKNOWLEDGMENT: Department of Agriculture

03 148345

## RAILROAD TANK SAFETY RESEARCH AND TEST PROJECT. PHASE 16-TANK CAR WEAR EXPERIMENTS

In the FAST program at the DOT Test Center 18 tank cars will eventually accumulate a total of approximately 160,000 miles. These tank car accelerated Life Tests (ALT) will provide an in-service reliability of both insulation jacket type and sprayed-on-coating-type thermal shields. Phase 16 has been established to cover the various tank car component measurements (wheels, trucks, center plates, brake shoes, etc.) as related to wear.

See also 12A 099425.

PERFORMING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration

SPONSORING AGENCY: Association of American Railroads Technical Center; Railway Progress Institute; Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Phillips, EA Tel (312)567-3607

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1976

ACKNOWLEDGMENT: Association of American Railroads Technical Center

03 159630

## FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, TASK 6. UTILIZATION IMPACTS OF FREIGHT CAR DESIGN AND SERVICEABILITY

Evaluate the relationships between serviceability and freight car utilization. Analyze utilization costs associated with car purchase decisions based on initial purchase price alone. Standardization of car design will be investigated. Evaluate the utilization costs related to the rejecting of cars by shippers including the costs and benefits of different strategies to reduce the number of expected bad-order cars. Conduct a study to quantify the benefits of cooperative repair programs by individual railroads.

PERFORMING AGENCY: Association of American Railroads

SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Shamberger, RC Tel (202) 426-2608 Wooden, DG Tel (202) 293-5018

92500

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$92,500

ACKNOWLEDGMENT: AAR

03 159632

## MAINTAINABILITY METHODOLOGY FOR THE EVALUATION OF ALTERNATIVE HIGH SPEED PASSENGER TRAIN TRUCKS

This work is for the development of a maintainability model for use on advanced passenger trains capable of at least 125 MPH (200 KPH). Passenger train locomotives and powered and non-powered cars will be considered. The model is to include costs associated with all truck components, such as braking equipment, generators, suspension systems, structural elements and traction motors. Acquisition and utilization of design and maintenance data in an appropriate model to provide a methodology suitable for specifying and evaluating new passenger train trucks is the major thrust of this project. Early in the project, the simulation cost model (SCM) technique was identified as being the most appropriate technique to use. It calculates the cost per unit time needed to operate the component or system under consideration. Sensitivity analyses can be run and future cost and component or system usage projections can be made. Since the technique incorporates dynamic analysis, the effects of gradually introducing a new or improved component can be estimated.

PERFORMING AGENCY: Shaker Research Corporation

INVESTIGATOR: Krauter, AI Tel (518)877-8581

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Yearwood, KW Tel (614)494-2046

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Dec. 1976 COMPLETION DATE: Feb. 1978 TOTAL FUNDS: \$70,806

ACKNOWLEDGMENT: TSC

03 159633

## FABRICATE AND PACKAGE TWO ENGINEERING PROTOTYPE NON-DESTRUCTIVE RAILROAD ROLLER BEARING DIAGNOSTIC SYSTEMS

The purpose of this contract is to develop two (2) non-destructive instrumentation systems for evaluation of diagnostic techniques. One system; a Railroad Roller Bearing Shock Emission Analyzer will be used to detect spalling and brinelling in roller bearings. The other system, a Pulse Echo Ultrasonic Lubrication Detector will determine the lubrication level in roller bearings. These systems should be capable of inspecting the bearings while they are on the wheel set.

PERFORMING AGENCY: SKF Industries, Incorporated

INVESTIGATOR: Allen, G Tel (215) 265-1900

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Yearwood, KW Tel (617) 494-2046

Contract DOT-TSC-1377

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 TOTAL FUNDS: \$161,643

ACKNOWLEDGMENT: TSC

03 160405

## IMPROVED PASSENGER EQUIPMENT EVALUATION PROGRAM

The objectives of this program are to evaluate new passenger train systems and equipment now under development throughout the world, to develop standard methods and techniques for the evaluation of passenger train equipment, and to develop specifications for passenger train equipment.

PERFORMING AGENCY: Unified Industries, Incorporated/SBA

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Lamproe, AF Tel (202) 426-9564

Contract DOT-FR-74249 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1977 COMPLETION DATE: Sept. 1979 TOTAL FUNDS: \$2,487,428

ACKNOWLEDGMENT: TRAIS

03 165811

## RAILCAR STANDARDIZATION-PHASE II

The broad objectives of UMTA's Railcar Standardization program are to reduce or stabilize railcar initial and life cycle costs, reduce maintenance costs, increase fleet availability and permit evolutionary technology improvements. The contractor will perform a series of tasks including one requiring the development of a minimum number of car performance and dimensional specifications which collectively bracket future transit industry requirements.

PERFORMING AGENCY: Parsons, Brinckerhoff, Quade and Douglas, Inc.  
IT-06-0175

INVESTIGATOR: Morris, RE Tel (703) 827-0227

SPONSORING AGENCY: Urban Mass Transportation Administration, Office of Technology Development and Deployment

RESPONSIBLE INDIVIDUAL: Mora, J Tel (202) 426-0090 Rhine, W

Contract DOT-UT-70043

STATUS: Active NOTICE DATE: Nov. 1977 START DATE: Sept. 1977 COMPLETION DATE: Nov. 1978 TOTAL FUNDS: \$484,274

ACKNOWLEDGMENT: UMTA

### 03 170592

#### TRANSIT TRUCK TESTING

To provide confidence in analytical predictions for future truck designs and analysis of existing truck problems.

PERFORMING AGENCY: Ontario Ministry of Transportation & Communication, 3122

INVESTIGATOR: Young, J Tel (416) 248-3771 Appa Rao, T

SPONSORING AGENCY: Ontario Ministry of Transportation & Communication, Can

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1977 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$31,500

ACKNOWLEDGMENT: Ontario Ministry of Transportation & Communication, Can

### 03 170601

#### RAIL CAR STANDARDIZATION, PHASE II

APTA will provide industry input, advice and consensus to UMTA contractor in their work in developing the standard rapid rail transit car specification.

PERFORMING AGENCY: American Public Transit Association

SPONSORING AGENCY: Urban Mass Transportation Administration

Contract DOT-UT-60004

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1976 COMPLETION DATE: Oct. 1978 TOTAL FUNDS: \$140,000

ACKNOWLEDGMENT: American Public Transit Association

### 03 170604

#### URBAN RAPID RAIL VEHICLES AND SYSTEMS PROGRAM PHASE IV

The Urban Rapid Rail Vehicles & Systems (URRVS) Program includes two parallel efforts. One activity is directed towards completion of the Advanced Concept Train (ACT) and the other activity supports the Advanced Subsystem Development Program (ASDP).

PERFORMING AGENCY: American Public Transit Association

SPONSORING AGENCY: Urban Mass Transportation Administration

Contract DOT-UT-60060

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1977 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$120,000

ACKNOWLEDGMENT: American Public Transit Association

### 03 170608

#### ENGINEERING DATA FOR CHARACTERIZATION OF RAILWAY ROLLING STOCK AND REPRESENTATIVE LOADINGS AND WHEEL PROFILES

This contract will provide engineering data to characterize the fleet of U.S. railway rolling stock, representative loadings and wheel profiles, for the range of freight, passenger and locomotive vehicles in current use or proposed for use in the near future. This data is intended primarily for use in parametric studies of rail vehicle/track system dynamic interactions, performed under separate contract (DOT-TSC-1302), and may also be useful to freight systems studies. The efforts of the contractor are expected to result in 1-Definition of major generic families of rail cars and locomotives based on similar configurational features; 2-Definition of truck configurations, couplers and representative loadings for each generic vehicle family; 3-Engineering parameters describing generic families of vehicles, trucks and loadings; 4-Descriptions of representative in-service wheel profiles for each generic vehicle family.

PERFORMING AGENCY: Pullman-Standard Car Manufacturing Company, Champ Carry Technical Center

INVESTIGATOR: Johnstone, B

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Di Masi, FP Tel (617) 494-2210

Contract DOT-TSC-1362

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1977 COMPLETION DATE: June 1979

ACKNOWLEDGMENT: FRA

### 03 170617

#### PERFORMANCE LIMITS OF RAIL PASSENGER VEHICLES

The objective of this research is to identify the dynamic performance capability of conventional and innovative passenger truck designs. As a part of this objective, the best performance capability of generic optimum passive passenger trucks, employing conventional wheel-sets, will be established so that specific truck designs may be compared against the general optimum design. The research consists of defining, in an engineering sense, the performance boundaries (hunting, curving, derailment, ride quality, wheel-track force levels, etc.) of current and proposed passenger truck configurations. This work will compare the performance of conventional passenger trucks, optimized conventional trucks and new truck designs (e.g. the radial truck), to determine the performance limits of each class of passenger trucks.

PERFORMING AGENCY: Massachusetts Institute of Technology, Department of Mechanical Engineering

INVESTIGATOR: Hedrick, JK Wormley, DN Richardson, HH

SPONSORING AGENCY: Department of Transportation, Office of University Research

RESPONSIBLE INDIVIDUAL: Ravera, RJ Tel (202) 426-0190

Contract DOT-OS-70052

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 COMPLETION DATE: Sept. 1978

ACKNOWLEDGMENT: DOT

### 03 170630

#### WHEEL SETS WITH ASSEMBLED AXLEBOXES: DESIGN, MAINTENANCE AND STANDARDISATION

Standardization of wheelsets with assembled journal bearings. Maintenance recommendations. Standardization of axles. Comparison of calculation methods. Comparative study of various types of roller bearings. Study of current flow through roller bearings. Fixation of brake discs on small wheels. Present state; (1) Standardisation of wheelsets with assembled journal bearings: a. Field tests on wheels of 920 mm Ø will be continued up to end of 1977. b. Tests on wheels of 1,000 mm Ø according to B 136/RP 2 have been commenced. c. Studies and tests for wheelsets fitted with small wheels are being carried out. Standardisation of axleshafts and fixation of brake discs on small wheels will also be dealt with here. (2) Establishment of a calculation method applicable to future standard wheelsets and recognised by the Member Administrations. The first interim report B 136/RP 3 was approved on October 1976. A full report B 136/RP 6 will be presented in April 1978. (3) Studies of maintenance methods for wheelsets with assembled axleboxes used by the different Administrations; report B 136/RP 7, October 1978. (4) Study of current flow phenomena. Inquiry results being evaluated; Report in April 1979. (5) Study of standardization of dimensions of roller bearings is being made with an inquiry (April 1978).

Three reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Minkes Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1973 COMPLETION DATE: 1979

ACKNOWLEDGMENT: UIC

### 03 170638

#### STANDARDISATION OF AIR-CONDITIONING AND HEATING INSTALLATIONS

With the delivery of the Eurofima prototype standard passenger coaches the B 107 Committee has been given an opportunity to study, in conjunction with the B 108 Committee, different air-conditioning systems (single and twin duct systems) installed in virtually identical coaches. Relevant measurements were taken in accordance with a test programme worked out by a joint group of the two Committees B 107 and B 108, the tests being carried out at the Vienna Arsenal Climatic Chambers. The results of these tests are described in the report B 107/RP 4 of October 1975. Further studies

concern the interchangeability of given parts of air-conditioning systems and the improvement of the air distribution in the compartments.

Four reports have been published to date.

PERFORMING AGENCY: International Union of Railways  
RESPONSIBLE INDIVIDUAL: Hoppe Office for Research and Experiments  
STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1970  
ACKNOWLEDGMENT: UIC

## 03 170639

### CONDITIONS WHICH SHOULD BE COMPLIED WITH BY WAGON COMPONENTS FOR 22 T AXLE LOAD

Study concerning the adaptation of the present cars to an axle load raised from 20 to 22 t. Theoretical and tentative analysis of the structural elements of the car liable to affect directly the operational reliability and fatigue strength at increased axle loads. At this time a test-train on the lines of a network for studying the stresses at different points of bogie frames is being run. The corresponding report is in the course of being drafted. Parallel with the tests for the D 141 Committee, test-train running is being carried out on the Velim loop. Initial conclusions could be drawn in the beginning of 1978 after completion of a first series of runs covering 100,000 km.

PERFORMING AGENCY: International Union of Railways  
RESPONSIBLE INDIVIDUAL: Jutard, M Office for Research and Experiments  
STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1976  
ACKNOWLEDGMENT: UIC

## 03 170641

### ELASTIC SYSTEMS FOR TRACTION AND SHOCK GEAR (SIDE BUFFERS AND CENTRE BUFFERS)

Research, comparison and development of elastic systems for current and future traction and shock systems. Devices to protect the load (long-stroke shock absorbing systems, other means); preparation of leaflets for elastic systems and long-stroke shock absorbing systems. Acceptance testing of spring systems. Comparative tests with representative specimens of the five families of elastic systems have been concluded. All the results have been summarised in a report (RP 14). A joint leaflet has been prepared which will also include the special conditions for the friction cone, hydrodynamic compression and hydrostatic compression families of elastomers (from reports B 36/RP 12 and 13). The acceptance procedure for elastic elements has been initiated; the "ring spring types B 412B" (RP 16) and "B 412A" (RP 17) have been accepted; acceptance of types Jarret DC 13, Rheinmetall 129-11U and Sagem 12054 is in progress. Testing of load protecting devices (so far dealt with in reports No. 10, 11 and 15) is still to be completed. A leaflet for long-stroke shock absorbing systems has been prepared (RP 18). A joint UIC/OSJD leaflet is being prepared for an elastic system for passenger coaches (all elastic elements between two coupled coaches). Theoretical calculations are in progress for elastic systems dependent on speed.

Eighteen reports have been published to date.

PERFORMING AGENCY: International Union of Railways  
RESPONSIBLE INDIVIDUAL: Lage, HH Office for Research and Experiments  
STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1959  
ACKNOWLEDGMENT: UIC

## 03 170643

### TESTS ON AUTOMATIC COUPLING

Work has continued to perfect the automatic coupler for wagons, chiefly regarding the interchangeability of various sub-assemblies and the design of the operating components. The engineering work on the automatic coupler for wagons has been completed in time. The revised complete set of drawings for the production of the automatic coupler is available. A rather large number of these couplers are already in use in trains on scheduled services to gather more findings on the wear characteristics and maintenance conditions. In this connection, trains with a total mass of about 5400 tonnes are also being equipped for ore traffic; they were placed in operation early in November 1976. Tests in progress on revenue earning services on the system of various administrations which, in to some extent difficult operating and climatic conditions, are being made with trains of a total mass of up to 5000 tonnes and fitted with couplers of the 1969 type will be continued. Studies covering the final design of the automatic coupler for passenger coaches have been completed. Some details of this coupler vary from that for wagons to do justice to the special conditions of a modern

passenger coach; direct coupling with the automatic coupler for wagons in ensured. The first couplers will be supplied during the period ending 1977/beginning 1978. Preliminary tests will then be carried out immediately.

Nineteen reports have been published to date.

PERFORMING AGENCY: International Union of Railways  
RESPONSIBLE INDIVIDUAL: Lang Office for Research and Experiments  
STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1968  
ACKNOWLEDGMENT: UIC

## 03 170646

### STANDARDISATION OF PASSENGER CARS

Inquiry report B 106/RP 1 "Design of passenger accommodation" was presented in October 1971. In conformity with the decision of the 79th meeting of the ORE Control Committee in April 1977, application will be made to UIC to include question S 2031 "Permissible stresses on internal and external parts of passenger coaches" in the B 106 programme of work. The investigation of the parts in passenger coaches takes priority. A B 106 Specialists Committee has been set up.

One report has been published to date.

PERFORMING AGENCY: International Union of Railways  
RESPONSIBLE INDIVIDUAL: Lage, HH Office for Research and Experiments  
STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1970  
ACKNOWLEDGMENT: UIC

## 03 170647

### UNIFICATION OF ELECTRICAL EQUIPMENT FOR PASSENGER COACHES

Standardization of given electrical equipment of passenger coaches such as batteries, lighting, switch boards and instrument cabinets, remote control system for lighting and doors. In connection with the air-conditioning test being carried out by the B 107 Committee, the B 108 Committee is testing power supply systems in the same coaches. These tests cover several (380 V three-phase a.c., 50 Hz and 1000 V d.c.) with rotary transformer as well as systems with a static converter. The results of these tests were published in report B 108/RP 3. Further studies will serve to standardise the electrical equipment of passenger coaches, such as relays, safety fuses, lighting, batteries.

Three reports have been published to date.

PERFORMING AGENCY: International Union of Railways  
RESPONSIBLE INDIVIDUAL: Hoppe Office for Research and Experiments  
STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1973  
ACKNOWLEDGMENT: UIC

## 03 170654

### MODERN SUSPENSION SYSTEMS FOR TWO-AXLED WAGONS

The Specialists Committee made extensive strength and running tests with several selected solutions for existing suspension designs, which were assessed according to specified criteria and, taking as a basis the results of the studies and the tests, presented in April 1976, a proposal for a vertical type of progressive suspension system for two-axled wagons in service (B 13 4/RP 1). Operating tests concerning these solutions, and also studies regarding the profitability and suitability of this wagon for taking an axleload of 22 t, will be continued with a view to preparing a standard solution proposal. Completion of this work is expected in 1977. In addition, studies with newly developed progressive suspension systems for future two-axled wagons were carried out. The results will be presented in October 1978 with report RP2, with which this question will then close.

One report issued to date.

PERFORMING AGENCY: International Union of Railways  
RESPONSIBLE INDIVIDUAL: Jutte, H Office for Research and Experiments  
STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1975 COMPLETION DATE: 1977  
ACKNOWLEDGMENT: UIC

## 03 170658

### NON-POLLUTING SANITARY INSTALLATIONS

In view of the doubts existing among passengers and authorities concerning the hygienic conditions of toilet systems installed in railway coaches (as a result of which several Administrations have already tested new solutions and suggested possible improvements) an examination is being made of the

present position and of possible improvements. The differences in purchasing and maintenance costs for different variants of non-polluting toilets have also been established. The inquiry report B 140/RP 1, was approved by the Control Committee in October 1975. In accordance with the suggestions of the report, the rapporteur was asked to continue his work of observing the tests being made by the different administrations and to prepare a new report within two years. The second enquiry report was approved in October 1977. A Specialists Committee which presented its programme of work and Action Sheet to the Control Committee in October 1977 has meanwhile been set up.

Two reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Minkes Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1974

ACKNOWLEDGMENT: UIC

### 03 170659

#### NON-DESTRUCTIVE EXAMINATION PROCEDURES

The E 139 Committee is studying the standardisation of non-destructive examination procedures for the acceptance testing of running gear at the works. It has initiated its studies by ultrasonic tests in the laboratory on axles; the results are now being evaluated; magnetoscopic tests are in progress. Ultrasonic tests on wheel tyres and solid wheels, which had been collected on various railways were made. A Working Group is preparing a list of expressions used in ultrasonic and magnetoscopic examinations. The E 139 Enlarged Committee, with the participation of representatives from 8 suppliers as Invited Specialists, had been set-up and had held its first meeting.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Minkes Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977

ACKNOWLEDGMENT: UIC

### 03 170665

#### INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS: PHASE III. TASK 4-FUTURE SYSTEM STUDIES

This task will evaluate critically future rail systems options, needs and proposed advanced-concept proposals in order to assess their potential for safe, cost-effective operation to provide direction and priorities for developments of the second stage of Phase III. The subtasks: (4.1) Compile a list

of present and future test facilities and match these with future TTD requirements; (4.2) Investigate problem areas in current braking systems, including use of pneumatic system simulation models; (4.3) Survey the scope of options for development of hardware systems from a standpoint of future market opportunities and constraints; (4.4) Explore the engineering economics of car size and include the wheel-load/rail-wear relationships; (4.5) Catalog and evaluate currently proposed advanced concepts and development efforts for couplers, brakes, trucks and other components.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyer, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1978 COMPLETION DATE: 1979

ACKNOWLEDGMENT: AAR

### 03 172456

#### STANDARDISATION OF WAGONS

Standardization of freight cars (vehicles, subassemblies and parts) is being achieved in accordance with decisions of the Joint Meeting of the 4th/5th Committees of UIC--Operating and Rolling Stock and Motive Power. Test specifications and test programs are being developed. Plans are also made for adaption of operating rolling stock to receive the automatic coupler. Designs of eight types of cars, including three for transporting containers, have been completed with drawings. The ninth and tenth types to be standardized will be complete in 1978, an eleventh in 1979 and work on the 12th type is being undertaken. Standardization of car components is also progressing. To date a welded car truck, a cross gangway and 20-ft ISO container have been completed. Work on two other truck designs is to be concluded in 1978. Preliminary work on car ends and on the mechanical components of the brake system is also proceeding. Test programs are being developed; current attention is directed at leaf springs, fatigue strength of cars and buffing test conditions.

Twenty five reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Jutte, H Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977

ACKNOWLEDGMENT: UIC

04 054561

## ON BOARD ENERGY STORAGE FOR TRANSIT CARS

Description: The design, development and testing of an electric propulsion system with an onboard energy storage unit for use on subway cars. The kinetic energy of the moving car during braking is directed to a motor driven flywheel resulting in storage of the energy by increasing the speed of the flywheel. During acceleration the flywheel energy is released and supplies the majority of power required for acceleration of the car. Performance by computer analysis indicates a potential energy savings of 30%. Verification of performance compared to conventional car will be accomplished by operation on the NYCTA subway lines.

PERFORMING AGENCY: AiResearch Manufacturing Company; Metropolitan Transportation Authority of New York

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Mora, J. Tel (202)426-0090

Contract DOT-UT-550

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1971 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$1,900,000

ACKNOWLEDGMENT: UMTA

04 058270

## ELECTRIFICATION AND ELECTRIC TRACTION

This sub-program is a continuous effort and is concerned with advanced analytical and laboratory studies in electrical propulsion, as well as basic studies for electrification. The work includes power conditioning systems, linear electric motors, power collection, power distribution, and cost analyses.

PERFORMING AGENCY: Transportation Systems Center

INVESTIGATOR: Raposa, FL Tel 617-494-2031

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Guarino, M, Jr Tel (202) 426-9665

PPA-RR-05

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: FRA

04 058280

## POWER AND PROPULSION SYSTEM, TECHNICAL AND SCIENTIFIC SERVICES AND DATA

Task effort is to include: (1) energy charging analysis and charger station requirements for flywheel propulsion systems for various urban vehicles; (2) power conditioner surveys for the linear synchronous motor; (3) cost data and economic analysis of linear electric motor propulsion systems; (4) review of advanced propulsion, power, and train control approaches for improved freight operations; (5) updating of cost data of wayside power supply systems; (6) design analysis, including both magnetic field and circuit modeling of synchronous and asynchronous linear motors; (7) complex computer modeling and analysis of propulsion drive systems.

PERFORMING AGENCY: Kusko (Alexander) Incorporated

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Raposa, FL Tel (617)494-2031

Contract DOT-TSC-965 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Apr. 1976 TOTAL FUNDS: \$124,000

ACKNOWLEDGMENT: TRAIS (612-0218)

04 059676

## INVERTER POWER SYSTEM FOR METROLINER

To build a static inverter system capable of operating on a Metroliner vehicle which will be used in place of existing motor alternator system in providing auxiliary power. Due to the contract, Model unit will not be designed for under car installation.

PERFORMING AGENCY: Rohr Industries, Incorporated

INVESTIGATOR: Holt, J Tel (714) 575-2207

SPONSORING AGENCY: Transportation Systems Center, R6351

RESPONSIBLE INDIVIDUAL: Wlodyka, R Tel (617) 494-2143

Contract DOT-TSC-1284 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1976 COMPLETION DATE: May 1978 TOTAL FUNDS: \$393,000

ACKNOWLEDGMENT: TRAIS (R6351)

04 099377

## FLYWHEEL ENERGY STORAGE SWITCHER (FESS) SYSTEM ENGINEERING

There are three phased effort covering the system analysis, fabrication, testing and demonstration of a yard switching locomotive incorporating a flywheel energy storage unit. This project will utilize available hardware and existing knowledge to design, fabricate, and test the system. The three phases are, Phase I--System Analysis, Economic Analysis, and Bench Testing, Phase II--Design, Hardware Fabrication, Testing and Phase III--Demonstration.

Further work will depend on the results of Phase I, System analysis and Bench Testing.

PERFORMING AGENCY: Garrett Corporation

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Cracker, WF, Jr Tel 202-426-0855

Contract DOT-FR-74247 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1977 COMPLETION DATE: Oct. 1978 TOTAL FUNDS: \$428,000

ACKNOWLEDGMENT: FRA

04 128008

## FLYWHEEL ENERGY STORAGE STUDY, PHASE I. TECHNOLOGY REVIEW AND FEASIBILITY STUDY

The purpose of this project is to conduct a technology review and data acquisition of existing operational flywheel units as well as of flywheel units that are being actively developed. The units to be considered are complete energy storage systems including the flywheel itself, the input/output motor and controls and the ancillary systems such as the vacuum, lubricating, safety and containment systems. The factors of interest are the cost, energy storage properties and efficiencies, size and weight, reliability, safety, etc. This project will further conduct a preliminary assessment of the feasibility and viability of flywheel energy storage in rail transportation using a benefit cost analysis. This will lead into the Phase II study (if feasibility has been established) which will investigate actual flywheel energy storage applications and uses in terms of cost effectiveness, both in on-board and in-station configurations. /RTAC/

PERFORMING AGENCY: Ontario Ministry of Transportation & Communication

INVESTIGATOR: Soots, V

SPONSORING AGENCY: Ontario Ministry of Transportation & Communication

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1975

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

04 135721

## DESIGN OF IMPROVED FLYWHEEL-TYPE ENERGY STORAGE DEVICES USING HIGH-STRENGTH FILAMENTS

Description: The purpose of this research is to develop more efficient designs of flywheels for energy storage applications in ground vehicles. Particular emphasis is placed on those using high-strength filament materials. Specifically, these types of flywheels are being investigated. 1. Radial brush type. 2. Laminated disk, consisting of multiple layers of filamentary composite material at various orientations. 3. Filament-wound disk. 4. Wound-rim type. 5. Concentric-ring type. The approach used is to perform stress analyses, using modern techniques of elastic and plastic mechanics and mechanics of filamentary and laminated composite materials. Then the stress analyses are used to arrive at optimal design for each of the configurations listed. To date, the first two types have been investigated and it was found that previous analyses found in the literature contain some serious errors. Future effort will be directed toward the other configurations listed above and to design optimization for vehicular applications.

PERFORMING AGENCY: Oklahoma University, School of Aeronautical and Mechanical Engineering

INVESTIGATOR: Bert, CW

SPONSORING AGENCY: Oklahoma University

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (NDY 19 1)

04 135723

**ENERGY CONVERSION, ENERGY STORAGE AND RECONVERSION**

To develop a family of systems for storing electrical energy and thereafter re-utilize the stored energy in various ways. In storage, major emphasis has been in the development of high-pressure (1000 to 3000 PSI) moderate temperature (300 to 400 degrees Fahrenheit) electrolysis cells, fuel cells and rechargeable fuel cells for the storage of electrical energy in the forms of high-pressure hydrogen gas (other alternatives include hydrides and liquid hydrogen). The stored hydrogen can be used in many ways: mechanical output: hydrogen engine, Aphodid burner turbine electrical output: fuel cells, high-speed turbine field modulated generator system heat output: burners synthetic fuel output: conversion of organic materials to hydrocarbon fuels. In reconversion, the emphasis at present is to develop a family of variable-speed constant (or adjustable) output frequency alternators by applying the field modulated frequency down conversion principle. These alternators will be driven at high speeds (around 10,000 RPM or higher) and consequently will be much smaller in size than conventional alternators of similar capabilities. Application of field modulated frequency down converters for variable speed mechanical inputs such as aeroturbines (wind energy systems) and for variable speed drive applications such as urban cars and prime-mover carrying mass transportation systems are currently being studied.

PERFORMING AGENCY: Oklahoma State University, School of Electrical Engineering

INVESTIGATOR: Hughes, WL Allison, HJ Ramakumar, R Lingelbach, DD

SPONSORING AGENCY: Oklahoma State University

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (NOK 99 1)

04 136017

**ENVIRONMENTAL ENGINEERING AND ENERGY MANAGEMENT (FLYWHEEL ENERGY STORAGE SYSTEM)**

The objective is to apply advanced space technology to the development of flywheel energy storage systems for application to ground transportation. The technical approach will include in-house studies and system simulations, and contracted efforts to fabricate the composite material flywheel energy storage system, mobile test vehicle, and test equipment. After interim testing of the vehicle with a battery set, the flywheel system will be integrated and final testing accomplished. The flywheel energy storage system for use on mobile vehicles for ground transportation will provide benefits in the areas of pollution control and more efficient utilization of energy sources. In addition, low maintenance and long life are expected from this concept.

PERFORMING AGENCY: Langley Research Center, National Aeronautics and Space Administration

INVESTIGATOR: Graves, GB

SPONSORING AGENCY: Langley Research Center, National Aeronautics and Space Administration

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange

04 159663

**WAYSIDE ENERGY STORAGE SYSTEM (WESS)**

Feasibility study assessing energy storage concepts for wayside application on long downgrades in railroad freight operations. Technical/engineering economic assessment will include location sites, integrated system concepts or flywheel stations and locomotives, power and energy requirements, locomotive modifications, wayside third rail and/or catenary, flywheel station hardware concepts, control system analysis, energy supplement concepts, interface with electrified railroads, economic viability and cost sensitivity, and recommendations for suitable follow-on work.

PERFORMING AGENCY: AiResearch Manufacturing Company

INVESTIGATOR: Lawson, J Tel (213)323-9500 Shapiro, H

SPONSORING AGENCY: Transportation Systems Center; Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Koper, JM Tel (202)426-0808

Contract DOT-TSC-1349

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1977 COMPLETION DATE: July 1978 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: FRA

04 170637

**TRANSMISSION OF INFORMATION THROUGH A TRAIN-LINE**

This study concerns the definition, selection and development of a system for the transmission, first through the UIC loudspeaker cable and subsequently through the automatic coupler, of information which should serve to assist the subsequent automation within the train. Specifications for the transmission system are currently being prepared. These specifications which take into account the results of test runs on the systems of DB, FS, PKP and SNCF will enable recommendations for the choice of a system to be drawn up.

Four reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Vokac Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1967

ACKNOWLEDGMENT: UIC

04 170640

**ACCEPTANCE TESTING AND MAINTENANCE OF DIESEL ENGINES**

Report No. 21, defining the methods for measuring atmospheric pollution by diesel engine exhaust gases, was approved by the Control Committee in April 1977. The next and last report, which fixes the pollution limits for engines in service and for engines still to be built, will be terminated before the end of 1977 and presented to the Control Committee in April 1978. The Committee will then be transformed into a Group responsible for the acceptance testing of engines and will merely meet for the purpose of examining test records. The question would then be directly taken over by a Conseiller Technique of ORE.

Twenty one reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Osuch, K Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1962 COMPLETION DATE: 1977

ACKNOWLEDGMENT: UIC



05 081802

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH  
PROGRAM ON TRACK TRAIN DYNAMICS--PHASE II. TASK  
6--BRAKE SYSTEM**

Task objective is evaluation of the performance of present braking systems to identify those areas where improvements would result from the establishment of performance specifications and/or design guidelines. Evaluation will include stopping distance, reaction time, recharge time, wheel tread temperatures, rigging efficiency, etc. Evaluation will include parametric sensitivity study utilizing dynamic simulation computer models developed in Phase I of the Track Train Dynamics Program. If desirable, field testing of modified braking systems will be conducted. Task will also include field testing of effects on stopping performance caused by different brake shoes. These tests will be single car "breakaway" tests and will be augmented to full train characteristics using the dynamic simulation computer models.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Misner, GR

SPONSORING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyar, GJ Tel (312) 225-9600 X-146

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1975 COMPLETION DATE: 1978

ACKNOWLEDGMENT: AAR

05 148340

**STUDY OF ADVANCED PASSENGER TRAIN BRAKING  
SYSTEMS**

Purpose is to assess the functional performance and economics of various concepts for electromagnetic braking systems for use on locomotives, powered coaches, and non-powered coaches in passenger train operations. The assessment is to be carried out on all such systems in use or proposed regardless of the degree of development to actual hardware. Emphasis of the study will be upon those braking systems which utilize eddy-current effects for the braking force. A comparison study will also be made of braking systems in common use.

PERFORMING AGENCY: Kearney (AT) and Company, Incorporated

INVESTIGATOR: Eshelman, L Tel (312)782-2868

SPONSORING AGENCY: Transportation Systems Center; Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Hazel, M Tel (617) 494-2651

Contract DOT-TSC-1298

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Oct. 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$44,900

ACKNOWLEDGMENT: TSC

05 157901

**BRAKING AND COUPLING SYSTEMS PERFORMANCE  
OPTIMIZATION PROGRAM**

This multi-year program will begin in FY-78 with the award of two one-year contracts as follow-on investigations to the technology assessments performed previously. Topics being considered are: the effects of friction shoe materials on wheel profile; control of train action forces through optimization of train line valving and plumbing; electropneumatic braking; configuration economics; load sensing devices; and automatic coupler design.

Contracts to specific performing agencies not yet awarded.

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Fay, GR Federal Railroad Administration Tel (202)426-0855

STATUS: Proposed NOTICE DATE: July 1977 COMPLETION DATE: Dec. 1978

ACKNOWLEDGMENT: FRA

05 159634

**DESIGN AND FABRICATION OF A WAYSIDE BRAKE  
INSPECTION SYSTEM FOR RAILROAD VEHICLES**

This contract is for the development of a brake inspection system. It is expected that the system will be able to determine the braking performance of freight cars in a dynamic mode as a train passes through the wayside system. Two techniques are to be integrated into the total system. Infrared measurement of the wheels will be used to provide a qualitative measurement of the energy input to the wheels. The second technique will use a short instrumented "reaction rail" section spliced into one rail to give a quantitative indication of the retarding force of the wheels.

PERFORMING AGENCY: Novatek Incorporated

INVESTIGATOR: Spaulding, D Tel (617)272-6230

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Yearwood, KW Tel (617)494-2046

Contract DOT-TSC-1323

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1977 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$77,753

ACKNOWLEDGMENT: TSC

05 170652

**BRAKE PADS FOR DISC BRAKES AND COMPOSITION BRAKE  
BLOCKS**

Report No. 1 contains the provisional acceptance conditions for brake pads. Studies concerning the physical and chemical properties of pads have been completed and the results are laid down in RP 2. Further tests should demonstrate the suitability of given test procedures for quality checks and also the correlation with the braking performance. Comparative tests on six different test rigs have been completed, studies concerning the causes of differences in the results are in progress and a report No. 4 will be presented in April 1978. Another enquiry concerning the use of composition brake blocks on all ORE administrations has been evaluated and the contents are laid down in RP 3 (initial enquiry B 64/RP 10). On the basis of reports B 64/RP 10 and B 126/RP 1 the final drafts of two UIC leaflets 541-3 and 541-4 have been worked out in co-operation with the UIC Sub-Committee for Braking. Tests in winter conditions (in the dynamic chamber of the Vienna Arsenal Vehicle Testing Station-MBVA) began in September 1977. Results are being analysed, and decisions on future tests will be taken early in 1978. The revised Action Sheet was approved by the Control Committee in October 1977. The B 126 Committee has been asked to prepare a detailed programme and a supplement to the Action Sheet on the problem of brake power limits.

Three reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Osuch, K Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1973

ACKNOWLEDGMENT: UIC

05 170656

**STANDARDISATION OF THE MATERIAL FOR CAST-IRON  
BRAKE BLOCKS**

Programme of work and the Action Sheet were approved by the Control Committee in October 1977. The selected cast-iron brake shoes are currently being supplied and the laboratory tests will be started in December 1977.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Osuch, K Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: June 1977

ACKNOWLEDGMENT: UIC

06 099410

**THE DEVELOPMENT OF A TRAIN LOCATION IDENTIFICATION AND CONTROL SYSTEM**

The objective of this study is the development of locomotive identification and control techniques for railway signalling applications. The work includes: (a) Definition of operational requirements. (b) Conduct of system design and preparation of technical specifications. (c) Specification, design, construction and factory tests of locomotive control unit, cab signalling unit, microwave site unit, computer interface unit, and test panel. (d) Provision of assistance in the installation of the above equipment on British Columbia Railway property and conduct of field test and debugging of system.

PERFORMING AGENCY: Glenayre Electronics Limited

INVESTIGATOR: Francis, JR Tel 604-980-6041

SPONSORING AGENCY: Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Rudback, NE Tel 514-283-4077

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Feb. 1975 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$184,670

ACKNOWLEDGMENT: Transportation Research and Development Center

06 129714

**OPTICAL ACI INVESTIGATION**

Investigation of different techniques involved in receiving retroreflective light from the color coded label and the associated signal processing will lead to a set of engineering requirements and a set of relevant performance specifications. This effort will define a more optimized system with increased performance especially readability.

PERFORMING AGENCY: Transportation Systems Center

INVESTIGATOR: Long, LE Tel (617) 494-2234

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Cracker, WF, Jr Tel 202-426-0855

Contract PPA-RR-716

STATUS: Active NOTICE DATE: Feb. 1978 COMPLETION DATE: Aug. 1978 TOTAL FUNDS: \$515,000

ACKNOWLEDGMENT: FRA

06 136338

**COMPUTER APPLICATIONS IN CONTROL OF RAILWAY SYSTEMS**

DESCRIPTION: This project encompasses development activity in the application of computers to the control of main line rail traffic, rail classification yards and high density rail and rapid transit interlockings. The general goals of these efforts are improvement of resource utilization, minimization of delays, and greater rail system throughput. Benefits are reduction in energy consumption and increased attractiveness of rail transport as an alternative to more energy intensive forms of transportation. Classification yard control includes automatic computer control of retarder for precise coupling speeds and the switching network for accurate car routing. Computer based management information systems operate in conjunction with the above for maintenance of rolling stock inventory. Development efforts are aimed at improving yard throughput while maintaining or improving coupling speed accuracy. Main line control projects currently underway emphasize centralization and simplification of dispatching and routing functions. Systems deployed to date utilize computer-aided control with the basic decision processes being performed by operating personnel. Development efforts are directed toward higher levels of automatic control encompassing larger areas of controlled territory to yield increased operating efficiency. High-density rail and rapid transit interlockings are ideal candidates for computer control because of their complexity and frequency of traffic. Computerized route finding is currently used in GRS systems, and systems in development will automatically perform many more of the necessary control functions allowing higher traffic densities to be accommodated.

PERFORMING AGENCY: General Railway Signal Company

INVESTIGATOR: Means, JB

SPONSORING AGENCY: General Railway Signal Company

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (AX 615 1)

06 138529

**TRACK CIRCUIT RESEARCH PROJECT**

The objectives of the Track Circuit Research Project are: 1) to develop a comprehensive file and bibliography on track circuits; 2) to develop analytical and computer models of the track circuit which can be used as research tools; 3) to collect the necessary data in order to validate the track circuit models; 4) to prepare several reports containing the information produced by the project. These reports fall into two separate categories, documentation of the track circuit models and a handbook containing the necessary information to understand track circuits.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hartmann, PW

SPONSORING AGENCY: Association of American Railroads

STATUS: Active NOTICE DATE: July 1976 START DATE: Sept. 1975

ACKNOWLEDGMENT: AAR

06 159655

**CLASSIFICATION YARD ELECTROMAGNETIC COMPATIBILITY COMMUNICATION AND CONTROL STUDY**

The objectives of this study are to identify and evaluate the electromagnetic relationships between various systems (power, control, communication) in the classification yard and to investigate the impact from electrification on communication and signal equipment and the environment. The results of this evaluation will provide for a more compatible electromagnetic environment. The project will include a literature search, analysis and testing. Recommendations will be made for follow-on research, as appropriate.

**REFERENCES:**

Res Plan EMC Study of the Communications and Control Systems in a Railroad Classification Yard, Electromagnetic Compatibility Analysis Center, FRA/ORD-77/44, July 1977

PERFORMING AGENCY: Electromagnetic Compatibility Analysis Center

INVESTIGATOR: Safferman, S Tel (301) 267-2224 Speh, P

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Cracker, WF, Jr Tel (202) 426-0855

IA AR74311

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1977 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$140,000

ACKNOWLEDGMENT: FRA

06 159656

**RAILROAD CLASSIFICATION YARD TECHNOLOGY: NEW CONCEPTS AND ADVANCED TECHNOLOGY IN FREIGHT CAR SPEED CONTROL**

The objective of this study is to select only the most promising car speed control concepts and technology and recommend them as candidates for yard integration and test demonstration. The most promising concepts and technology are to be selected on the basis of cost effectiveness, technical suitability and likelihood for near term (ten years or less) application in upgraded or new U.S. yards. The project will assess the advances in the state-of-the-art. The project will result in a recommended plan for yard integration and tests of the most promising concepts and advanced technology.

Contract to a performing agency has not yet been awarded.

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Cracker, WF, Jr Tel (202)426-0855

STATUS: Proposed NOTICE DATE: Aug. 1977 START DATE: Feb. 1977 COMPLETION DATE: Dec. 1978 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: FRA

06 159657

**RAILROAD CAR PRESENCE DETECTION DEVICES**

The objective of this study is to develop a performance specification for car presence detection devices. The project will assess the function and requirements for the device and evaluate the performance of present day devices. The effort will identify and evaluate causes of device failures and collect reliable data on performance. Engineering cost elements will be identified and an analysis of trade-offs between performance and cost.

Contract to a performing agency has not yet been awarded.

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Cracker, WF, Jr Tel (202)426-0855

STATUS: Proposed NOTICE DATE: Aug. 1977 START DATE: Mar. 1977 COMPLETION DATE: Nov. 1978 TOTAL FUNDS: \$210,000

ACKNOWLEDGMENT: FRA

06 160400

#### EVALUATION OF SIGNAL/CONTROL SYSTEM EQUIPMENT AND TECHNOLOGY

The status of signal/control equipment and systems used on passenger routes shall be evaluated. Concurrently, the technology of present-day equipment and systems shall be assessed. The applicability of this technology in meeting the goal of this program shall be considered and recommendations shall be made for a continuing effort.

PERFORMING AGENCY: STV, Incorporated  
SPONSORING AGENCY: Federal Railroad Administration

Contract DOT-FR-773-4236 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1977 COMPLETION DATE: Dec. 1978 TOTAL FUNDS: \$538,294

ACKNOWLEDGMENT: TRAIS

06 170599

#### GUIDED RADAR FOR RAILWAY OBSTACLE DETECTION

A continuing problem in rail safety has been the reliable detection of obstacles on the right-of-way. The objective of the current research is to investigate the effectiveness of guided radar for detecting earthslides, mudslides and small obstacles on a railway. VHF guided radar has been under investigation at Queen's University for about 5 years. All the systems currently under development employ two "leaky" coaxial cables, laid parallel, one of which is excited by rf pulses in the 60-120 MHz region. Some of the pulse energy is leaked outside the transmitting cable, and coupled into the second (receiving) cable, which is monitored by a digital computer. An obstacle appearing near the cables causes the field between the cables to be perturbed, and this perturbation, when handled by hardware and software signal processing techniques, indicates the presence of a "target".

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 1.33.77

INVESTIGATOR: Beattie, DG

SPONSORING AGENCY: Canadian National Railways; Canadian Pacific; Canadian Transport Commission

RESPONSIBLE INDIVIDUAL: English, GW Tel (613) 547-5777

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1977 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$12,153

ACKNOWLEDGMENT: CIGGT

06 170610

#### OPTICAL AUTOMATIC CAR IDENTIFICATION

The overall objective of this task is the development of a performance specification for an OACI Scanner System of improved readability, to be achieved following design and test of selected modifications to existing equipment. The project is also intended to assess the possibility for improving the scanner reliability and maintainability with reduced life cycle costs. Specific goals include laboratory demonstration of improved readability, particularly for degraded labels and difficult ambient conditions; preparation of design guidelines for a compact self-calibrating scanner configuration requiring no air conditioning; and identification of maintenance benefits associated with improved system design. Under this task, modified scanner configurations will be demonstrated in the laboratory and will include the general improvements designed in FY '77 plus improved digital label data processing. A microprocessor will be selected to replace the existing label data processor, interfaced with the system, and necessary programming carried out. The end deliverables are performance specifications for a high performance, cost effective OACI scanner and documentation of the technical work leading to the performance specification.

#### REFERENCES:

Optical ACI--A New Look Specification, Wiseman, R; Ingrao, HC; Crack, WF; Oct. 1978

Optical Automatic Car Identification (OACI) Scanner Long, LE, July 1978

PERFORMING AGENCY: Transportation Systems Center, R8313

INVESTIGATOR: Long, LE Tel (617) 494-2234

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Long, LE Tel (617) 494 2234

Contract DOT-RR-816 (78-RR)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Nov. 1976 COMPLETION DATE: May 1978 TOTAL FUNDS: \$771,000

ACKNOWLEDGMENT: FRA

06 170628

#### TRANSMISSION OF DATA TO 9.6 KBIT/S

The Committee was set up in October 1976. At the request of the UIC Committee "Data processing", the A 145 Specialists Committee was entrusted with the task of carrying out practical investigations concerning data transmission, particularly on international railway transmission circuits at speeds from 4.8 to 9.6 kbit/s for application on the future international data processing (teleprocessing) network. The tests will only concern those modems that are recommended by the CCITT (V 29). It is suggested that the tests on modems should be made at Vienna-Arsenal and the measurements concerning the bit and block-error rates on the circuits proposed. The following circuits are proposed: Paris, Frankfurt, Vienna, Warsaw, Lucerne, Rome. The first three series of measurements have been made on the above mentioned circuits and the measured values are currently being processed. The results will be the subject of report No. 1, which is intended for presentation to the Control Committee in April 1978. Further work will be concerned with the question of compatibility, i.e. the possibility of operating with two modems built by different companies.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Vokac Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: Oct. 1976

ACKNOWLEDGMENT: UIC

06 170629

#### ADAPTATION OF MARSHALLING YARDS FOR TAKING WAGONS WITH WHEEL BASE OF MORE THAN 14 M

Adaptation of electric installations in classification yards for shunting of cars with wheelbase of adjacent axles of more than 14 m. The first stage consists of a technical analysis and an economic survey of existing solutions. The following stage will consist of the choice of solutions(s) for existing yards and/or yards still to be constructed.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Savarit Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977

ACKNOWLEDGMENT: UIC

06 170631

#### PROPAGATION OF RADIO WAVES

The studies are intended to produce guiding principles and data for planning radio links on railway property, covering stations, lines and tunnels. ORE A 133/RP 1 reviewed the documentation available on radio wave propagation and proposed a classification system for railway terrain. Further to this report, methods for the measurement and test of radio propagation on lines, stations and tunnels were produced and applied to collect a considerable amount of experimental data in a number of Administrations. The process of data reduction, analysis and statistical interpretation is now well advanced and it is anticipated that the report ORE A 133/RP 2 will be of considerable value to the designer of a radio communication system for use in railway conditions.

One report has been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Gelbstein Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977

ACKNOWLEDGMENT: UIC

06 170635

#### APPLICATION OF THYRISTORS IN RAILWAY TECHNOLOGY: CONSEQUENCES AND REMEDIES

Analysis of possible interference in information transmission installations. Theoretical considerations for different d.c. and a.c. thyristor vehicles and tests. A brief summary of the previous work carried out by the A 122 Committee and of the results obtained have been published in an interim report (A 122/RP 16). It can be said that all important questions relating to tractive vehicles have been cleared up. Basically this also applied to signalling systems. Further studies serve to reveal the disadvantages as

regards power collection, determination and definition of interference source characteristics, establishment of sensitivity characteristics of objects subjected to interference, superimposition of multiple source interference and confirmation of methods for calculating induced voltages. Results of investigations into the effects on telecommunication circuits and data transmission due to operating thyristor controlled a.c. tractive units (15 kV 16 2/3 Hz and 25 kV 50 Hz) are given in report A 122/RP 22 of April 1977.

Twenty two reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Hoppe Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1970

ACKNOWLEDGMENT: UIC

#### 06 170650

##### USE OF ELECTRONIC COMPONENTS IN SIGNALLING

The ultimate object of the studies is to determine the types of electronic component which may be used in railway safety systems, also specifying their applications and the conditions in which they may be applied. The

present phase of studies in this field has now been completed. A review of the work of this Committee leads to the following results: 1. Description of the working environment for electronics in railway signaling applications (RP 4 and RP 10). 2. General principles, definitions and methods of calculations applicable to safe electronic systems (RP 1, RP 3, RP 5, RP 6, RP 7). 3. Aids to the design of fail-safe electronic circuits (RP 2, RP 8). 4. Safe electronic systems based on computer technology (RP 9, RP 11, RP 12). Furthermore, a general review of the work of this Committee has been prepared (RP 13) and a problem description concerning the transmission of safety information is being prepared to serve as a basis for future work. It has also been agreed that a colloquium on the subject studied by A 118 will take place in 1980 to report on new developments and recent experience in this field.

Thirteen reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Gelbstein Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1971

ACKNOWLEDGMENT: UIC

07 049659

**HUMAN FACTORS IN RAILROAD OPERATIONS**

This continues a program of research and consultation on human factors in railroad safety in support of FRA regulatory responsibilities involving human performance. Current work includes measurement of air contaminants in the train crew environment, development and evaluation of train handling aids, studies of crew alertness, design of a locomotive cab based on functional requirements, and study of employee motivation.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

INVESTIGATOR: Devoe, DB

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Levine, D Tel (202) 426-1227

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: FRA

07 148352

**ALCOHOL AND DRUG ABUSE PROGRAMS IN THE RAIL INDUSTRY: PHASE II**

To develop techniques and program factors that can be used in the development and improvement of alcohol and drug abuse programs. Included in this development will be the verification cost effective measures, and of program effectiveness evaluation techniques. The end goal is to provide information necessary for every railroad to voluntarily develop an alcohol and drug rehabilitation program that will meet its own organizational objectives and needs.

PERFORMING AGENCY: University Research Corporation

INVESTIGATOR: Mannelo, T Tel (301) 524-3936

SPONSORING AGENCY: Federal Railroad Administration; Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Collins, DM Tel (202) 472-7280

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 COMPLETION DATE: Jan. 1979

ACKNOWLEDGMENT: FRA

07 170590

**CONFERENCES ON RAILROAD PERSONNEL DEVELOPMENT/ASSISTANCE**

Co-sponsor conferences which familiarize railroad labor and management officials with FRA research activities. Topics of these conferences include but are not limited to alcohol and drug rehabilitation research, training and labor-management communications improvement.

**REFERENCES:**

Conference on the Detection, Prevention, and Rehab of the Prob Drinker Employee in the RR Industr, Cornell U, Jan 1976, Proceedings 1975

Employee Assistance--An Alternative to Tragedy, Texas Transportation Institute, November 1976, Proceedings 1976

Local Level Labor-Management Workshop (Carson Inn Project) Chicago, Milwaukee, St Paul & Pacific Railroad, Nov. 1976

Conference on Public Support for Railroad Training Stewart (DA) and Associates, Jan. 1978

SPONSORING AGENCY: Federal Railroad Administration, Office of Policy and Program Development

RESPONSIBLE INDIVIDUAL: Vass, TJ Tel (202) 472-7280

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Apr. 1975

ACKNOWLEDGMENT: FRA

07 170598

**A STUDY OF HUMAN FACTORS ASPECTS IN LOCOMOTIVE CAB DESIGN**

The purpose of this study is to make recommendations and to specify further

research needs with respect to locomotive cab design with a view to maximizing crew job satisfaction, crew safety and work efficiency.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 7.65.76

INVESTIGATOR: Wilde, GJS Tel (613) 547-6219

SPONSORING AGENCY: Association of American Railroads Technical Center

RESPONSIBLE INDIVIDUAL: Hawthorne, KL Tel (312) 567-3604

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Oct. 1976 COMPLETION DATE: July 1978 TOTAL FUNDS: \$80,000

ACKNOWLEDGMENT: CIGGT

07 170614

**PROPOSED RESEARCH PLAN TO IMPROVE RAILROAD EMPLOYEE TRAINING**

The purpose of this study was to present an overall research plan for consideration by the Federal Railroad Administration which would aid the railroad industry in fulfilling its employee training needs. A sample of eight railroads, including both rail labor and management representatives, were interviewed to determine the extent of existing training and to gain insights as to a possible role for the Federal Railroad Administration. The major recommendation was that FRA consider the development of a Basic Core Curriculum which would have universal applicability over the railroad system. This recommendation and the thirteen other research recommendations are now under review and consideration.

PERFORMING AGENCY: Stewart (D.A.) and Associates, Incorporated

SPONSORING AGENCY: Federal Railroad Administration, Office of Policy and Program Development

RESPONSIBLE INDIVIDUAL: Vass, TJ Tel (202) 472-7280

Contract DOT-FR-75145

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Dec. 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$59,340

ACKNOWLEDGMENT: FRA

07 170662

**INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS: PHASE III. TASK 1--TTD TECHNOLOGY SHARING AND IMPLEMENTATION**

This task will develop effective education and training program aids to facilitate dissemination to operating levels of what is known now as a result of the TTD research program. The subtasks: (1.1) Promote safer train make-up through improvement in the knowledge of yardmasters, locomotive engineers and other operating personnel; (1.2) Improve safety awareness of maintenance-of-way and maintenance-of-equipment of conditions of track and equipment that affect derailment tendency and catastrophic failure; (1.3) Tell the TTD story through a newsletter to the rail and supply industry, the government and educational community; (1.4) Develop workshops to coordinate and support the technology transfer of the TTD program; (1.5) Plan, organize and promote a TTD conference to involve the general research community, railroads, suppliers, government and universities.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyar, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1978 COMPLETION DATE: 1979

ACKNOWLEDGMENT: AAR

08 049658

**RAIL SAFETY/GRADE CROSSINGS PROTECTION**

The program will consist of three major tasks: (1) Development of Application Guidelines for Train 'on board' conspicuity and impact attenuation devices. (2) Innovative System development will study new grade crossing protection concepts. (3) System Analysis will establish inter-administration state and railroad requirements for a data system to accommodate new FRA grade crossing inventory and other data.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

INVESTIGATOR: Hopkins, JB Tel (617)494-2023

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Levine, D Tel 202-426-1227

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: FRA

08 058459

**ON-BOARD LOCOMOTIVE/AUTO IMPACT TEST DEVICE**

Develop a locomotive/auto impact test device to be evaluated in train-strikes-vehicle validation tests at the DOT High Speed Ground Test Site at Pueblo, Colorado. The development is part of TSC Grade Crossing Safety Research and Development sponsored by the Federal Railroad Administration, Office of RD&D, and is directed toward possible improvement in protection for automobile occupants during grade crossing accidents. The attenuator is also intended to decrease the possibility of train derailment due to automobile engine block entrapment under the locomotive.

PERFORMING AGENCY: Minicars, Incorporated

SPONSORING AGENCY: Transportation Systems Center, RR-502

RESPONSIBLE INDIVIDUAL: Raab, AR Tel (617) 494-2539

Contract DOT-TSC-997 (CPFF)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Apr. 1975 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$122,180

ACKNOWLEDGMENT: TRAIS (RR-502), FRA

08 148325

**AN EVALUATION OF THE EFFECTIVENESS OF VARIOUS GRADE CROSSING ILLUMINATION STRATEGIES**

The purpose of this research is to determine whether there is a lighting problem at railway/highway grade crossings to which various illumination strategies can be feasible, cost effective solutions. Research that has thus far been directed toward the resolution of the grade crossing problem has been almost exclusively "accident record" based. To this end little is known regarding driver reaction to different grade crossing systems or even to the

same systems under varying conditions. More specifically, the research shall: Determine if illumination at grade crossings improves safety, Evaluate the effectiveness of illumination in a range of crossing conditions, Determine the guidelines for the conditions where illumination is most effective, Determine guidelines that optimize the use of illumination to achieve either maximum improvement at reasonable cost or An acceptable level of illumination with minimum cost and/or energy use. Initial efforts shall focus on analyzing the available data regarding illumination at grade crossings that have had a high-accident rate. Scate models, and visual simulators will be used to evaluate the effectiveness of increased illumination.

PERFORMING AGENCY: Kansas State University, Department of Civil Engineering

INVESTIGATOR: Russell, ER

SPONSORING AGENCY: Department of Transportation

RESPONSIBLE INDIVIDUAL: MacKinnon, JH

Contract DOT-OS-60133

STATUS: Active NOTICE DATE: Feb. 1978 TOTAL FUNDS: \$70,303

ACKNOWLEDGMENT: DOT

08 159644

**COMPUTER SIMULATION OF DERAILMENT IN RAILWAY GRADE CROSSING COLLISION (ENDEV)**

Development of a digital computer program to analyze the collision of road and rail vehicles at grade crossings and a sensitivity analysis of the effect on rail vehicle derailment by several variables.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 8.35.77

INVESTIGATOR: Churchas, D

SPONSORING AGENCY: Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: English, GW Tel (613) 547-5777

Contract OST77-00021

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Apr. 1977 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$118,500

ACKNOWLEDGMENT: Queen's University, Canada

08 159654

**GRADE CROSSING SAFETY**

Development of reliable and intelligent train detection, constant warning time devices, off-track train detection and warning devices, and active advance warning signals.

PERFORMING AGENCY: Federal Railroad Administration

SPONSORING AGENCY: Federal Railroad Administration

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1977 TOTAL FUNDS: \$800,000



09 058267

**METALLURGICAL TESTS AND ANALYSIS FOR HAZARDOUS MATERIAL RAILROAD TANK CARS**

The objectives of this task are to (a) collect a data base on railroad tank car and pressure vessel steels, (b) prepare guidelines for steels to be used in railroad tank car construction, (c) evaluate the elevated temperature performance characteristics of TC-128 steel, and (d) perform a metallurgical evaluation of full scale tanks tested at White Sands Missile Range and tanks involved in actual rail accidents

PERFORMING AGENCY: National Bureau of Standards, Institute for Materials, Metallurgy Division

INVESTIGATOR: Interrante, CG Tel 301-921-2997

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Dancer, DM Tel (202)426-1227

AR-40008

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1973 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: FRA

09 058484

**WEAR AND FRACTURE CHARACTERISTICS OF CRITICAL COMPONENTS IN GROUND TRANSPORTATION SYSTEMS**

The subject of investigation is the wear of rail wheel and track under rolling contact. Tasks include chemical, metallographical and metallurgical examinations of worn Specimens and wear particles from the field. X-ray diffraction, optical and SEM micrographs were employed to compare wear surfaces and particles of laboratory tested specimens as well as those from field. Wear track depth as a function of contact loading and environmental factors was investigated. Subsurface damage caused by rolling contact was studied by hardness survey as well as micrographic analysis. The important finds include: 1. There is a threshold condition which separates mild wear from severe wear. 2. Severe wear is hardness tests indicated that an extremely hard wear zone associated with a surface delamination process producing wear flakes a few microns thick and several hundred microns in size. 3. The subsurface damaged zone is much shallower than what classical theory predicts for smooth surfaces but is of right order of magnitude when surface asperities are taken into account. 3. An unexpected high concentration of hydrogen (10-20 ppm) was measured at wear surface. A theory is proposed to explain the presence of hydrogen and its role in promoting wear.

**REFERENCES:**

Wear and Fracture Characteristics of Critical Components in Ground Transportation Systems, Keller, DV, Jr, First year Final Report

Wear of Rail Wheel and Truck Under Rolling Contact Tong, KN, Aug. 1977

PERFORMING AGENCY: Syracuse University, Department of Materials Science

INVESTIGATOR: Keller, DV, Jr Tel (315) 423-2341 Tong, KN

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Lauriente, M Tel 202-4269364

Contract DOT-OS-50124

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: May 1975 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$134,637

ACKNOWLEDGMENT: TRAIS, OST

09 059688

**TRANSFORMER COOLANT REPLACEMENT FOR POLYCHLORINATED BIPHENYLS**

The objective is to evaluate a potential replacement material for the Polychlorinated Biphenyls (PCBs) coolant presently used in transformers by the railroad industry. The replacement fluid shall function as a coolant for new railroad transformers as well as a replacement for the PCBs in the transformers already in railroad service.

PERFORMING AGENCY: General Electric Co.

SPONSORING AGENCY: Transportation Systems Center, R6351

Contract DOT-TSC-1293 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: July 1977 TOTAL FUNDS: \$74,092

ACKNOWLEDGMENT: TRAIS (R6351)

09 059690

**TRANSFORMER COOLANT REPLACEMENT FOR POLYCHLORINATED BIPHENYLS (PCBS)**

The objective is to evaluate a potential replacement material for the Polychlorinated Biphenyls coolant presently used in transformers by the railroad industry. The replacement fluid shall function as a coolant for new railroad transformers as well as a replacement for the PCBs in the transformers already in railroad service.

PERFORMING AGENCY: Westinghouse Electric Corporation

SPONSORING AGENCY: Transportation Systems Center

Contract DOT-TSC-1294 (CR)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: July 1977 TOTAL FUNDS: \$99,938

ACKNOWLEDGMENT: TRAIS

09 104358

**FIBER REINFORCED CONCRETE**

Economical sophisticated mix designs involving different cementitious materials and properties are being developed for steel fiber reinforced concrete. Physical properties are being determined. A study of mixing, handling and placing procedures in construction size quantities is a part of the project as is continued observations of the completed field installations. Anchorage of the fibers to the matrix is being studied. /SIE/

PERFORMING AGENCY: Illinois University, Urbana, Department of Theoretical and Applied Mechanics

INVESTIGATOR: Kesler, CE

SPONSORING AGENCY: United States Steel Corporation

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1972 COMPLETION DATE: 1978

ACKNOWLEDGMENT: Science Information Exchange (NIL 753 4), Illinois University, Urbana

09 104774

**PROPERTIES AND PERFORMANCE OF CLEAR AND PIGMENTED COATINGS**

An attempt is made to find which types of coatings have the best durability so that advice can be given to users and to determine which basic properties confer durability to assist in development of coatings with improved performance. Both natural and accelerated weathering are used in evaluation studies. Exterior exposures of clear finishes have been completed and a report prepared. Factory-coated sidings are being exposed in comparison with plastic materials. The results of the wood stabilization project are being assessed. The effect of internal stress on coating properties is being studied. /RTAC/ The Swelling of Wood in Polar Organic Solvents, H.E. Ashton, Wood Science, Vol. 6, No. 2, pp 159, 1973. Exterior Exposure Study of Stains and Clear Finishes, H.E. Ashton, Canadian Paint and Finishing, Vol. 48, 2, pp 12 (February 1974). Removal of Solvent From Swollen Wood, H.E. Ashton, Wood Science, Vol. 6, 4, pp 368 (April 1974).

PERFORMING AGENCY: National Research Council of Canada, Division of Building Research

INVESTIGATOR: Ashton, HE Tel (613)993-1596

SPONSORING AGENCY: National Research Council of Canada

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1954

ACKNOWLEDGMENT: National Research Council of Canada, Div Bldg Res, Roads and Transportation Association of Canada

09 135139

**SUPER ELASTIC ALLOYS TO SHOCK ABSORBER SYSTEMS**

The objective of the program is to study the application of 'super elastic' alloys such as aluminum bronze to shock absorber systems such as gun mounts or vehicle bumpers. The ability of the material to deform considerably (18 to 20 percent), absorb energy of impact, and return to its original configuration after force of impact is removed, lends itself very well to this type of application. The material absorbs mechanical energy in two stages-by martensitic transformation and by elastic deformation. Either or both modes may be used for deformation energy absorption. These alloys function at any useful temperature, and hence would fill all requirements between say, minus 50 degrees C and 100 degrees C. Specifically, it is proposed to investigate this material in configurations where it will augment or replace overtaxed hydraulic systems in gun mounts. This is not overlooking the possible use of this material in the same configurations in

vehicle bumpers or for that matter in any application where impact energy must be absorbed. The effect of temperature and loading rate and the configuration for energy absorption by buckling (long and short columns) as well as compressive blocks will be investigated. Also the fatigue characteristics will be looked into.

PERFORMING AGENCY: Department of the Army, Materials and Mechanics Research Center

INVESTIGATOR: Warnas, A Shepard, LA

SPONSORING AGENCY: Department of the Army, Department of Defense, DA0F4717

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQA 64717)

#### 09 135495

##### EVALUATION OF SHOTCRETE THEORY AND TECHNIQUES

Purpose of study/investigation: To evaluate shotcrete as a construction material for application to Corps project, i.e., to determine correct sampling techniques, pertinent physical properties, problem areas, and limitations of usage. Approach or plan: A summary of what is known about (1) shotcrete from various users, (2) available equipment, and (3) laboratory tests will be made. Both fine and coarse aggregate mixtures will be utilized using the two types of shotcreting equipment (wet and dry). Basic properties, procedures, limitation, and applications will be studied. Progress to date: (1) To date. Laboratory work, approximately 80 percent complete, has been conducted on four types of shotcrete: fine and coarse dry process and fine and coarse wet process shotcrete. Information has been developed on the compressive, tensile, and shear strength of each type of shotcrete. In addition, data have been secured on bond of old shotcrete to fresh shotcrete, permeability and freeze-thaw resistance, and bond to reinforcing steel. (2) Anticipated FY 74. The remaining data on tests mentioned above will be secured, tabulated, and analyzed. The field application phase will be planned and initiated.

PERFORMING AGENCY: Waterways Experiment Station, Concrete Laboratory

INVESTIGATOR: Mather, B

SPONSORING AGENCY: Army Corps of Engineers, Department of the Army

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZTK 367)

#### 09 136074

##### SHEAR TRANSFER IN REINFORCED CONCRETE

The objective of this continuing research is to extend the study of shear transfer across a plane in reinforced concrete as follows: (1) To study the influence of a normal tension stress across the plane, on the shear transfer strength of reinforced concrete subject to cyclically reversing load. (2) To study the transfer of shear across the interface between concrete cast at different times (and between concrete and mortar) under the action of both single direction and cyclically reversing loads. (3) To study the influence of reinforcing bar diameter on shear transfer behavior, with particular reference to the possible limitations on the use of large diameter reinforcing bars as shear transfer reinforcement. In each instance the study will be directed toward the development of design recommendations for shear transfer in reinforced concrete under the conditions involved, through the attainment of a better understanding of the mechanics of behavior.

##### REFERENCES:

Shear Transfer in Reinforced Concrete with Moment or Tension Acting Across the Shear Plane, Mattock, AH; Johal; Chow, Journal of the Prestressed Concrete Institute, Vol. 20, No. 4, July 1975

Shear Transfer in Lightweight Reinforced Concrete Mattock, AH; Li; Wang, Journal of the Prestressed Concrete Institute, Vol. 21, No. 1, Jan. 1976

PERFORMING AGENCY: Washington University, Seattle, Department of Civil Engineering, 61-6808

INVESTIGATOR: Mattock, AH Tel (206)543-6503

SPONSORING AGENCY: National Science Foundation, Division of Engineering

Contract NSF-ENG74-21131

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1974 COMPLETION DATE: Mar. 1977 TOTAL FUNDS: \$93,400

ACKNOWLEDGMENT: Science Information Exchange (GSE 3608 2), Washington University, Seattle

#### 09 136093

##### PROTECTION OF WOOD IN USE

OBJECTIVE: Modify existing procedures and develop new ones for imparting a high resistance to wood against biological degradation and harmful weathering action, with special attention to minimizing objectionable environmental side effects. APPROACH: Develop new concepts and procedures for preserving wood such as chemical modification of the polysaccharides in wood. Investigate the possibility of increasing the permeability of wood by chemical or microbiological methods. Develop an economical preservative treatment for wood piles to protect against all species of borers by a combination of creosote and inorganic salts. Determine the practicality of diffusion-type treatments for various wood species by studying the effectiveness of various combinations of salts and pretreating steps. Develop improved water-repellent-preservative finishes by increasing the permanence of fungicidal chemicals used in such finishes. Improve the permanence of coatings by modifying the surface of wood as an acceptor of finishes. Develop effective preservatives for controlling degradation of pulp chips during outside storage.

##### REFERENCES:

Nonconventional Wood Preservation Methods Rowell, RM, ACS Symposium Series 43(4): 47-56, 1977

Characterization of the Attack on Wood by the Marine Borer Limnoria Tripunctata, Kalnins, MA, Amer. Wood-Preserver's Assoc. Proc. 72: 250-262, 1976

Performance of Single- and Dual-Treated Panels in a Semi-Tropical Harbor, Johnson, BR, Amer. Wood-Preserver's Assoc. Proc., 1977

PERFORMING AGENCY: Wisconsin University, Madison, Forest Products Laboratory

INVESTIGATOR: Hajny, GJ

SPONSORING AGENCY: Forest Products Laboratory, 0040038 FPL3212

RESPONSIBLE INDIVIDUAL: Youngs, RL

##### In-House

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1974 COMPLETION DATE: 1978

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GY 40038 2), Forest Products Laboratory

#### 09 138557

##### IMPROVED INSPECTION, DETECTION AND TESTING RESEARCH

This Division will plan, implement, sponsor and provide overall technical control and direction to development programs in the area of improved inspection, detection and testing techniques and equipment designed to improve railroad safety. The Division is the FRA contact point for all such programs and will provide for interchange of technological information among interested parties within the department, other government agencies and industry. Programs include Safety Life-Cycle Testing, Vehicle Inspection, Track Inspection and Testing, and Automated Inspection System Development.

For the subprograms see RRIS Nos. 03A 138558, 03A 138559, 01A 138560 and 01A 138561.

PERFORMING AGENCY: Federal Railroad Administration, Improved Inspection, Detection and Testing Research Division

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Winn, JB Tel (202)426-1682

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1975

ACKNOWLEDGMENT: FRA

#### 09 138558

##### SAFETY LIFE-CYCLE TESTING

Develops, recommends, promotes and implements, a safety life-cycle testing and evaluation program. Provides facilities, equipment and technology necessary to detect and evaluate the cause and effect of rolling stock and track deterioration/failure thru the accumulation of Life-Cycle testing, data and experience.

PERFORMING AGENCY: Federal Railroad Administration, Improved Inspection, Detection and Testing Research Division

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Winn, JB Tel (202) 426-1682

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Oct. 1977

ACKNOWLEDGMENT: FRA

09 138571

**EFFECTS OF MICROSTRUCTURE VARIABLES ON THE FATIGUE BEHAVIOR OF RAIL STEELS**

This investigation of the properties of rail and wheel steels has indicated that non-metallic inclusions do shorten the time required to initiate fatigue cracks but do not affect the subsequent rate of crack growth and also show that the tension-compression loading ratio affects the rate of crack growth.

PERFORMING AGENCY: California University, Los Angeles

SPONSORING AGENCY: Association of American Railroads Technical Center

RESPONSIBLE INDIVIDUAL: Stone, DH

STATUS: Active NOTICE DATE: July 1976

09 139164

**RAIL MATERIAL FAILURE PROPERTIES AND BEHAVIOR CHARACTERIZATION**

This program is structured along three lines--experiments, analysis and metallography. The crack growth properties of U.S. rail population are determined. The importance of metallurgical factors (chemical composition, microstructure and production methods) are assessed. A fractographic reference standard for service failure analysis will be compiled. A failure model for prediction of rail failures, when small flaws are discovered, will be established. The model will be used to evaluate possible metallurgical changes for rail improvement.

PERFORMING AGENCY: Battelle Columbus Laboratories

INVESTIGATOR: Broek, D Tel (614) 424-6424

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Steele, RK Tel (617)494-2457

Contract DOT-TSC-1076

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1975 COMPLETION DATE: Oct. 1977 TOTAL FUNDS: \$395,738

ACKNOWLEDGMENT: FRA

09 148320

**FLAMMABILITY STUDIES AND TOXICOLOGICAL EVALUATION OF MATERIALS USED IN TRANSPORTATION VEHICLES**

The increasing use of plastics and other man-made materials in various vehicular interiors poses new flammability, toxicity, and smoke generation hazards. Various government agencies and manufacturers have been considering the establishment of performance standards for materials used in interior finishes and several new materials have been developed in anticipation of such standards. This research describes a comprehensive approach to the general materials testing problem, leading to the establishment of design criteria and standards which shall result in fire-safe vehicles for the future. A complete study shall be made of the burning characteristics of various interior materials ignited inside simulated enclosures. Test conditions shall be varied to investigate the effects of the following factors:

- 1) Flammability ratings of the materials as obtained from laboratory tests.
- 2) Ventilation rates as provided by different size openings into the enclosure.
- 3) Partitioning of the enclosure by use of a fire barrier curtain.
- 4) Discharge of toxic gases into the interior space.

A comparison of the flame resistant properties offered by different materials will be conducted. Results of the research will be used to propose new flammability test standards and specific recommendations for increasing vehicle-interior fire protection will be offered.

PERFORMING AGENCY: Rice University, Rice Center for Community Design and Research

INVESTIGATOR: Margrave, JL

SPONSORING AGENCY: Department of Transportation

RESPONSIBLE INDIVIDUAL: Bolger, PH

Contract DOT-OS-60149

STATUS: Active NOTICE DATE: Aug. 1977 TOTAL FUNDS: \$125,000

ACKNOWLEDGMENT: DOT

09 152653

**CONTROL OF BIODETERIORATIONS OF WOOD STRUCTURES IN MARINE ENVIRONMENTS**

To develop effective means for the control of biodeterioration of Navy wood structures located in marine environments. Isolate the microorganisms present in treated test wood panels which have been exposed in the ocean to determine their role in premature failure of treated pilings. Determine the effectiveness of various on-site preservative treatments for exterior millwork, decks, and piles by field tests. Determine what combination of preservative type, quality and quantity is the most effective and economical for use in the dual treatment to protect wood against marine borers in warmwater harbors. Study the effect of pretreatment molding of southern pine upon the permanence of treatment. Conduct field trials of a new attractant insecticide bait method to control the formosan termite.

PERFORMING AGENCY: Wisconsin University, Milwaukee, Forest Products Laboratory

INVESTIGATOR: Eslyn, WE Clark, JW

SPONSORING AGENCY: Naval Facilities Engineering Command, Department of the Navy, DN144303

STATUS: Active NOTICE DATE: Nov. 1976 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GQN144303 1)

09 170603

**SMOKELESS CABLE**

APTA is providing industry input to UMTA and UMTA's contractor in the determination of representative insulation materials from a wide sampling of manufacturers and the determination of whether any of these can meet criteria which will be established by taking into consideration the fire hazards inherent in transit systems.

PERFORMING AGENCY: American Public Transit Association

SPONSORING AGENCY: Transportation Systems Center

Contract DOT-TSC-1277

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1976 COMPLETION DATE: Oct. 1978 TOTAL FUNDS: \$24,000

ACKNOWLEDGMENT: American Public Transit Association

09 170615

**SYMPOSIUM ON POLYMERIC MATERIALS AND THEIR USE IN TRANSPORTATION**

A symposium on polymeric materials and their use in transportation was held at the Polytechnic Institute of New York on April 27-29, 1977. The purpose of the symposium was to acquaint those in transportation responsible for specifying, using and maintaining systems composed of polymeric materials with knowledge about what materials are available, how and where such materials can be used, their limitations and safety aspects with emphasis on flammability, and future developments which will accelerate the use of polymeric materials.

## REFERENCES:

Polymeric Materials and their Use in Transportation- Polytechnic Institute of New York, June 1977

PERFORMING AGENCY: Polytechnic Institute of New York

INVESTIGATOR: Pearce, EM Tel (212) 643-5272

SPONSORING AGENCY: Department of Transportation, Office of Safety Affairs

RESPONSIBLE INDIVIDUAL: Burns, WJ Tel (202) 426-4476

Contract DOT-OS-60139

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: June 1976 COMPLETION DATE: June 1977

ACKNOWLEDGMENT: DOT

**10 058132****PROGRAM FOR LOCOMOTIVE AND MARINE DIESEL ENGINE PERFORMANCE AND EMISSIONS**

To improve engine efficiency and reduce emissions from large medium speed diesels. Methods include the use of waste lube oil, determining ship duty cycle, optionization of prop/pitch loading, development of engine diagnostics, and the use of water-in-fuel emulsions.

**REFERENCES:**

A Study of Fuel Economy Emission Reduced Methods for Marine and Locomotive Diesel Engines, Stormont, J, Sept. 1975

Waste Oil Burn-off in CG Powerplants Stormont, J, July 1976

Use of water-in-fuel-Emulsions in a Single Cylinder Diesel Engine, Stormont, J

PERFORMING AGENCY: Southwest Research Institute

INVESTIGATOR: Stormont, JO Tel (512)684-5111x2643

SPONSORING AGENCY: Transportation Systems Center, CG-407; United States Coast Guard

RESPONSIBLE INDIVIDUAL: Mason, RL Tel (617)494-2514.

Contract DOT-TSC-920

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Nov. 1974 COMPLETION DATE: Feb. 1978 TOTAL FUNDS: \$400,000

ACKNOWLEDGMENT: TRAIS (CG-407)

**10 058462****ASSESSMENT OF RAILROAD LOCOMOTIVE NOISE**

To date, most available data on railroad noise has been of the opportunity type with little emphasis on controlled parametric testing. The intent of this project is to determine under controlled locomotive operating conditions overall and major source component noise levels, the directivity and the propagation efficiency (level vs. distance) of locomotive noise, and the proper measuring techniques required to accurately assess overall and component noise levels from a typical locomotive. An interim report is being prepared.

Co-sponsorship is from FRA, DOT and OST, DOT.

PERFORMING AGENCY: Bolt, Beranek and Newman, Incorporated

INVESTIGATOR: Remington, PJ Tel (617)491-1850 Michale, R

SPONSORING AGENCY: Transportation Systems Center, OS-507

RESPONSIBLE INDIVIDUAL: Mason, RL Tel (617)494-2443

Contract DOT-TSC-1016 (CPFF)

STATUS: Active NOTICE DATE: July 1976 START DATE: Apr. 1975 COMPLETION DATE: July 1977 TOTAL FUNDS: \$49,017

ACKNOWLEDGMENT: TRAIS (OS-507), TSC

**10 058621****RAILROAD RETARDER NOISE REDUCTION**

A cooperative effort is planned between DOT (TSC), and the BN to collect, assess and disseminate information regarding the character of the noise environment associated with the operation of active retarders in railroad classification (hump) yards and also, to present in useful form information as how to reduce retarder noise locally and to surrounding communities by the use of noise barriers. Information will be obtained by a measurement, barrier construction and evaluation program to be conducted at the Northtown freight classification yard of the Burlington Northern Railroad, Fridley, Minnesota.

PERFORMING AGENCY: Burlington Northern, Incorporated

SPONSORING AGENCY: Transportation Systems Center, OS-507

RESPONSIBLE INDIVIDUAL: Rickley, EJ Tel (617)494-2372

Contract DOT-TSC-1035 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1975 TOTAL FUNDS: \$69,150

ACKNOWLEDGMENT: TRAIS (OS-507), FRA

**10 058675****DEVELOPMENT OF ENGINEERING DATA ON IN-SERVICE PERFORMANCE AND COSTS OF METHODS FOR CONTROL OF URBAN RAIL SYSTEM NOISE**

The objective is (1) to develop definitive engineering data on long term costs and performance of four noise control techniques, and (2) to organize and present the data to permit engineering estimates of costs and performance of the techniques on any urban rail transit system in the United States. The techniques are: (a) use of resilient wheels on transit cars, (b) use of damped wheels, (c) use of wheel truing equipment to remove wheel flats and reduce

wheel roughness, and (d) use of rail grinding equipment to reduce rail roughness.

**REFERENCES:**

In-Service Performance and Costs of Methods for Control of Urban Rail System Noise. Experimental Design, Holowaty, M; Saurenman, H; Rosen, S, UMTA-MA-06-0025-76-4 Intrm Rpt, May 1976

In-Service Performance and Costs of Methods to Control Urban Rail System Noise. Test and Eval Plan, Saurenman, H; Holowaty, M, UMTA-MA-06-0025-7710 Int Rpt77, 1904

PERFORMING AGENCY: De Leuw, Cather and Company

SPONSORING AGENCY: Transportation Systems Center, UM-804

RESPONSIBLE INDIVIDUAL: Kurzweil, LG Tel (617) 494-2142

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1975 COMPLETION DATE: June 1978 TOTAL FUNDS: \$425,357

ACKNOWLEDGMENT: TRAIS (UM-804), TSC

**10 059682****DATA ANALYSIS ON LOCOMOTIVE NOISE**

The objective is to simplify noise source diagnostic procedures and overall noise level testing procedures to facilitate the large scale assessment of locomotive noise.

PERFORMING AGENCY: Bolt, Beranek and Newman, Incorporated

SPONSORING AGENCY: Transportation Systems Center, R6513

Contract DOT-TSC-1304 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$16,991

ACKNOWLEDGMENT: TRAIS (R6513)

**10 059730****STUDY ON NOISE EMANATING FROM HIGHWAYS AND RAILROADS**

The objective is to study the highway and railroad noise measurement data obtained by TSC, and to provide TSC with engineering analytical, interpretive, and design information based on this data, which will further knowledge of acoustic propagation and improve the prediction and abatement of noise from highway and railroad operations and rights-of-way.

PERFORMING AGENCY: Sonatech, Incorporated

SPONSORING AGENCY: Transportation Systems Center, R6513/R6513T

Contract TSC-1287 (FFP)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1976 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$24,875

ACKNOWLEDGMENT: TRAIS (R6513/R6513T)

**10 099085****ENVIRONMENTAL NOISE MEASUREMENT**

Federal noise control legislation has resulted in an increased need for valid procedures for the measurement of environmental noise. Through the development of measurement methodologies for tire noise, truck and air compressor certification tests; the establishment of data bases in the areas of surface transportation; machinery and community noise; and the development of specialized measurement and analysis instrumentation, NBS programs have contributed to satisfying this need. Future work will build upon this base and extend the understanding of generation mechanisms of various environmental noise sources as the initial step in developing noise control technology and appropriate measurement procedures. Objective: To provide government and industry with the technical basis for noise abatement and control through the development of measurements standards, development of specialized instrumentation and conduct of research in support of accurate, reliable noise measurements.

PERFORMING AGENCY: National Bureau of Standards, Department of Commerce

INVESTIGATOR: Blomquist, DS

SPONSORING AGENCY: National Bureau of Standards, Department of Commerce, 2130150

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 COMPLETION DATE: June 1977 TOTAL FUNDS: \$223,000

ACKNOWLEDGMENT: Science Information Exchange (ZBA 5729 2)

10 130953

**ANALYSIS OF A NEW APPROACH FOR ENVIRONMENTAL POLICY EVALUATION**

This project will complete analysis of environmental policy issues related to five problem areas, for the purpose of developing the general methods and techniques for using Pareto Analysis as a means of evaluating the political feasibility of various decisions. The problem areas are: 1) Control of air pollution-stationary sources; 2) Control of air pollution-mobile sources; 3) Environmental aspects of electric power plant siting; 4) Residuals management in land-use planning; and 5) Urban solid waste management. This final phase also focuses on producing a monograph that provides an introduction to Pareto Environmental Analysis (PEA); practical applications; the development of PEA theory; and conclusions in which PEA is evaluated and advantages and disadvantages are discussed. The PEA method which is being developed formalizes the decision-making process. It involves a method for identifying interest groups and quantifying their evaluation of alternatives. The tool is intended to improve decisions and make decision technicians far more useful.

PERFORMING AGENCY: Harvard University, School of Engineering, Engineering & Applied Physics  
 INVESTIGATOR: Thomas, HA

SPONSORING AGENCY: National Science Foundation, Division of Advanced Environmental Research & Technology, AEN72-03523 A04

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Dec. 1975 TOTAL FUNDS: \$212,900

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 331 3)

10 135661

**CHARACTERIZATION AND CONTROL OF AIR POLLUTANT EMISSIONS FROM COMBUSTION OF FUELS**

Description: The overall objectives of this research project are to determine the characteristic air pollutant emission types and levels from: (1) Combustion of current fuels in use, and (2) Combustion of new fuels that are projected for major use in the future. This project will evaluate the air pollutant control potential for a wide range of liquid, gaseous, and solid fuels. All of the investigation will be performed under controlled laboratory conditions and will provide information that will establish the air pollutant emission picture of fuel in different combustion systems. A series of fuels will be tested for emission characteristics over a wide range of conditions with appropriate combustors. This series will include heavy oils, desulfurized heavy oils, distillate oils, crude oil, methanol, low and high BTU gases, and coal. A survey of fuels will be made, concentrating on obtaining information (cost, composition, etc.) about fuels in present use and new "clean" fuels that may become major energy resources as new air pollution control regulations are passed.

PERFORMING AGENCY: National Environmental Research Center, Environmental Protection Agency  
 INVESTIGATOR: Martin, GB

SPONSORING AGENCY: Environmental Protection Agency, Office of Research and Development, 21 ADG 46

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1972 COMPLETION DATE: June 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (AO 20684 2)

10 136145

**MASS TRANSIT SYSTEMS STUDY**

EPA agrees to join in a cooperative interagency contract for a policy study on mass transit systems. The other agencies involved are OAWP, SASD, Land Use Planning Branch, and the Office of the Assistant for Environment and Urban Systems, Department of Transportation. The contractor would review, report, and advise on information on traffic congestion, air pollution and energy requirements associated with urban transportation, project the results of current trends in these areas, assuming no change in outside influences, and evaluate the consequences of continuation of the present Federal goals for urban area mass transportation and air quality. The contractor would also determine the air pollution implications of various forms of mass transit now under consideration by UMTA, including magnetic levitation, tracked air cushion and over-the-water air cushion vehicles, hydrofoil, personalized rapid transit, dual-mode vehicles, dial-a-ride, and increased use of taxis.

PERFORMING AGENCY: Urban Mass Transportation Administration

INVESTIGATOR: Winkler, F

SPONSORING AGENCY: Environmental Protection Agency, Office of Research and Development, IAG 107 72P21175

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (AO 21175)

10 138534

**NOISE ABATEMENT**

Identified as a major systems problem for transit authorities, this program has as its objective the reduction of noise and vibration on urban rail transit systems. Problem areas have been identified and the noise climate on operating authorities has been appraised. Tests and evaluation of available abatement hardware are to be made. New technology is to be developed. A handbook on noise and vibration control is to be produced.

PERFORMING AGENCY: Transportation Systems Center

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Spencer, PR Tel (202) 426-0090

Contract DOT-UM-604

STATUS: Active NOTICE DATE: July 1976 START DATE: 1971 COMPLETION DATE: June 1979 TOTAL FUNDS: \$3,500,000

ACKNOWLEDGMENT: UMTA

10 148323

**TASSIM: A TRANSPORTATION AND AIR SHED SIMULATION MODEL**

The research objective is to improve the capability to predict the environmental and transportation consequences of metropolitan transportation policies. The research has developed TASSIM, a computer simulation model that is capable of predicting air quality levels as a function of transportation related pollutants. TASSIM contains three submodels: an urban transportation model, vehicle emission factors, and an air diffusion model. An underlying hypothesis of this model is that the air quality is a function of the transportation system's configuration, level of service and distribution of demand. The model has been extended and improved, documented for other users, and applied to evaluate numerous transportation control and land use policies in urban areas. In addition, econometric analyses relating metropolitan area transportation and land use patterns have been performed as groundwork for developing a more complete representation of land use/transport interactions in policy evaluation models.

**REFERENCES:**

TASSIM: A Transportation and Air Shed Simulation Model, Case Study of the Boston Region, Ingram, GK; Fauth, GR; Kroch, EA, Harvard University, Cambridge, Mass., Volume 1, No Date, PB-232933/AS

TASSIM: A Transportation and Air Shed Simulation Model, Program User's Guide, Ingram, GK; Fauth, GR; Kroch, EA, Harvard University, Cambridge, Mass.

PERFORMING AGENCY: Harvard University, Department of Economics

INVESTIGATOR: Ingram, GK

SPONSORING AGENCY: Department of Transportation

RESPONSIBLE INDIVIDUAL: Cooper, NL

Contract DOT-OS-30099

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$176,994

ACKNOWLEDGMENT: DOT

10 148341

**WHEEL/RAIL INTERACTION SIMULATOR**

Design of a machine which simulates interaction of rails and wheels for purposes of noise measurements.

PERFORMING AGENCY: Ontario Ministry of Transportation & Communication

INVESTIGATOR: Curmi, RA Tel (416)248-3771

SPONSORING AGENCY: Ontario Ministry of Transportation & Communication

RESPONSIBLE INDIVIDUAL: Curmi, RA Tel (416)248-3771

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Dec. 1976 COMPLETION DATE: June 1978

ACKNOWLEDGMENT: Ontario Ministry of Transportation & Communication, Can, Roads and Transportation Association of Canada

10 148349

**ADDITIONAL RAIL RAPID TRANSIT NOISE STUDIES BASED ON THE NEW YORK CITY TRANSIT AUTHORITY**

This work is a continuation of the work performed by the Polytechnic Institute of New York on "Noise Assessment and Cost of Abatement in the NYCTA Rail Transit System." Three efforts are being undertaken: 1) Cost Data and Analysis work will aim at improved quantification of the costs associated with noise control treatments. 2) Field Measurements of noise in and near selected cars or trackage will quantify rates of degradation of improvements in terms of noise. 3) Analysis of Car Maintenance Records will be used to correlate car status with noise characteristics and to help determine useful life and costs of car improvements, overhaul and time since certain key repairs.

PERFORMING AGENCY: Polytechnic Institute of New York  
 INVESTIGATOR: McShane, WR Tel (212) 643-5525 Slutsky, S  
 SPONSORING AGENCY: Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Kurzweil, LG Tel (617) 494-2142

Contract NY-11-0002

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Mar. 1976 COMPLETION DATE: June 1978 TOTAL FUNDS: \$62,304

ACKNOWLEDGMENT: UMTA

10 170602

**NOISE AND VIBRATION**

APTA will provide industry input, advice and consensus to UMTA for its contractor to perform work on in-service testing and evaluation of state-of-the-art urban rail noise control techniques.

PERFORMING AGENCY: American Public Transit Association  
 SPONSORING AGENCY: Transportation Systems Center

Contract DOT-TSC-1123

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1976 COMPLETION DATE: Feb. 1978 TOTAL FUNDS: \$68,058

ACKNOWLEDGMENT: American Public Transit Association

10 170655

**RAILWAY NOISE**

The reference values for the noise and vibration stresses to which people are exposed is established along with the propagation of train running noise and the influence of sound protection barriers and vehicle skirting. Proposals for noise abatement measures for older railway vehicles and the effect of time on the acoustic behaviour of railway vehicles are presented. Noise generation during the wheel/rail rolling contact and when braking and negotiation sharp curves are discussed. A report about noise levels inside and outside the vehicles of various Administrations was approved in the meantime. It takes into account statutory regulations and gives provisional guide values for noise levels. A detailed work program is being drawn up for dealing with sound radiation from bridges. The types of bridge to be measured are currently being selected. Curve screech and braking noise tests were terminated. The findings were summarised in a report. A first interim report on reference measurements is now available concerning experience with technical noise-abatement measures for old vehicles. The second part on conversion measures and results as well as a report on the noise of track maintenance machines are being prepared.

Six reports have been published to date.

PERFORMING AGENCY: International Union of Railways  
 RESPONSIBLE INDIVIDUAL: Thiele Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977

ACKNOWLEDGMENT: UIC



11 058273

**EVALUATION OF ELECTRICAL PROPULSION BY MEANS OF IRON-CORED SYNCHRONOUSLY OPERATING LINEAR MOTORS**

This project constitutes the initial research phase of synchronous linear motors for transportation. The motors considered are restricted to those having both the excitation and armature windings on the same structure, i.e., on board the vehicle. The primary objectives are to determine the feasibility of two types (the homopolar inductor and the claw-pole) for propulsion of railroad vehicles, and to establish a basis for further exploratory R&D on a test wheel. The aim is to develop an alternate to the present linear induction motor, with the potential for higher efficiency and power factor, larger clearances with the reaction rail, and useful attraction and guidance forces to inhibit vehicle derailment.

PERFORMING AGENCY: Polytechnic Institute of New York

INVESTIGATOR: Levi, E Tel (212) 643-4486

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Guarino, M, Jr Tel (202) 426-9564

STATUS: Active NOTICE DATE: Aug. 1977 COMPLETION DATE: Apr. 1979

ACKNOWLEDGMENT: FRA

11 058375

**MORGANTOWN PERSONAL RAPID TRANSIT SYSTEM IMPACT EVALUATION**

This study consists of four phases as follows: (1) Pre-PRT phase prior to passenger service of the system, (2) Interim Phase during initial passenger service, (3) Post-Operational Phase following introduction of revenue service, and (4) Final Phase integrating all the data. The study objectives include (a) to measure the service and accessibility of the system, (b) to determine the nature of system patronage, (c) to describe the operational costs and revenues of the system, (d) to examine the attitudes toward the systems, (e) to measure the impact of the PRT on travel and traffic, the economy, the society, and the environment in the PRT corridor, (f) to create a methodology for extrapolation of the results. The Pre-PRT and Interim Phases have been completed. The Post-Operational Phase is scheduled for completion in May 1978. The Final Report Phase is scheduled for completion in July 1978.

PRT Impact Study, Pre-PRT Phase. March 1976, Volume 1- Travel Analysis, SEG Elias; Volume 2-Data Collection Methodology and Coding Manual; Volume 3-Frequency Tabulations from Transportation Related Surveys, CN Redwine.

PERFORMING AGENCY: West Virginia University, WV-03-0006 DOT-TSC-1316

INVESTIGATOR: Elias, SEG Tel (304) 293-5536

SPONSORING AGENCY: Transportation Systems Center, UM-639; Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Stearns, MD Tel (617)494-2796 Rubin, D Tel (617) 494-2160

Contract DOT-TSC-985

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1975 COMPLETION DATE: May 1978. TOTAL FUNDS: \$272,333

ACKNOWLEDGMENT: UMTA, West Virginia University, TSC

11 059365

**ANALYSIS OF THE MORGANTOWN INDUCTIVE COMMUNICATION SYSTEM DESIGN**

Provide a report documenting the Morgantown Inductive Communication System Design. The report shall contain the following elements: a) Provide a general description of the MPRT System and its operation including a description of the Control and Communications System; b) Describe the system level design requirements and the resulting design, analysis and development test program undertaken to meet and validate these requirements as well as the rationale that led to the selection of the communication techniques implemented in the MPRT System; c) Describe the significant analysis and test results obtained, with emphasis on the major problem areas encountered at Morgantown and the solutions to these problems; d) Provide a detailed description of efforts made to develop a guideway analytical model, any validation tests performed and known limitations of work done to date. Define areas which must be expanded or validated to develop a useful guideway model.

PERFORMING AGENCY: Boeing Company, P.O. Box 3999, DOT-TSC-1275

INVESTIGATOR: Johnstone, T Tel (206) 773-1826

SPONSORING AGENCY: Transportation Systems Center, R6782

RESPONSIBLE INDIVIDUAL: Yoh, P Transportation Systems Center Tel (617)494-2271

Contract DOT-TSC-1275 (CPF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1976 COMPLETION DATE: July 1978 TOTAL FUNDS: \$21,525

ACKNOWLEDGMENT: TRAIS (R6782)

11 059376

**INDEPENDENT STUDY OF PERSONAL RAPID TRANSIT (PRT)**

Existing technology elements available for implementing PRT were identified, and were indicated where added development work is required. Environmental and energy impacts on urban areas which might result from PRT system deployment were evaluated. A methodology for feasibility establishment of PRT deployment was defined and demonstrated in the Los Angeles basin arena. Evolutionary growth potential and the effects of reliability on PRT performance were identified. A PRT development plan was summarized.

PERFORMING AGENCY: Aerospace Corporation, J.O. 7621

INVESTIGATOR: Olson, CL Tel (213) 648-6045 Bernstein, H

SPONSORING AGENCY: Urban Mass Transportation Administration, CA-06-0091

RESPONSIBLE INDIVIDUAL: Hoyler, RC Tel (202) 426-8483

Contract DOT-UT-60052T

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: Sept. 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$176,000

ACKNOWLEDGMENT: TRAIS (CA-06-0091)

11 059380

**SYSTEMS OPERATION STUDIES FOR AUTOMATED GUIDEWAY TRANSIT SYSTEMS**

No Abstract.

PERFORMING AGENCY: General Motors Corporation

SPONSORING AGENCY: Transportation Systems Center, R6709

RESPONSIBLE INDIVIDUAL: Marino, JJ Tel (617)494-2000

Contract DOT-TSC-1220 (CPF)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: June 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$2,187,000

ACKNOWLEDGMENT: TRAIS (R6709)

11 059421

**LINEAR INDUCTION MOTOR RESEARCH VEHICLE (LIMRV). TEST PROGRAM**

The primary object of this test program is to obtain essential test data on linear induction motors and on truck/rail dynamics, as well as correlation of this data with theory and mathematical models. The LIMRV is considered an important testbed because of its unique instrumentation and speed range. The LIMRV has established a world speed record for steel-wheel on steel-rail vehicles of 411.5 Km/h.

PERFORMING AGENCY: AiResearch Manufacturing Company

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Guarino, M, Jr Tel (202)426-9665

Contract DOT-FR-64226 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1976 COMPLETION DATE: Jan. 1979 TOTAL FUNDS: \$1,210,000

ACKNOWLEDGMENT: TRAIS

11 059435

**ALTERNATIVE GUIDEWAY CROSS SECTION STUDY**

The successful implementation of advanced technology transportation systems-systems more advanced than those currently being investigated in UMTA's Automated Guideway Transit (AGT) program-may well depend on the ability of system designers to develop low cost, elevated, aesthetically pleasing guideways permitting extensive switching and carrying two-way vehicle flow. Possible guideway configurations which meet these criteria include those with an elevated single beam span which can support two-way flow by either suspending the vehicles from the side of the beam or in an over-and-under configuration. What is needed is a rational approach to

measure the overall effectiveness of the various guideway possibilities, particularly with regard to structural efficiency and cost.

PERFORMING AGENCY: Urban Mass Transportation Administration

INVESTIGATOR: Izumi, G Tel (202) 426-8483

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Ravera, RJ TST-45 Tel (202) 426-9364

ID DOT-AS-70005

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Oct. 1976 TOTAL FUNDS: \$795,930

ACKNOWLEDGMENT: TRAIS

#### 11 059696

##### AGT AVAILABILITY GUIDELINES

The objective is to develop and examine various definitions and expressions for the service availability of automated guideway transit systems and to develop a set of guidelines that will present the definitions along with their applicability and use.

PERFORMING AGENCY: Battelle Columbus Laboratories

SPONSORING AGENCY: Transportation Systems Center, R6709

RESPONSIBLE INDIVIDUAL: Watt, CW Tel (617) 494-2298

Contract DOT-TSC-1283 (CPF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1976 TOTAL FUNDS: \$97,366

ACKNOWLEDGMENT: TRAIS (R6709)

#### 11 059922

##### INVESTIGATION OF VEHICLE-SUSPENSION GUIDEWAY DYNAMIC INTERACTIONS FOR URBAN TRANSIT

The project on the investigation of vehicle-suspension guideway dynamic interactions for automated rail transit will be composed of two major tasks: 1) extend previously developed techniques to achieve design programs for multi-vehicle guideway systems. The use of multiple spans is likely to reduce guideway cross-sectional requirements and minimize thermally induced deflections thus reducing guideway costs; 2) conceptually design and evaluate practical limitations for lateral AGT vehicle steering. This work will provide a reference of optimum performance against which to measure the performance of any real steering system, and a series of practical steering systems which could be implemented in practice.

PERFORMING AGENCY: Massachusetts Institute of Technology

INVESTIGATOR: Richardson, HH Tel (617) 253-2222

SPONSORING AGENCY: Urban Mass Transportation Administration, MA-11-0003

RESPONSIBLE INDIVIDUAL: Izumi, G Tel (202) 426-8483

Grant DOT-MA-11-0003

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Aug. 1976 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$71,450

ACKNOWLEDGMENT: TRAIS (MA-11-0003)

#### 11 059924

##### MULTI-DISCIPLINARY STUDY OF THE USE OF TRAINS OR PLATOONS OF VEHICLES FOR URBAN AUTOMATED GUIDEWAY TRANSPORTATION (AGT)

The project undertakes research on the use of trains or platoons of vehicles in combination with individual small vehicles for urban automated transportation. The multi-disciplined study will undertake two tasks: 1) System Operations-Relate the technological characteristics of the trained AGT systems to the potential economic and service advantages these systems offer. 2) Vehicle Control- Investigate vehicle control configurations. Determine what kind of vehicle control system will permit operations at the highest capacity level. Derive and justify the safety assumptions and synthesize and simulate the controller configuration. Conduct a single-vehicle/train capacity analysis.

PERFORMING AGENCY: Massachusetts Institute of Technology

INVESTIGATOR: Shladover, SE

SPONSORING AGENCY: Urban Mass Transportation Administration, MA-11-0029

RESPONSIBLE INDIVIDUAL: Hyler, RC Tel (202) 426-4047

Grant DOT-MA-11-0029

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1976 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$47,000

ACKNOWLEDGMENT: TRAIS (MA-11-0029)

#### 11 059925

##### RESEARCH ON LONGITUDINAL CONTROL AND CRASHWORTHY VEHICLE DESIGN FOR AUTOMATED GUIDEWAY TRANSIT (AGT) SYSTEMS

The project includes seven tasks: 1) study of vehicle-follower control by examining the behavior of strings of vehicles during various conditions; 2) study design of point follower control systems; 3) examine sensors to evaluate their suitability for use in AGT systems; 4) determine trade-offs between vehicle-follower and point-follower control concepts; 5) develop mathematical models and evaluate passenger protection systems for oblique collisions; 6) evaluate use of non-conventional braking systems; and 7) explore the safety and control problems associated with the use of AGT vehicles.

PERFORMING AGENCY: Minnesota University, Minneapolis

INVESTIGATOR: Garrard, WL

SPONSORING AGENCY: Urban Mass Transportation Administration, MN-11-0002

RESPONSIBLE INDIVIDUAL: Hoyler, RC Tel (202) 426-4047

Grant DOT-MN-11-0002

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: Apr. 1976 TOTAL FUNDS: \$25,580

ACKNOWLEDGMENT: TRAIS (MN-11-0002)

#### 11 110862

##### RESEARCH AND DEVELOPMENT WORK CONCERNING ELECTRODYNAMIC MAGNETIC LEVITATION-PHASE III

A feasible Maglev system based on electrodynamic levitation and linear synchronous motor propulsion for high speed ground transportation in the Canadian corridor has been identified. Mathematical models describing the levitation, guidance, propulsion, stability and dynamic performance of the vehicle have been developed. Large-scale tests of electrodynamic suspension and LSM propulsion have shown very good agreement with analysis. A design study of the superconducting magnets and isochoric dewar system has been conducted.

##### REFERENCES:

Performance Characteristics of Variable Speed Linear Synchronous Motors, Dawson, GE; John, UI, Canadian Institute of Guided Ground Transport, Report No. 74-6, Aug. 1974

Interim Report on Linear Synchronous Motor Experimental Models, Dawson, GE; John, UI; Sen, PC; Bennett, JA, Canadian Institute of Guided Ground Transport, Report No. 74-7, Aug. 1974

Superconducting Magnetic Levitation & Linear Synchronous Motor Propulsion for High Speed Guided Ground Transportation, Atherton, DLA; Eastham, AR, Canadian Maglev Group, Phase II, Report No. 75-5, Mar. 1975

Superconducting Magnetic Levitation and Linear Synchronous Motor Propulsion for High Speed Guided Ground Trans, Canadian Maglev Group, Phase III, Intrm CIGGT Rpt. 76-7, Mar. 1976

Superconducting Linear Synchronous Motor Propulsion and Magnetic Levitation for High Speed Guided Ground Transp, Canadian Maglev Group, CIGGT Rpt 76-7, Phase III, Mar. 1976

Electrodynamic Suspension & Linear Synch Motor Prop for High Speed Guided Ground Transp, Canadian Maglev Group, Report to be published 7709

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, TDA07

INVESTIGATOR: Atherton, DL Tel (613) 547-3015 Eastham, EA Slemon, GR Belanger, PR Dawson, GE Burke, PE Ooi, B Silvester, P

SPONSORING AGENCY: Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Audette, M Tel (514) 283-2880

Contract OST-5-0112

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Apr. 1975 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$480,000

ACKNOWLEDGMENT: CIGGT

**11 130949****THE DYNAMICS OF ELASTIC STRUCTURES WITH HIGH ELECTRIC CURRENTS**

This research is a continuation of a program dealing with the mechanics of elastic structures carrying large electric currents. The experimental program will be extended to: (1) The study of the vibration and stability of a superconducting coil under its own field, and under external magnetic fields. (2) The generation of compressional and torsional stress waves by a transient magnetic field in a ferromagnetic elastic bar. (3) The dynamics of magnetically levitated vehicles on a rotation wheel. (4) The stresses and dynamics of a linear induction motor reaction rail using a rotating wheel. The analytical program will consider: (1) The prediction of deformation and stresses in beams and plates under a transient current pulse. (2) The calculation of stresses in rectangular and non-circular superconducting coils. (3) The study of currents, magnetic fields, and stresses in a linear motor reaction rail for a two-sided and single-sided motor. (4) The stresses in conductors due to a moving contact such as occur in power collectors, motor brushes, and superconducting homopolar motors.

This action provides a second year of support for continuing grant EN-7509079.

PERFORMING AGENCY: Cornell University, School of Engineering, Department of Theoretical & App Mech

INVESTIGATOR: Moon, FC

SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG75-09079 A01

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1975 TOTAL FUNDS: \$45,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5028 1)

**11 130956****PIPELINE TRANSPORTATION OF SOLIDS IN SLURRY FORM**

Objective: To assist in the development of this technique for the transportation of bulk solids. Approach: (a) To conduct experimental studies of the factors governing energy consumption for typical materials in pipelines up to 12 inches in diameter; (b) to examine new materials or equipment proposed for such pipelines; (c) to study procedures or design changes which could reduce capital costs or improve pipeline reliability; (d) to examine the application of this new technique to new situations. Progress: 1. A thorough study of the pipeline behaviour of Western Canadian metallurgical coals in water: Studies of Manitoba limestone in water, Quebec iron ore in water, Saskatchewan potash in brine, and various sands in water have been completed. 2. A preliminary study of the preparation, pumping, separation and utilization of Western Canadian coal-oil slurries is being completed. 3. Various theoretical studies and research contract investigations for commercial clients are in progress. 4. Current plans include the study of mixtures containing coarse (one inch diameter and above) particles. The major application of such work will be in coal mining. Academic studies relating to these projects are also undertaken.

**REFERENCES:**

Experimental Studies on Pipelining of Canadian Commodities: Report 1 to 9

Experimental Studies on Pipelining of Coal-Oil Slurries

PERFORMING AGENCY: Saskatchewan University, Canada, Saskatchewan Research Council & Department of Chem & Chem Eng

INVESTIGATOR: Husband, WH Tel (306)343-2952 Haas, DB Shook, CA

SPONSORING AGENCY: Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Gilbert, IF Tel (514)283-5071

Contract TDA-OSU76-00165

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1970 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$500,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (SJ 632)

**11 135604****COMMAND AND CONTROL SYSTEMS FOR ADVANCED TRANSPORTATION SYSTEMS**

This project is a study of new "people mover" concepts which may evolve to provide practical attractive alternatives to the private automobile as a mode of transportation. Each concept requires a command and control system not only to provide safety but also to ensure efficient and expeditious

movement of traffic. In all cases operation is automatic with respect both to the onboard control of the propulsion and brakes of the individual vehicles and also to the overall coordination of system functions. Development effort has been directed toward meeting new requirements of advanced system concepts. Especially in the area of Personal Rapid Transit, controls are being developed to meet the conflicting need to achieve traditional standards of rapid transit safety while permitting the short headways necessary for acceptable capacity with small vehicles. A family of control systems is being realized for applications varying widely with respect to vehicle characteristics, guideway configuration, and operating policy (scheduled or demand modes of service).

PERFORMING AGENCY: General Railway Signal Company

INVESTIGATOR: Auer, JH

SPONSORING AGENCY: General Railway Signal Company

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (AQ 881 2)

**11 138792****MORGANTOWN PRT SYSTEM**

Develop a personal rapid transit system capable of carrying 5,000 passengers per lane per hour at a 15-second headway, prove the technical feasibility of a fully automated PRT, determine economic and service benefits of a PRT system and assess the institutional problems encountered in building such a system in an urban environment. The concept of automatic control for a vehicle system operating on close headways and the fail-safe concept using checked redundancy have been validated. Design for expansion of the system is underway. Present system is being expanded under an UMTA Capital Grant of \$63.5M to the West Virginia Board of Regents from 3 stations, 5.4 miles single lane guideway, and 45 vehicles to 5 stations, 8.4 miles single lane guideway, and 73 vehicles. An Additional maintenance facility, a heated power rail, and other technical improvements will also be added.

**REFERENCES:**

Morgantown PRT System Boeing Aerospace Company, Nov. 1975

PRT Impact Study (Pre-PRT Phase) Elias, SEG, Mar. 1976

Morgantown PRT Operation & Maintenance History Stone, AL, Boeing Aerospace Company, Jan. 1977

Morgantown PRT Impact Evaluation. Interim Analysis Of Ridership, Stearns, M; Schaeffer, K, Mar. 1977

PERFORMING AGENCY: Boeing Company; West Virginia University

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Barsony, SA Tel (202) 426-2896

Contract WV-06-0005

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1970 COMPLETION DATE: Sept. 1979 TOTAL FUNDS: \$60,000,000

ACKNOWLEDGMENT: UMTA

**11 138793****AUTOMATED GUIDEWAY TRANSIT INDEPENDENT STUDIES**

The objectives of this project are to provide technical studies and analyses to support the development of critical technologies under the AGT program. The entire program was initiated in 1973 but the current phase calls for vehicle/guideway trade-off studies; environmental impact guidelines, functional analysis, and technical studies and analysis to support the automated guideway transit technology program.

PERFORMING AGENCY: Mitre Corporation

INVESTIGATOR: Mouchaboir, G Tel (730) 827-6910

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Izumi, G Tel (202) 426-4047

Contract UT-50016

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1975 COMPLETION DATE: May 1978 TOTAL FUNDS: \$460,000

ACKNOWLEDGMENT: UMTA

**11 148334****NON-CONTACT SUSPENSION/PROPULSION TECHNOLOGIES**

An integrated magnetic levitation/propulsion system is a possible candidate for achieving noiseless, lightweight urban and moderate speed interurban transportation. The objective of this research is to explore the feasibility of such systems for high-speed interurban transportation. A single-sided linear induction motor (LIM) and reaction rail will be fabricated and tested on the rotating wheel facility operated by the Canadian Institute of Guided Ground

Ground Transport at Queens University in Kingston, Ontario. These tests and subsequent analysis will be used to place SLIM performance in context with competing magnetic levitation schemes.

PERFORMING AGENCY: Mitre Corporation, Metrek Division  
 INVESTIGATOR: Milner, JL Tel (703) 790-6456  
 SPONSORING AGENCY: Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Ravera, RJ Tel (202)426-9365

Contract DOT-UT-50016

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1976 COMPLETION DATE: June 1978 TOTAL FUNDS: \$409,362

ACKNOWLEDGMENT: DOT

#### 11 148343

##### DYNAMIC EXPERIMENTS OF ALTERNATIVE GUIDEWAY-VEHICLE SYSTEMS

The purpose of this Project is to experimentally investigate vehicle-elevated guideway response dynamics. The first major objective is to experimentally validate the various analyses of vehicle-guideway dynamics developed within the past several years. The second objective is to experimentally investigate those vehicle-guideway configurations which because of complex geometries, have not yet received analytical treatment.

PERFORMING AGENCY: Duke University  
 INVESTIGATOR: Wilson, JF Tel (919)684-2434  
 SPONSORING AGENCY: Office of the Secretary of Transportation  
 RESPONSIBLE INDIVIDUAL: Ravera, RJ Tel (202)426-9365

Contract DOT-OS-60130

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1976 COMPLETION DATE: July 1978 TOTAL FUNDS: \$111,000

ACKNOWLEDGMENT: DOT

#### 11 148346

##### NON-CONTACT SUSPENSION/PROPULSION TECHNOLOGIES

This is a US/Federal Republic of Germany cooperative research project. The objective is to determine the limits of allowable guideway flexibility and roughness for high-speed attraction magnetic levitation systems. Tests will be conducted using the German-developed 400 K/h KOMET test vehicle and track. The test data will be used to validate vehicle/guideway computer simulations which will be used to perform parametric studies.

PERFORMING AGENCY: Mitre Corporation, Metrek Division  
 INVESTIGATOR: Milner, JL Tel (703)790-6456  
 SPONSORING AGENCY: Office of the Secretary of Transportation; Transportation Systems Center  
 RESPONSIBLE INDIVIDUAL: Ravera, RJ Tel (202)426-9365

Contract DOT-TSC-1263

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Sept. 1976 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$90,000

ACKNOWLEDGMENT: DOT

#### 11 148347

##### ASSESSMENT OF TECHNOLOGY BASE AND APPLIED RESEARCH FOR NON-CONTACTING VEHICLE SUSPENSION AND PROPULSION SYSTEMS

The research shall assess critically the technological base available for the evaluation of non-contacting suspension and propulsion systems in urban and intercity transport systems. The assessment involves critical reviews of existing data, identification of gaps in current technology and areas which show promise for the future. An applied research program to provide performance data for selected ferromagnetic and fluid non-contacting propulsion and suspension systems complements the general assessment.

PERFORMING AGENCY: Massachusetts Institute of Technology  
 INVESTIGATOR: Hedrick, JK Tel (617)253-2246 Richardson, HH  
 SPONSORING AGENCY: Office of the Secretary of Transportation  
 RESPONSIBLE INDIVIDUAL: Ravera, RJ Tel (202)426-9365

Contract DOT-OS-60135

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1976 COMPLETION DATE: June 1979 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: DOT

#### 11 149463

##### SYNCHRONOUSLY OPERATING LINEAR ELECTRIC MOTORS FOR GROUND TRANSPORTATION

To conduct studies, primarily analytical, of certain aspects of linear synchronous motor operation and design. To review work of General Electric, done under a related contract, on the design of linear synchronous motors, and on the construction and testing of a small scale model of such machines.

##### REFERENCES:

Preliminary Method for Design of a Linear Synchronous Motor, Inductor Type, Levi, E, Jan. 1977

PERFORMING AGENCY: Polytechnic Institute of New York, Department of Transportation Planning & Engineering, PR-4227

INVESTIGATOR: Levi, E Tel (212)643-4486 Birenbaum, L Zabar, Z

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Guarino, M, Jr Tel (202)426-9665

Contract DOT-FR-64227

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1975 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$62,660

#### 11 152650

##### ANALYSIS OF SEGMENTED LINEAR RELUCTANCE MOTORS

Over the last decade, linear induction and synchronous motors have been studied at length, especially with regard to their possible application for ground transportation. In addition, a conventional type of linear reluctance motor, having a notched ferromagnetic secondary rail has also been investigated. The principal objective of this research is to study the linear reluctance motor having a segmented secondary. It is proposed to investigate new phenomena, such as end-effects and traverse-edge effects stemming from a topographic change from a cylindrical structure to a flat one. This, in turn, is expected to yield a realistic mathematical model of the reluctance motor leading to its design, development, and feasibility for various applications. It is proposed to design and construct a laboratory model to test the validity of the mathematical model.

PERFORMING AGENCY: Kentucky University, Department of Electrical Engineering

INVESTIGATOR: Nasar, SA

SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG75-17366

STATUS: Active NOTICE DATE: Dec. 1976 START DATE: July 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$26,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5562 1)

#### 11 159637

##### FEASIBILITY STUDY OF AN INTEGRATED SUSPENSION-PROPULSION SYSTEM FOR A TRACKED MAGNETICALLY LEVITATED VEHICLE

An experimental evaluation is planned to evaluate a SLIM for an integrated suspension-propulsion system for guided ground transport. A bar-type reaction rail will be mounted on a 0-101 km/h 7.7 m diameter test wheel, and the 1.73 m long 6 pole stator will be mounted in a six-component force balance and energized by a 200 kVA PWM inverter. This experiment will be conducted at the CIGGT, Kingston, Canada. Tests will be conducted over a wide range of operating conditions and parameters will be monitored, proceed and stored by means of a data acquisition/minicomputer system.

PERFORMING AGENCY: Mitre Corporation

INVESTIGATOR: Katz, RM Tel (730) 827-6000

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Ravera, RJ Tel (202) 426-0190

Contract DOT-UT-50016

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Mar. 1978 COMPLETION DATE: Aug. 1978 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: Mitre Corporation

#### 11 159643

##### MAG-LEV MODEL LSM

A general feedback control scheme which provides acceptable linear synchronous motor (LSM) propulsion characteristics has been established and analysed. The vehicle is controlled by continuous variation of the power conditioning unit (cycloconverter) output voltage and frequency in response to vehicle velocity and force angle. Effective damping and control of the

vehicle during acceleration, deceleration and steady state operation have been achieved. The theoretical concepts have been confirmed experimentally on a linear synchronous motor small model facility.

#### REFERENCES:

Linear Synchronous Motor Feedback Controls Dawson, EG; Sen, PC; Clarke, DG; Lakhavani, S, IEEE Trans on Magnetics, VMAG12,N6, pp885-888, Nov. 1976

A Device to Measure Force Angle of a Linear Synchronous Motor, Dawson, EG; Schwalm, L; Unteregelsbacher, E, IEEE Trans on Indus Elec and Control Instrum, VIECI23, N4, pp 406-09, Nov. 1976

Superconducting Mag Levitation & Linear Synchronous Motor Propulsion for High-Speed Guided Ground Transp, Ministry of Transport, CIGGT, No. 76-7, Mar. 1976

Superconducting Mag Levitation & Linear Synchronous Motor Propulsion for High Speed Guided Ground Transp, Ministry of Transport CIGGT, No. 75-5, Mar. 1975

Interim Report on Linear Synchronous Motor Experimental Model, Dawson, GE; John, VI; Sen, PC; Bennett, JA; Clarke, S, CIGGT, No. 74-7, Aug. 1974

Department of Characteristics of Variable Speed Linear Synchronous Motor, Dawson, GE; John, VI, CIGGT, No. 7406, Aug. 1974

Analysis & Appl of Superconducting May Lev & Linear Synchro Motor Propul to High Speed Guided Ground Transp, Ministry of Transport, Mar. 1974

Linear Synchronous Machine: Transient Analysis and Control Lakhavani, S, Queen's University, Elec Engineering Dept, Ms Thesis

Cycloconverter Control of Linear Synchronous Motor Clarke, D, Queen's University, Elec Engineering Dept, MS Thesis

Study of Magnetic Levitation & Linear Synchronous Motor Propulsion, CIGGT, Canadian Maglev Group, No. 73-1, Dec. 1972

Performance Characteristics of Variable Speed Linear Synchronous Motor, Dawson, GE; John, VI, CIGGT, No. 74-6, &408

The Canadian High Speed Magnetically Levitated Vehicle System, CIGGT, Canadian Maglev Group, No. 7712, Sept. 1977

Electrodynamic Suspension & Linear Synchronous Motor Propulsion for High-Speed Guided Ground Transportation, CIGGT, Canadian Maglev Group, No. 77-13, Sept. 1977

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 6/18/74

INVESTIGATOR: Dawson, GE Tel (613)547-2684

SPONSORING AGENCY: Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Audette, M Tel (514) 283-2880

Contract OST5-0112

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: 1972  
COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$45,080

ACKNOWLEDGMENT: Queen's University, Canada

#### 11 159658

#### AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY PROGRAM, SYSTEM, SAFETY AND PASSENGER SECURITY PROJECT

The objectives of the project are to 1. Generate guidance and planning information on system and passenger security. 2. Develop a model based on system features to predict passenger perceptions of system safety and security. 3. Provide standard deceleration and seating specs to assure passenger safety during emergency stops in AGT systems. 5. Specification of seating and slope. 6. Passenger Security and Vandalism. 7. Passenger Safety and Convenience. 8. Passenger Evacuation and Rescue. 9. Dissemination of information through guidebooks and user workshops.

PERFORMING AGENCY: Dunlap and Associates, Incorporated

INVESTIGATOR: Pepler, RD Tel (202)655-3971

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Sussman, ED Tel (617)494-2041

Contract DOT-TSC-1314

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1977  
COMPLETION DATE: Jan. 1979 TOTAL FUNDS: \$588,000

ACKNOWLEDGMENT: UMTA

#### 11 159659

#### AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY PROGRAM, VEHICLE LATERAL CONTROL AND SWITCHING (VLACS) PROJECT

The VLACS project will develop AGT vehicle lateral control and switching concepts that (1) reduce cost, weight, and complexity, (2) improve performance (ride quality), life, reliability, and increase switching capability. The VLACS project provides for an experimental program to validate and evaluate the analytical design studies. Both contact (mechanical) and non-contact (wire follower) lateral control systems will be evaluated. To aid government officials, transit planners and system manufacturers, the VLACS project will develop lateral control and switching system guideline specifications and data base of the current technology.

INVESTIGATOR: Haines, G Tel (303) 343-8780

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Izumi, G Tel (202) 426-4048

Contract DOT-UT-70088

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Aug. 1977  
COMPLETION DATE: Aug. 1979 TOTAL FUNDS: \$869,477

ACKNOWLEDGMENT: UMTA

#### 11 159660

#### AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY PROGRAM, VEHICLE LONGITUDINAL CONTROL AND RELIABILITY

Reduce cost and complexity and increase reliability of Longitudinal Control Systems through the following steps: (1) Technology Evaluation and Model Development; (2) Vehicle Longitudinal Control Studies; (3) Reliability Enhancement Studies; (4) Entrainment and Platooning Studies; (5) Experimental Program; (6) Data Base Development and Guidelines Specification and Requirements.

PERFORMING AGENCY: Otis Elevator Company, Transportation Technology Division

INVESTIGATOR: Schumacher, PJ Tel (303)343-8780

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Hoyler, RC Tel (202) 426-4047

Contract DOT-UT-70048

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1977  
COMPLETION DATE: Sept. 1979 TOTAL FUNDS: \$2,562,000

ACKNOWLEDGMENT: UMTA

#### 11 159661

#### AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY PROGRAM GUIDEWAY AND STATION TECHNOLOGY (GST) PROJECT

The GST project will develop/establish guideway and station concepts that: (1) reduce construction, installation, operating and maintenance costs, (2) improve site integration and aesthetics, and (3) improve all weather operation and power distribution. To aid system manufacturers, governmental officials and transit planners the GST project will develop AGT guideway station design guidelines and requirements, computer based cost and implementation time models and a data base on AGT guideway and station technology. The project is expected to require 25 months.

PERFORMING AGENCY: De Leuw, Cather and Company

INVESTIGATOR: Stevens, R Tel (312)346-0424

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Izumi, G Tel (202)426-4048

Contract DOT-UT-70066

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1977  
COMPLETION DATE: Aug. 1979 TOTAL FUNDS: \$999,865

ACKNOWLEDGMENT: UMTA

#### 11 159662

#### AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY. SYSTEMS OPERATION STUDY

The objectives of the System Operation Study are to evaluate the applicability of AGT systems to alternative application areas as well as to make AGT computer analysis tools available to AGT systems and investigate the operational characteristics of automated guideway transit systems in network configurations such as simple shuttles or loop, line haul networks and complex or area-wide networks.

PERFORMING AGENCY: General Motors Corporation, Transportation Systems Division

INVESTIGATOR: Thompson, J Tel (313)575-8485

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: MacKinnon, D Tel (202) 426-4047

Contract DOT-TSC-1220

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1976 TOTAL FUNDS: \$3,200,000

ACKNOWLEDGMENT: UMTA

#### 11 160399

##### FRA ADVANCED SYSTEMS PROGRAMS

The FRA Advanced Systems Programs were reduced to that of only monitoring activities of other countries. The Department took this action to reflect the position that revitalizing and upgrading our existing railroads was of a higher priority than developing technology for advanced systems that would not be needed for some years to come. The Department should keep abreast of the technology developments in other countries so that when it is again decided that this country needs to develop advanced systems, we will have the right information on which to base our technical choices from our own independent evaluations of the state-of-the-art.

PERFORMING AGENCY: Massachusetts Institute Of Technology

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Kamilian, N

Contract DOT-FR-751-4331 (CR)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1977 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$9,945

ACKNOWLEDGMENT: TRAIS

#### 11 170589

##### ACCELERATING WALKWAY DEMONSTRATION

A moving walkway which accelerates a user from a 1.5 mph entrance speed to a 7.5 mph cruise speed and then decelerates the user back to a 1.5 mph exit speed is being developed, tested and demonstrated. The system provides an up to five times improvement in cruise speed compared to conventional constant speed moving walkways.

PERFORMING AGENCY: Port Authority of New York and New Jersey, IT-06-0126

INVESTIGATOR: Fruin, J Tel (201) 963-7205

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Izumi, G Tel (202) 426-4048

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1976 COMPLETION DATE: Dec. 1982

ACKNOWLEDGMENT: UMTA

#### 11 170593

##### ECONOMIC FEASIBILITY OF A MAGNETICALLY LEVITATED TRANSPORTATION SYSTEM IN THE CANADIAN CORRIDOR

A technically feasible maglev system based on electrodynamic levitation and linear synchronous motor propulsion was identified as a future model option

for high speed ground transportation in the Canadian corridor during phase III studies. The objective of this project is to analyse the economic feasibility of the proposed concept, conduct economic trade-offs to optimize the design, investigate various scenarios by which a maglev system may be implemented in the Canadian corridor, and estimate the time frame for development and implementation of a maglev system in the Canadian context.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 8.48.77

INVESTIGATOR: Lake, RW Tel 5777 Boone, CJ Eastham, AR Rice, RA

SPONSORING AGENCY: Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Audette, M Tel (514) 283-2880

Contract OST-77-00109 NOTICE DATE: Feb. 1978 START DATE: Dec. 1977 COMPLETION DATE: Aug. 1979 TOTAL FUNDS: \$200,000

ACKNOWLEDGMENT: CIGGT

#### 11 170605

##### AGTT/AGRT SUPPORT AND CONSENSUS

APTA will provide UMTA's AGRT and AGTT programs with transit industry input, advice, and consensus on automated guideway transit technology and advanced group rapid transit in such areas as classification, basic requirements, service and operational requirements, passenger accommodations, system and subsystem design requirements, and system verification, certification, and acceptance.

PERFORMING AGENCY: American Public Transit Association

SPONSORING AGENCY: Urban Mass Transportation Administration

Contract DOT-UT-70058

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Feb. 1977 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$113,788

ACKNOWLEDGMENT: American Public Transit Association

#### 11 170621

##### VEHICLE DATA ACQUISITION SYSTEM

One of the SEATAC SLT vehicles will be instrumented with sensors, scanner, and data storage device to be designed and developed. The device will record the condition of 32 sensors for the most recent 20 minutes in order to aid with vehicle diagnostics in the event of a failure. A data processing system will produce a strip chart of the recorded sensor outputs within one hour of a failure. A failure analysis wing VDAS will be carried out for 6 months, and the results, including cost effectiveness of such a system, documented in a Final Report.

PERFORMING AGENCY: SEA-TAC International Airport, Port of Seattle

INVESTIGATOR: Bitts, MK Tel (206) 433-5407

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Hoyler, RC Tel (202) 426-4047

Contract DOT-WA-06-0009

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Aug. 1977 COMPLETION DATE: July 1978 TOTAL FUNDS: \$88,295

ACKNOWLEDGMENT: UMTA



12 055784

**TOXICOLOGICAL AND SKIN CORROSION TESTS ON HAZARDOUS MATERIALS**

Toxicological data are inadequate for classifying certain of the materials being transported. The work is to verify further the suitability of proposed transportation health hazards classification criteria and to permit classification of additional materials according to these proposed criteria.

PERFORMING AGENCY: Department of the Air Force, Toxic Hazards Division

SPONSORING AGENCY: Materials Transportation Bureau, Department of Transportation

RESPONSIBLE INDIVIDUAL: Harton, EE, Jr Tel 202-4262311

IA AS-40079

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1974 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$88,860

ACKNOWLEDGMENT: TRAIS, Materials Transportation Bureau

12 058266

**RAILROAD TANK CAR FIRE PROGRAM**

The objectives of this task are to (1) perform laboratory scale fire tests to evaluate the effectiveness of coatings in providing fire protection for tank cars and (2) develop analytical models of pool and torch fires.

PERFORMING AGENCY: Ames Research Center, Aeronautics and Space Technology Office, NASA

INVESTIGATOR: Mansfield, J Tel 415-965-5991

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Dancer, DM Tel (202)426-1227

AR-30033

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1973 COMPLETION DATE: Sept. 1978

ACKNOWLEDGMENT: FRA

12 058268

**HAZARDOUS MATERIAL RAILROAD TANK CAR TORCHING AND POOL FIRE STUDY**

The objectives of this task are to (a) construct a facility which would enable the flow structure and properties of a burning jet to be characterized and (b) design and conduct a series of torch and pool tests to evaluate the ability of railroad tank cars to withstand the effects of torching with and without insulation.

PERFORMING AGENCY: Ballistic Research Laboratory

INVESTIGATOR: Baicy, E Tel 301-272-3979

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Levine, D Tel 202-426-1227

AR-44061

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Feb. 1974 COMPLETION DATE: Apr. 1978

ACKNOWLEDGMENT: FRA

12 058838

**SYSTEM SAFETY-AN INTERDISCIPLINARY APPROACH TO TRANSPORTATION SAFETY**

The effort concerns an analysis of system safety at the planning and design stages of new transportation facilities, equipment or programs and in the operational stages of existing facilities or ongoing programs. Specific results shall be generated in methodology and guidelines and in case studies. The specific objectives of the first phase of the research are: 1. To transfer applicable systems reliability concepts to the transportation safety sector. 2. To identify and resolve key issues in transportation safety. 3. To develop a preliminary systems safety methodology applicable to the transportation modes.

**REFERENCES:**

Transportation Systems Safety. A Literature Search and Annotated Bibliography, Cantilli, EJ et al, Mar. 1976

Key Issues in Transportation Safety Horodniceanu, M et al, June 1976  
Transportation System Safety Methodology Cantilli, EJ et al, Jan. 1977

PERFORMING AGENCY: Polytechnic Institute of New York, Department of Transportation Planning & Engineering

INVESTIGATOR: Pignataro, LJ Tel (212) 643-5272 Cantilli, EJ Shoo-

man, M

SPONSORING AGENCY: Department of Transportation

RESPONSIBLE INDIVIDUAL: Bolger, PH Tel 202-4264458

Contract DOT-OS-50241 (CS)

STATUS: Active NOTICE DATE: Sept. 1977 START DATE: Sept. 1975 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$147,000

ACKNOWLEDGMENT: TRAIS (PUR-50315), OST, Polytechnic Institute of New York

12 059248

**FIRE SAFETY TECHNOLOGY ASSESSMENT**

The objective is to perform a comprehensive analysis of fire safety in the passenger compartments of transportation vehicles and crew compartments of rail vehicles, and to provide a documented information base and criteria from which the suitability of proposed standards in each mode can be assessed, or DOT R&D programs can be generated, ranked and prioritized.

PERFORMING AGENCY: Wiggins (J.H.) Company

SPONSORING AGENCY: Transportation Systems Center, R6533

RESPONSIBLE INDIVIDUAL: Polcari, S Tel (617) 494-2000

Contract DOT-TSC-1227 (CPF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$85,290

ACKNOWLEDGMENT: TRAIS (R6533)

12 059864

**EVALUATION OF SAFETY OF LOADING AND SECUREMENT HARDWARE FOR TRANSPORTING WHEELCHAIR PASSENGERS ON TRANSIT VEHICLES**

The objectives includes: (1) developing safety guidelines for wheelchair loading equipment, (2) determining the crashworthiness of standard wheelchairs secured by selected, representative securement systems, (3) comparison of parameters other than safety of systems being tested (i.e., ease of use, acceptability to user, costs), (4) recommendation of design modifications if they are found to be needed, (5) establishment of the cost effectiveness of the securement systems, and (6) development of educational materials for users and operators of wheelchair loading and securement facilities.

PERFORMING AGENCY: California Department of Transportation

INVESTIGATOR: Gianturco, A

SPONSORING AGENCY: Urban Mass Transportation Administration, CA-06-0098-00-01

Contract CA-06-0098-00-01 (FFP)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1977 COMPLETION DATE: July 1978 TOTAL FUNDS: \$195,000

ACKNOWLEDGMENT: TRAIS (CA-06-0098-00-01)

12 059876

**INVESTIGATING SAFETY OF WHEELCHAIR BOARDING AND SECUREMENT HARDWARE FOR TRANSPORTING WHEELCHAIR PASSENGERS**

California Department of Transportation will (1) develop safety guidelines for wheelchair loading equipment; (2) test (up to force of 10 g's) wheelchair securement systems to determine their effectiveness and the crashworthiness of standard wheelchairs when secured at different points of securement; (3) evaluate systems for ease of use, costs, and acceptability to user; (4) recommend design modifications if found needed; and (5) establish cost effectiveness of securement system.

PERFORMING AGENCY: National Highway Traffic Safety Administration  
SPONSORING AGENCY: Urban Mass Transportation Administration, DC-06-0172

RESPONSIBLE INDIVIDUAL: Simpich, PE Tel (202) 426-4023

ID AT-70008

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1977 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$5,000

ACKNOWLEDGMENT: TRAIS (DC-06-0172)

12 059880

**ASSESSMENT OF THE INCLINED ELEVATORS USED IN STOCKHOLM, SWEDEN**

In Stockholm there are 36 inclined elevators--elevators that ascend at the same angle as the escalator and are placed, in the Stockholm rapid rail

system, right beside the escalator. Some inclined elevators there have been in use for over 10 years. This UMTA sponsored research project has put together a team from DeLeuw Cather Company, the General Services Administration's Construction Management Office, and Boston's MBTA Office of Special Needs to visit Stockholm and undertake a case study of the Stockholm experience with inclined elevators. The case study will be written to meet the informational needs of three groups of readers: (1) management of transit properties, (2) architects and engineers planning and designing transit stations, and (3) elderly and handicapped travellers. The team is to determine what the experience in Stockholm is with this device, to obtain factual engineering, architectural, operational, and user data about the equipment, all to the purpose of helping to decide whether the inclined elevator is a worthy candidate for use in U.S. transit stations.

PERFORMING AGENCY: General Services Administration, Office of Construction Management; De Leuw, Cather and Company

INVESTIGATOR: Hansen, T Tel (202) 637-1231

SPONSORING AGENCY: Urban Mass Transportation Administration, DC-06-0167

RESPONSIBLE INDIVIDUAL: Simpich, PE Tel (202) 426-4023

Contract IT-06-0172

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1977 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$39,000

ACKNOWLEDGMENT: TRAIS (DC-06-0167)

## 12 081788

### RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT

This project is directed at improving the performance of tank cars in derailments and minimizing the danger of catastrophic tank car accidents. When initiated, it consisted of 12 Phases with additional Phases subsequently added. Phase 03--Materials Study; Phase 08--Reduced Scale Model Studies; Phase 12--Vessel Failure Research; Phase 13--Head Shield Study; Phase 14--Stub Sill Buckling Study and Phase 15--Switchyard Impact Tests are completed. The other phases, on which work is continuing, are the following: Phase 01--Accident Review; Phase 02--Accident Data Analysis; Phase 04--Literature Review; Phase 05--Head Study; Phase 06--Safety Valve in Liquid Study; Phase 07--Safety Relief Devices; Phase 09--Design Study, Tanks and Attachments; Phase 10--Design Study, Car, Phase 11--Thermal Effects Studies; and Phase 16--Tank Car Wear Experiments.

PERFORMING AGENCY: Association of American Railroads Technical Center; Railway Progress Institute

INVESTIGATOR: Phillips, EA Tel 312-5673607

SPONSORING AGENCY: Association of American Railroads Technical Center; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Phillips, EA Tel 312-5673607

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1970

ACKNOWLEDGMENT: AAR

## 12 099389

### RAIL VEHICLE SAFETY RESEARCH PROGRAM

This program has as its objectives: (1) Increase the safety of hazardous material cars; (2) Decrease number and severity of accidents caused by vehicle component failures; (3) Decrease the number of accidents caused by human error; (4) Reduce the number and severity of grade crossing accidents; (5) Improve communication and control systems. Torch and relief valve test facilities have been completed and used for the on-going hazardous material tank car project. On-board automatic inspection and monitoring systems are being developed as a means of component failure prevention. Development of cab and train handling simulator as part of the human factors project began late in FY 75. Modularized grade crossing equipment has been developed under the grade crossing safety project, which started in early FY 75.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Safety Research

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Levine, D Tel (202) 426-1227

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: FRA

## 12 099392

### LOCOMOTIVE CAB SAFETY

A number of special projects directed toward improving the safety of the work space provided for operating crews in the cabs of locomotives have been undertaken. After an in-depth review of FRA-funded studies of accidents and potential hazards, it was determined that the railroad industry should respond with effective cab improvements. AAR had Electro-Motive and General Electric develop "clean" locomotive cab mock-ups. Modifications were based on reviews of these mock-ups. As a result, about 20 improvements are being incorporated in the cabs of production locomotives. These changes eliminate potentially hazardous sharp corners and edges, provide protective padding on certain exposed surfaces, provide added protection to prevent injuries associated with cab doors, provide improved drinking water facilities and improved sanitary facilities. Another project is a study of the consequences of head-on and rear-end collisions between trains. A test program is intended to provide the information necessary to redesign locomotives to increase the survival rate in train-to-train collisions. Furthermore locomotive cab seats are being examined in light of human factors criteria to arrive at generic specifications for the design and development of safer, more comfortable seats to be incorporated in new locomotive deliveries.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railroad Labor Organizations

RESPONSIBLE INDIVIDUAL: Hawthorne, KL Tel (202) 567-3584

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1973

ACKNOWLEDGMENT: AAR

## 12 099424

### RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 2-ACCIDENT DATA ANALYSIS

Analysis of accident data is handled under this phase. A general breakdown of the 1965-1970 data shows two main damage categories-mechanical and thermal. With few exceptions, the mechanical damage occurs first in the accident sequence. Exceptions involved fires originating from non-tank car sources. The analysis under this Phase includes the assignment of dollar losses incurred by the railroads due to product loss from the tank cars in these accidents. These losses are categorized by the specific types of damage which cause them. From this, the potential values of design solutions are determined. The values of overlapping solutions are also given. Some overlap positively and some negatively. For example, the value of a combined head and shell shield is greater than the sum of their individual values. Conversely, the value of a combined head and thermal shield is less than the sum of their individual values. All values must be reduced by the estimated efficiencies of actual design solutions which are developed. This leads to actual "benefit" values for each solution. The final cost effectiveness evaluation is made made simply comparing the actual benefit values with the estimated costs of solutions.

See also RRIS 12A 081788.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Phillips, EA Tel 312-5673607

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1970

ACKNOWLEDGMENT: AAR

## 12 099425

### RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 11-THERMAL EFFECTS STUDY

The whole thermal question, including fire environment and thermally induced stresses, is being covered under this phase. The major activity has been a search for a practical heat shield material, such as an ablative, intumescent, or simply an insulative coating, that can be applied to the non-insulated 112A (114A) pressure tank cars, which are the cars most vulnerable to violent rupture from external heat. Many companies which produce fire protective coatings have submitted samples which were studied in a laboratory fire test apparatus which was designed for initial screening. Two of the most promising materials were selected for application to 1/5 scale model tank cars which were subjected to large enveloping fires. These tests were conducted at the White Sands Missile Range in cooperation with

the FRA. The objectives were to confirm laboratory findings and theoretical analyses, to ascertain some of the properties of fires which were not yet defined, finally prepare subsequent full scale tests. This was followed by two full scale pool fire type tests, one with uncoated and the other with sprayed on type coating tank. A report on these fire tests has been published. Other current major problems in this Phase concern impact and accelerated service tests (ALT) of tank cars equipped with sprayed on coating type and insulation-jacket type thermal shields. These tests are being conducted at the DOT Transportation Test Center to evaluate in service reliability of the thermal shields. The tank cars will accumulate a total of approximately 160,000 miles in the facility for accelerated tests (FAST) program at the DOT Test Center. A third pool fire test on a full size 112A Car is tentatively scheduled for 1978 at the DOT Test Center. The Tank will be covered by one inch of an apparatus. The current major programs in this Phase concern mineral wool insulation covered by an 11 gage steel jacket.

See also RRIS 12A 081788 and 12A 058266.

PERFORMING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute; Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Phillips, EA Tel 312-5673607

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1970

ACKNOWLEDGMENT: AAR

#### 12 099427

##### **RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 7-SAFETY RELIEF DEVICES-GENERAL**

This Phase covers all currently used safety relief devices on all classes of tank cars. It has the general objective of seeking means, through design changes in these devices, for safer containment, or safer release, of hazardous products in accidents. Activity has not progressed beyond initial planning since, to date, there has not been sufficient evidence that either deficiencies exist or that design changes would lead to significant improvement. This Phase will be activated when and if, results from other studies (viz. Phases 01, 06, and 11) indicate such a need.

See also RRIS 12A 081788.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Phillips, EA Tel 312-5673607

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1970

ACKNOWLEDGMENT: AAR

#### 12 099428

##### **RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 6-SAFETY VALVE DISCHARGE CAPACITY**

When a tank car carrying liquified compressed gas is heated in a fire, its contents can expand to where the tank can become nearly shellfull at the safety valve pressure setting. The safety valve must then maintain safe tank pressure by momentarily discharging liquid. It may also be called upon to do this through liquid discharge in the event the tank is overturned and exposed to fire. As in other pressure vessel codes, the tank car specifications require that safety valves be sized and tested on the basis of vapor discharge. There being no firm data on liquid discharge capacities, this Phase was established with the objective of determining such capacities by means of full-scale test. Toward this end, a special 20,000 gallon test tank was fabricated with provisions for mounting the currently used safety valves on both the top and bottom of the tank. The tank has been installed at Edwards Air Force Base, and tests have been run using water, air, and vapor and liquid LPG. This program is being conducted on a cooperative basis with the FRA. Results, not yet available, will be published after all data is reduced.

See also RRIS 12A 081788 and 12A 054567.

PERFORMING AGENCY: Association of American Railroads Technical Center; Federal Railroad Administration

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute; Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Phillips, EA Tel 312-5673607

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1970

ACKNOWLEDGMENT: AAR

#### 12 099436

##### **RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT. PHASE 1-ACCIDENT DATA COLLECTION**

This is a major Phase and deals with the collection and cataloging of accident data. Any accident involving a tank car, loaded or empty, in which there is damage to the tank, its attachments and fittings, or its insulating steel jacket, is included. During the first two years of the project, such data were collected for the six year period 1965-1970. Currently, an update is nearly complete covering the five year period 1971-1975. Following this, procedures are established for collecting data on a continuing basis. Most of the information has been coded and computerized. For the six year period 1965-1970 the files contain data on 3853 tank cars damaged in 2321 accidents. This corresponds to an annual average of 642 tank cars damaged in 387 accidents.

See also RRIS 12A 081788.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads

RESPONSIBLE INDIVIDUAL: Phillips, EA Tel 312-5673607

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1970

ACKNOWLEDGMENT: AAR

#### 12 130946

##### **QUANTITATIVE DESCRIPTIONS OF TRANSPORTATION ACCIDENTS INVOLVING HAZARDOUS MATERIALS**

Description: Sandia's continuing effort in this area includes the following major components: Assessment of the probability of occurrence and the severity of the five major environments (impact, fire, puncture, crush and immersion) experienced by casks or containers in air, highway and rail transportation. Analyses of these predicted environments to assess possible revisions or regulatory standards. Consideration of specific examples, e.g., the response of a radioactive material shipping cask involved in a rail grade crossing accident, to determine threat probabilities for potentially large contamination incidents. Revision of analytical descriptions to make the results more applicable to an increasing number of specific risk analysis studies aimed at optimizing procedures for transporting radioactive materials. Compilation of pertinent accident information in a data bank to provide retrievability of specific information to parties performing analyses.

This project is also supported by Sandia Laboratories.

PERFORMING AGENCY: Sandia Laboratories, Division of Applied Mechanics

INVESTIGATOR: Priddy, TG Hartman, WF Foley, JT

SPONSORING AGENCY: Energy Research and Development Administration, Division of Waste Management and Transportation

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GPW 51 1)

#### 12 130966

##### **DEVELOPMENT OF A HEAT-ACTIVATED ALARM SYSTEM FOR RAILCARS CARRYING EXPLOSIVES**

To develop a simple, low-cost, portable heat-activated alarm system for protecting railroad boxcars carrying explosive materials for the navy. Railcars typically used for transporting explosive materials for the navy will be identified. Existing safety regulations and material handling method will be reviewed. The probable heat propagation mechanisms in these cars will be studied in light of the findings of accident investigations such as those compiled at Naval Weapon Center (NWC), China Lake and railroad companies. The desired characteristics of an optimum heat detection system such as the principle of detection, threshold temperature, response time, detector location, possible circuitry, alarm transmission, recording, and power requirements will be identified and design criteria developed. An experimental model of a heat-activated alarm system will be designed and breadboarded. Laboratory tests will be conducted under simulated conditions to determine the sensitivity and to insure the proper function of the system. Field tests will be conducted using existing large scale facilities such as those used by NWC. A prototype system will be constructed. A technical note will be issued on the prototype heat alarm system development.

PERFORMING AGENCY: Naval Civil Engineering Laboratory, Department of the Navy

INVESTIGATOR: Jenkins, JF Alumbaugh, RL

SPONSORING AGENCY: Naval Facilities Engineering Command, Depart-

ment of the Navy, DN587075

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQN587075 1)

#### 12 135594

#### STUDY OF PHYSICAL PARAMETERS OF TRANSPORTATION ACCIDENTS

The aim of the project is to extend the Transportation Accident Criteria study to describe the transportation accident environments to which large shipping casks can be exposed. These descriptions are required to determine the risk of shipment and for use in preparing environmental impact statements. Study will cover truck, rail, and waterways transport and include frequency of occurrence of impact, crush, puncture, fire, and immersion subsequent to such accidents.

PERFORMING AGENCY: Sandia Laboratories, ALO 117B

INVESTIGATOR: Hartman, WF Tel (505) 264-4753 Dennis, A

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA Tel (301) 973-5361

Contract E(29-1)-789

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1972 TOTAL FUNDS: \$371,000

ACKNOWLEDGMENT: Energy Research and Development Administration

#### 12 135595

#### PRELIMINARY ANALYSIS OF SAFETY ASSESSMENT IN TRANSPORTING RADIOACTIVE MATERIALS IN THE COMMERCIAL SECTOR

The aim of the project is to examine the technical basis for analyzing safety in transport of radioactive materials with the objective of providing program definitional assistance to NRC transportation research activities.

PERFORMING AGENCY: Sandia Laboratories, 06-19-05 A1035

INVESTIGATOR: Luna, R Tel (505) 264-5276

SPONSORING AGENCY: Nuclear Regulatory Commission

RESPONSIBLE INDIVIDUAL: Lahs, W Tel (301) 427-4356

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Nuclear Regulatory Commission

#### 12 135596

#### MAINTENANCE OF A TRANSPORTATION ACCIDENT ENVIRONMENTAL DATA BANK

The maintenance of this data bank involves the active pursuit of sources of new data, the updating of indices, and responding to official users who wish to obtain environmental data. A necessary part of this continued work is the processing of data and entry into the storage and retrieval system. As needs for new data are identified, these will be sought. User requests for nonexistent data are expected to be a major contributor to this identification.

#### REFERENCES:

Transportation Accident Environment Data Index Foley, JT; Davidson, CA, SAND 75-0248

PERFORMING AGENCY: Sandia Laboratories, AL 0517A

INVESTIGATOR: Foley, JT Tel (505) 264-3036

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA Tel (301) 973-5361

Contract AT(29-1) 789

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 TOTAL FUNDS: \$216,000

ACKNOWLEDGMENT: Energy Research and Development Administration

#### 12 135597

#### NEW STANDARDS FOR PACKAGE SAFETY QUALIFICATION TESTS

The aim of the project is to develop a practical set of test regulations and procedures in coordination with the pertinent Governmental agencies which are consistent with the earlier Transportation Accident Criteria Study. Candidate standards will be established; a test series will be designed and conducted on a selected container to be provided by ECT. Finally, the proposed system will be presented and justified to standards personnel.

PERFORMING AGENCY: Sandia Laboratories, AL 0917B

INVESTIGATOR: Hartman, WF Tel (505) 264-4753

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA Tel (301) 973-5361

Contract E(29-1)-789

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 TOTAL FUNDS: \$312,000

ACKNOWLEDGMENT: Energy Research and Development Administration

#### 12 135598

#### IMPACT ANALYSIS PROGRAM

The aim of the project is the promotion of a better understanding of the impact phenomena and the development of better techniques of evaluating the behavior of Type B packages subjected to impact loading. Existing analysis methods for each specific load configuration will be developed. Material property needs will be identified. Finally, procedures will be selected and analysis techniques developed for application to particular needs.

PERFORMING AGENCY: Los Alamos Scientific Laboratory, LS 8217A

INVESTIGATOR: Neudecker, JW Tel (505) 667-7021

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA Tel (301) 973-5361

Contract W-7405-ENG-36

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: July 1977 TOTAL FUNDS: \$405,000

ACKNOWLEDGMENT: Energy Research and Development Administration

#### 12 135599

#### FULL SCALE VEHICLE TESTING PROGRAM

This project plans full scale accident tests to determine the integrity of shipping casks for transportation of nuclear wastes. The problem of transporting nuclear wastes becomes more acute as operating reactors increase. Demonstrations of shipping container integrity are necessary. Three extreme accident full scale tests using obsolete casks are planned: (1) High speed locomotive impact on stalled truck cask; (2) High speed derailment of rail cask into solid abutment followed by fire; (3) Truck mounted cask at high speed into solid barrier. Modeling and analysis will precede instrumented tests. Results will aid in prediction of performance of currently used, better designed casks.

PERFORMING AGENCY: Sandia Laboratories, AL 3617A

INVESTIGATOR: Yoshimura, RH Tel (505) 264-2452

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA Tel (301) 973-5361

Contract E(29-1)-789

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$1,170,000

ACKNOWLEDGMENT: Energy Research and Development Administration

#### 12 135719

#### DYNAMIC PROPERTIES OF PACKAGING MATERIALS IN TRANSPORT ACCIDENTS

The aim of the project is to develop data on dynamic material properties for materials of construction for shipping casks, particularly those properties required for analysis of transport accidents. Structural problem areas during dynamic loading of shipping casks will be delineated; experimental techniques (mostly models) will be used for material and structure studies. Results will be used as benchmarks for computer codes being developed at LASL for dynamic loading problems of shipping casks.

PERFORMING AGENCY: Battelle Memorial Institute, CH 0407A

INVESTIGATOR: Robinson, RA Tel (614) 424-6424 X3414

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA Tel (301) 973-5361

Contract W-7405-ENG-92

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Energy Research and Development Administration

**12 136084****TRANSPORTATION SAFETY STUDIES**

The aim of the project is to develop and use a model for assessing the risks associated with the shipping of radioactive and other hazardous materials. Failure characteristics and thresholds will be determined for crush, impact, puncture, fire, and water immersion. Evaluation of release consequences will be assessed. Existing data sources on equipment failure rate, accident frequency, and accident severity will be used to fullest extent possible, supplemented by surveys or other means when data is not available.

**REFERENCES:**

An Assessment of the Risk of Transporting Plutonium Oxide and Liquid Plutonium Nitrate by Truck, McSweeney; Hall, BNWL-1846, Aug. 1975

PERFORMING AGENCY: Battelle Memorial Institute/Pacific Northwest Labs, RL 5917B

INVESTIGATOR: Hall, RJ Tel (509) 946-2459

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA Tel (301) 973-5361

Contract ERDA AT-(45-1)-1830

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1973 TOTAL FUNDS: \$668,000

ACKNOWLEDGMENT: Energy Research and Development Administration

**12 138531****SAFETY AND RELIABILITY**

The objective is to improve the safety and reliability of urban rail systems through data gathering, analysis and hardware development. This includes vehicle crashworthiness analysis (current and proposed models) and computer models, feasibility studies of obstacle detection and study of safety hardware along with establishment of National Reliability Data Bank.

PERFORMING AGENCY: Transportation Systems Center

SPONSORING AGENCY: Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Spencer, PR Tel (202) 426-0090

Contract UM-604

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: 1974 TOTAL FUNDS: \$2,800,000

ACKNOWLEDGMENT: UMTA

**12 138567****SAFETY VALVE STUDY**

By analysis and small scale experiments, study the flow phenomena occurring when a safety valve of a pressurized tank car discharges when engulfed in a fire.

PERFORMING AGENCY: Maryland University, College Park

INVESTIGATOR: Sallet, DW Tel (301) 454-4216 Ext 4

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Dancer, DM Tel (202) 426-1227

Contract DOT-FR-64181

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1976 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: FRA

**12 148324****THE DEVELOPMENT OF A SYSTEMS RISK METHODOLOGY FOR SINGLE AND MULTI-MODAL TRANSPORTATION SYSTEMS**

The purpose of the research is to develop and verify a probabilistic systems methodology for the quantitative risk assessment of existing or future transportation systems. The objective of the first phase of the research was to develop primary risk models for estimating the probability of failure of each major component in air transportation, rail transportation and highway transportation. The second year work involves continuation and verification in the highway mode only.

**REFERENCES:**

Development of a Risk Methodology for Transportation Systems Safety, Transportation Systems Safety Research Group, Technical Report, Feb. 1976

Development of a Risk Methodology for Transportation System Safety, Final Report, Oct. 1976

PERFORMING AGENCY: Illinois University, Urbana, Department of Mechanical & Industrial Engineering

INVESTIGATOR: White, RA Tel (217) 333-0356

SPONSORING AGENCY: Department of Transportation; Illinois University, Urbana

RESPONSIBLE INDIVIDUAL: Ravera, RJ Tel (202) 426-0190

Contract DOT-OS-50238

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1975 TOTAL FUNDS: \$159,000

ACKNOWLEDGMENT: DOT

**12 148348****TRANSPORTATION SAFETY INFORMATION SYSTEM (TRANSIS)**

The objective of this system is to make data and information on safety performance and on on-going safety activities in all transportation modes readily available to DOT managers to allow intermodal comparisons. The system contains national data on accidents, injuries, and fatalities by month and by transportation mode, with certain exceptions due to limitations within modal accident reporting systems. Data and information are collected from DOT operating elements on a quarterly basis.

The quarterly Transportation Safety Information Report is available from NTIS.

PERFORMING AGENCY: Transportation Systems Center, OE-608

INVESTIGATOR: Gay, WF Tel (617) 494-2450

SPONSORING AGENCY: Department of Transportation, Office of Safety Affairs

RESPONSIBLE INDIVIDUAL: McDonald, G Tel (202) 426-4468

STATUS: Active NOTICE DATE: Feb. 1978 TOTAL FUNDS: \$90,000

ACKNOWLEDGMENT: DOT

**12 170651****AUTOMATIC WARNING OF TRACK MAINTENANCE GANGS**

Study of problems linked with the perception of acoustic warning signals (noise produced by track working machines) and determination of optimum acoustic and visual signals for the warning, of maintenance gangs working on the track, of the approach of trains. Study of systems for the automatic initiation and transmission of the announcing of trains approaching the track working site. The study of the noise produced by track working machines has formed the subject of a draft UIC leaflet, examined by the competent Sub-Commissions of the UIC in 1974. The studies and tests should, in a few months, permit the best acoustic signals for the warning of gangs working on the track to be defined. Tests on automatic radio transmission announcing systems are shortly going to be undertaken.

Eight reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Gelbstein Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1970

ACKNOWLEDGMENT: UIC

**12 170780****SAFETY AND SYSTEM ASSURANCE**

This project will continue the development and design of a program which reflects the priorities and requirements of the transit operating properties, to implement the highest priority management/software work statement, provide data and information regarding support for UMTA/TSC in transit matters concerning Safety and System Assurance.

PERFORMING AGENCY: American Public Transit Association

SPONSORING AGENCY: Urban Mass Transportation Administration

Contract DOT-UT-60061

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Dec. 1976 COMPLETION DATE: June 1978 TOTAL FUNDS: \$269,610

ACKNOWLEDGMENT: American Public Transit Association

13 059244

**RAILROAD PASSENGER SYSTEMS AND EQUIPMENT RESEARCH SUPPORT**

In the area of railroad electrification, a report shall be prepared on railroad electrification describing its potential for application within the U.S. rail system. The report may include, but not be limited to, national benefits and an investigation and subsequent recommendation of the forces which would encourage the railroads to electrify. In the area of passenger train rolling stock R&D, the DOT/FRA has a role in the assessment and evaluation of train systems which may be introduced in the U.S. through Amtrak or other railroads. The FRA must be prepared to render a judgment on the suitability of new equipment being placed into service within the U.S. rail network.

PERFORMING AGENCY: Small Business Administration  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Novotny, RA Tel (202)426-7612

IA DOT-FR-64244 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: May 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$396,890

ACKNOWLEDGMENT: TRAIS

13 129700

**RAILROAD ELECTRIFICATION/ENERGY PROGRAM**

FRA is in the planning state of an electrification program for identifying the nation's and the railroad operator's benefits, which accrue from electrification, determining the incentives which the railroad industry needs to start electrification, and doing R&D where it is most cost effective in the field of electrification. Already established is the fact that 100,000 barrels of petroleum would be saved per day if 22,000 miles of track were electrified (and 22,000 seems economically justified.). Additional savings would result if modal shifts from auto and intercity truck freight occurred. There are plans to electrify the 14-mile passenger track at the Transportation Test Center. The immediate use of the electrified track will be for testing of Northeast Corridor equipment prior to putting it into revenue service and for determining cost effective methods of installing the catenary system. In addition, the railroad industry will be surveyed to determine what use they may have for the facility.

SPONSORING AGENCY: Federal Railroad Administration, Office of Passenger Systems Research and Development  
RESPONSIBLE INDIVIDUAL: Novotny, RA

STATUS: Proposed NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: FRA

13 131757

**ENVIRONMENTAL AND ENERGY IMPACTS OF RAILROAD ELECTRIFICATION**

Description: The potential environmental and energy impacts associated with conversion of land transportation modes are being evaluated in terms of reductions in air pollutant emissions, ambient air pollutant levels along roadways and railway lines, noise pollution, and reduced water pollution impact. Specific studies are being conducted of freight and passenger traffic diversion in the Houston-Dallas intercity corridor, of long distance coal energy transshipment from Wyoming to Texas, and for short line coal-hauling railroads in Texas. Comparative impacts upon localized ambient air quality are being projected for mobile line source highway and diesel rail modes with stationary point source coal-fired power plants used to power electrified railroads. Energy consumption requirements for freight and passenger railroad electrifications are developed for comparison to alternative modes.

PERFORMING AGENCY: Texas University, Austin, Department of Civil Engineering

INVESTIGATOR: Cooper, HBH, Jr Vanwinkle, WS

SPONSORING AGENCY: Texas University, Austin, Center for Energy Studies

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (NTX 487)

13 160275

**CONDUCT A RAILROAD ELECTRIFICATION PROGRAM IMPACT ANALYSIS**

The contractor will perform a program impact analysis to isolate and present in a succinct, informative manner those factors of railroad electrification

which bear upon Government decision making. Following the analysis, the Contractor will develop a management interchange and communications package (MICP) to facilitate consultation by FRA's Office of Passenger Systems with the various concerned agencies. The program impact analysis and MICP work will be followed by the development of an executive summary of the electrification report draft material.

PERFORMING AGENCY: Virginia Research Institute, Incorporated

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Novotny, RA Tel (202) 426-9564

Contract DOT-FR-737-4321 (FFP)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$24,780

ACKNOWLEDGMENT: TRAIS

13 164812

**COMPUTER SIMULATION OF THE OPERATION OF SUBWAY AND ELECTRIC-TRAINS**

An accurate mathematical model of electric train systems is prepared including models of the powering and braking systems, track configuration, etc. Equations of motion are solved numerically, and the operation of the system is simulated taking into consideration operating and other constraints. A numerical optimization routine determines the optimum operating and design parameters by minimizing an objective function. The objective function is the energy consumption of the system, or the travel time of the trains, or a suitable weighted combination of the energy consumption and travel time. The method can be used in designing new systems, or modifying existing systems using the objective evaluation of the simulated results for decision making, or the method can be used for finding the optimum operating mode of existing systems and thereby reducing the energy requirement or travel time, or both. /RTAC/

PERFORMING AGENCY: Toronto-York University Joint Program in Transp  
INVESTIGATOR: Fenton, RG

STATUS: Active NOTICE DATE: May 1977 START DATE: Apr. 1977 COMPLETION DATE: Mar. 1978

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

13 170609

**PARAMETRIC STUDIES FOR RAILROAD ELECTRIFICATION AND TRACTION**

This effort includes site specific system studies of various train consists for passenger and freight transportation. A simple computer train operation program is available permitting us to simulate traction equipment parameters and speed profiles along the route in order to achieve the specified goals. Traction equipment characteristics and their interaction with the assumed speed profiles are evaluated. Speed profiles are modified to match the anticipated track improvements. The work centers around the Northeast Corridor, though studies of other high density lines are anticipated. Findings are published, at frequent intervals, in the form of letter reports to the sponsor.

PERFORMING AGENCY: Jet Propulsion Laboratory

INVESTIGATOR: Macie, TW Tel (213) 354-4432

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Guarino, M, Jr Tel (202) 426-9665

Contract DOT-AR-30006

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Oct. 1977 COMPLETION DATE: Oct. 1978

ACKNOWLEDGMENT: FRA

13 170653

**HIGH POWER TRACTION CURRENT COLLECTION AT HIGH SPEED**

This study concerns the performance of the "overhead contact system/pantograph system" at high speeds and also the problem of power transmission under severe loading conditions. The first remit was to prepare a mathematical model for the study of the "overhead contact system/pantograph system". A first recommendation has been produced for pantographs and lightoverhead contact systems for high voltage current. Exact recommendations concerning the same problem are now being prepared. The study of other sections of the programme of work is nearly completed (measuring equipment to determine the upward contact force, determination of the currents acceptable at the point of contact, etc.).



Six reports have been published to date.

PERFORMING AGENCY: International Union of Railways

RESPONSIBLE INDIVIDUAL: Jutard, M Office for Research and Experiments

STATUS: Active NOTICE DATE: Dec. 1977 START DATE: 1973

ACKNOWLEDGMENT: UIC

**15 129701****METRO IMPACT STUDY**

As part of its ongoing programs, the Washington Area Council of Governments is conducting for UMTA an assessment of impacts of the METRO rail system in the Washington area. The program is somewhat narrower in scope than the BART Impact Work, concentrating on traveler impacts.

PERFORMING AGENCY: Metropolitan Washington Council of Governments, 1225 Connecticut Avenue, NW

SPONSORING AGENCY: Urban Mass Transportation Administration, Office of Planning

RESPONSIBLE INDIVIDUAL: McQueen, J

STATUS: Active NOTICE DATE: Feb. 1978

ACKNOWLEDGMENT: UMTA

**15 148353**

**COMMUNITY AND CITIZEN INITIATIVES FOR DEVELOPING PASSENGER TRANSPORTATION CENTERS AT EXISTING HISTORIC RAILROAD STATIONS**

To encourage joint use of existing historic terminals as intermodal transportation centers in combination with other community uses and community use of other historic transportation facilities and to identify implementation and funding problems, a study of railroad terminal locations is underway. This study of transportation facilities will be made in consultation with municipal, civic and private organizations concerned with preservation and reuse programs. The study will document the following: Adaptive reuse as transportation centers and benefits therefrom; other

adaptive community uses and their benefits; financial data and procedures involved in achieving such utilization.

PERFORMING AGENCY: Anderson Notter Finegold, Incorporated

INVESTIGATOR: McGinley, PG Tel (617) 227-9272

SPONSORING AGENCY: Department of Transportation, Office of Environmental Affairs

RESPONSIBLE INDIVIDUAL: Crecco, RF Tel (202)426-4298

STATUS: Active NOTICE DATE: Feb. 1978 COMPLETION DATE: June 1978

ACKNOWLEDGMENT: DOT

**15 160469****BART IMPACT PROGRAM, THE LAND USE PROJECT**

A major study area of the overall BART Impact Program, the Land Use Project will examine the effects of BART on (1) decisions about the location or residences, urban development, and activity patterns within the San Francisco Bay Area, (2) the behavior of the market for real property which exercises a major influence of such decisions, and (3) the resultant spatial distributions of people, activities, and development.

PERFORMING AGENCY: Metropolitan Transportation Commission

SPONSORING AGENCY: Office of the Secretary of Transportation

Contract DOT-OS-30176/205 (CC)

STATUS: Active NOTICE DATE: June 1978 START DATE: Jan. 1977 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$600,000

ACKNOWLEDGMENT: TRAIS

16 059144

**STUDY OF FUTURE TRANSPORTATION DEVELOPMENTS**

In developing the most likely future transportation states, attention shall be given to the many parameters that will influence and determine the level and types of demand for transportation services that will emerge; describe and extrapolate present economic, social and technological trends and determine future transportation and energy requirements within the context of these trends; determine when and if crisis points are reached in the transportation system and the supporting energy infrastructure; examine expected technological developments that might represent opportunities for the emergence of a radically different transportation/energy system; and determine what policy decisions are crucial to the expected or projected land-use developments, economic characteristics, and social patterns of the future.

PERFORMING AGENCY: Stanford Research Institute

SPONSORING AGENCY: Office of Policy, Plans and International Affairs

RESPONSIBLE INDIVIDUAL: Nutter, R Tel (202) 426-2916

Contract DOT-OS-60160 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Mar. 1976 COMPLETION DATE: Sept. 1978 TOTAL FUNDS: \$211,217

ACKNOWLEDGMENT: TRAIS

16 059373

**STUDY OF IMPACTS OF ENERGY-USE CONSTRAINTS ON U.S. FREIGHT OPERATIONS**

This study will develop a transportation network and operation based methodology to examine the energy cost, shipper impact and transportation investment tradeoffs implied by various conservation options for freight movements. The model will compute changes in energy use, implied mode investments, and in shipment characteristics. A benefit/cost evaluation procedure will then consider tradeoffs among these elements for each conservation option to determine optimal system configuration under joint objectives of reducing energy use in freight transportation while maintaining shipper services and investment levels to assure industry viability.

PERFORMING AGENCY: CACI Incorporated

SPONSORING AGENCY: Transportation Systems Center, R6814

RESPONSIBLE INDIVIDUAL: Anderson, DL Tel (617)494-2000

Contract DOT-TSC-1252 (CPF)

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Aug. 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$122,277

ACKNOWLEDGMENT: TRAIS (R6814)

16 128051

**RAIL VEHICLE POWER AND ENERGY CONSUMPTION STUDY**

The purpose of this study, which is part of the general Energy Management Program, is to determine the power requirements and energy consumptions of transit vehicles operating in free air and in tunnels under various conditions as specified by operational parameters such as acceleration, maximum speed, station spacing etc. The study first establishes the mechanical limits of power requirements, energy consumption, regeneration and energy storage in terms of the operational conditions and free air and in tunnels. The calculations within this part of the study will use the results of the aerodynamic drag study (project #3605) and operational criteria established in other studies. The study then incorporates the performance characteristics of various propulsion systems-DC series, shunt or separately excited motors, as well as AC motors-with and without energy saving devices such as choppers and flywheels. The study relies here on input from investigations carried out by the Electrical Group. The resulting calculations will produce actual power and energy consumption profiles of the different propulsion systems under the various operational conditions considered. The energies associated with drags, momentum change, regeneration and equipment losses will be identified. The results will be used in the Economic Evaluation Program to determine the viabilities of the various propulsion options. The viable alternatives will then be investigated further with refined performance data and extended operational ranges in order to provide basic data for preliminary conceptual design of the total energy system. /RTAC/

PERFORMING AGENCY: Ontario Ministry of Transportation &amp; Communication, Can, 3607

INVESTIGATOR: Soots, V

SPONSORING AGENCY: Ontario Ministry of Transportation &amp; Communication, Can

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1975

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

16 129721

**MEASUREMENT OF RAIL TRANSPORTATION FUEL CONSUMPTION**

This project has the objective of establishing accurate information concerning fuel consumption of railroad freight trains in a variety of actual operations. Initial emphasis will be on TOFC/COFC service. Accurate basic data is being collected in cooperation with a number of railroads, for revenue-service trains, and analyzed to provide results of general applicability. The analysis will be utilized to validate an analytical model developed for predicting fuel consumption as a function of various parameters and operating conditions.

REFERENCES:

Railroads and the Environment-Estimation of Fuel Consumption in Rail Transportation, FRA-OR&amp;D-75-14.II, Sept. 1977

Freight Service Measurements - Vol II

PERFORMING AGENCY: Transportation Systems Center

INVESTIGATOR: Hopkins, JB Tel 617-494-2148

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Koper, JM Tel 202-426-0808

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1975 COMPLETION DATE: Mar. 1978

ACKNOWLEDGMENT: FRA

16 135132

**INCREMENTAL COSTS AND TRADE-OFFS BETWEEN ENERGY EFFICIENCY AND PHYSICAL DISTRIBUTION EFFECTIVENESS IN THE INTERCITY FREIGHT MARKET**

This is a pioneer study to develop an analytical model to measure the physical distribution costs, transportation performance alternatives, and energy use for commodities of various densities and values shipped by rail, motorcarriers, and watercarriers in specific intercity freight markets. Also to be considered are the individual modes of transportation and the impact of these alternatives on intra-and inter-modal performance. Furthermore, aggregate policy scenarios will be developed to interrelate individual policies and assess energy, modal shifts, and dollar impacts of various government strategies.

PERFORMING AGENCY: Massachusetts Institute of Technology, Center for Transportation Studies

SPONSORING AGENCY: Federal Energy Administration, CO-50154-00

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (BP 451)

16 138528

**INTERCITY RAIL ENERGY EFFICIENCY FOR PASSENGER AND FREIGHT MOVEMENT**

The objective of this research was to develop and employ a method for determining the present and potential energy efficiency of intercity rail-passenger traffic under a variety of operating conditions. Variables considered in the analysis include load factor, rolling stock performance, and traffic and service characteristics. Two interest areas were addressed: 1. Development of an understanding of the impacts on productivity and energy efficiency of a modernization of the rolling stock, and 2. Identification of feasible, alternative improvements to the rail system that would increase productivity.

PERFORMING AGENCY: Union College, Mechanical Engineering Department

INVESTIGATOR: Mittal, RK Tel (518)370-6268

SPONSORING AGENCY: Department of Transportation, Office of University Research; Union College, Mechanical Engineering Department

RESPONSIBLE INDIVIDUAL: Ravera, RJ Tel (202) 426-0190

Contract DOT-OS-60124

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: June 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$55,980

ACKNOWLEDGMENT: Union College

16 148321

**ENERGY MANAGEMENT FOR ELECTRIC POWERED TRANSPORTATION SYSTEMS**

The purpose of this research is to further the state-of-the-art of energy management in electrically powered transportation systems. Inherent in this

objective is the determination of the relationships between the energy consumption of electric vehicles and their design capabilities and operating practices. Through this understanding, energy management strategies may be evaluated within a cost-benefit framework. The objectives of the work are: 1) To develop a realistic computer-based simulation model of energy consumption and cost in electric-powered transportation systems. This model will incorporate and link together the following three modules: (a) Train Performance Programs; (b) Energy Consumption Simulation; (c) Energy Cost Simulation. The advantage of this approach lies in its flexibility as it is anticipated that this technique will be able to accommodate any present or future system. 2) To develop strategies and guidelines for increasing the energy efficiency of electrically powered transportation systems. Used by the transit operators and designers, these guidelines would be applied to the modification of present systems and the construction of new ones. The strategies will be evaluated within the framework of the simulation model, and validated through application to selected real-world systems.

PERFORMING AGENCY: Carnegie-Mellon University, Department of Mechanical Engineering

INVESTIGATOR: Uher, RA Tel (412) 578-2960

SPONSORING AGENCY: Department of Transportation, Office of University Research

RESPONSIBLE INDIVIDUAL: Hopkins, JB Tel (617) 494-2023

Contract DOT-OS-60129

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1976 COMPLETION DATE: June 1978 TOTAL FUNDS: \$170,840

ACKNOWLEDGMENT: DOT

#### 16 165021

#### ENERGY INTENSITY OF VARIOUS TRANSPORTATION MODES

This study provides an overview of the existing literature related to Energy Intensity (EI) of various transportation modes. These transportation modes include intracity (auto, bus, automated guideway transit system, vans, heavy rail, and light rail transit), and intercity (airplanes, autos, buses, trucks, rail, waterways and pipelines) modes of transportation for passenger and freight movement. Wherever possible, an attempt has been made to correlate energy intensity as a function of operating conditions such as speed, load factor, type of commodities being moved, etc. Use of both statistical and engineering approaches has been made for estimating energy intensity figures. It is concluded that energy intensity values have a considerable range depending upon the operating conditions, types of hardware, trip characteristics, load factor and type of commodities being shipped. The major output of the study is a list of suggested EI values for several transportation modes. The study is highly data intensive. Finally, guidelines are also provided for furthering the state-of-the-art related to energy intensity work.

#### REFERENCES:

Energy Intensity of Various Transportation Modes Mittal, RK, Draft Report, Sept. 1977

PERFORMING AGENCY: Aerospace Corporation

INVESTIGATOR: Mittal, RK Tel (213) 648-6633

SPONSORING AGENCY: Oak Ridge National Laboratory

RESPONSIBLE INDIVIDUAL: Loeb, AS Tel (615) 483-8611X31218

STATUS: Active NOTICE DATE: Nov. 1977 START DATE: Apr. 1977 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$8,500

ACKNOWLEDGMENT: Aerospace Corporation

17 058277

**INTERMODAL MANAGEMENT INFORMATION SYSTEM, PHASE I**

Two management systems will be developed as part of the Intermodal Freight Program. These two systems will provide accurate and timely information to control costs, improve profitability, and assure service. Extensive use will be made of exception reporting to highlight problem areas requiring attention. Also, information will be assembled to facilitate advanced planning such as modeling. Phase I now in progress, will develop the general design of a specialized management information system which will improve intermodal operations in the areas of driver assignment, blocking policies, equipment inventory control, equipment distribution and planning, billing practices, sales and marketing. Phase II will cover completion of development under a separate future contract.

PERFORMING AGENCY: Association of American Railroads  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Bourque, WL Tel (202)426-2608

Contract DOT-FR-65101

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1976 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$76,000

ACKNOWLEDGMENT: FRA

17 059062

**SOFTWARE DEVELOPMENT FOR THE PROJECTION OF COMMODITY FLOW PATTERNS**

The objective is for the development of data reduction and analysis programs to project commodity flow patterns as an input to development of a national transportation simulator capability.

PERFORMING AGENCY: Transportation Systems Center  
SPONSORING AGENCY: Transportation Systems Center  
RESPONSIBLE INDIVIDUAL: Chamberlain, C Tel (617) 494-2087

In-House

STATUS: Active NOTICE DATE: Feb. 1978 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: TRAIS (R6831)

17 059344

**ENGINEERING AND TEST SUPPORT SERVICES FOR RAILROAD INSTRUMENTATION, DATA ACQUISITION, PROCESSING AND EVALUATION**

Perform test planning, test operations, special instrumentation support, computer program development, data processing and maintenance to perform assigned tasks having the following objectives: (1) to provide instrumentation that accurately measures the geometry, forces, accelerations, displacements and other physical properties of railroad track structures, vehicles and equipments; (2) provide for the acquisition of data from the instrumentation; and (3) provide for the processing, analysis and evaluation of accumulated data such that meaningful reports are produced.

PERFORMING AGENCY: ENSCO, Incorporated  
SPONSORING AGENCY: Federal Railroad Administration

Contract DOT-FR-64113 (CPIF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1976 COMPLETION DATE: June 1978 TOTAL FUNDS: \$6,751,609

ACKNOWLEDGMENT: TRAIS

17 059866

**COMPUTER ASSISTED INFORMATION SYSTEM ON TRANSIT SCHEDULES, ROUTES, AND FARES**

This project will develop, demonstrate, and evaluate a prototype computer assisted transit information system to more effectively respond to telephone requests for information on transit schedules, routes, and fares.

PERFORMING AGENCY: Washington Metropolitan Area Transit Authority  
INVESTIGATOR: Warrington, J Tel (202) 637-1326  
SPONSORING AGENCY: Urban Mass Transportation Administration, DC-06-0154  
RESPONSIBLE INDIVIDUAL: Durham, JS Tel 202-4264022

Grant DC-06-0154 (FFP)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Oct. 1976 TOTAL FUNDS: \$435,000

ACKNOWLEDGMENT: TRAIS (DC-06-0154)

17 059874

**COMPUTER TECHNICAL SERVICES FOR PROJECT MONITORING INFORMATION SYSTEM (PMIS)**

The computer support systems currently developed are: (1) Project Monitoring Information System (PMIS), a program oriented management information system for FRA calling for a multi-file system of records dealing with the planning, budgeting, contracting and reporting of FRA's appropriations, programs and projects. Two subsystems of PMIS are Manpower Analysis Reporting Systems (MARS) and Personal Property Data Base (PROPTY). MARS is an organizational management information system concerning FRA personnel. PROPTY records the acquisition of FRA property.

PERFORMING AGENCY: First Data Corporation  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Grosvenor, AC Tel (202) 755-9464

Contract DOT-FR-71832 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1977 COMPLETION DATE: June 1977 TOTAL FUNDS: \$39,565

ACKNOWLEDGMENT: TRAIS

17 099386

**RAIL SAFETY INFORMATION SYSTEM**

This computer system contains carrier originated accident and exposure data, government originated inspection data on track, equipment, signals, operating practices and hazardous materials and, in addition, the national railroad-highway crossing inventory is part of the system. The system is used for report production and research.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Systems Analysis and Program Development  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: George, BF Tel (202)755-9263

STATUS: Active NOTICE DATE: Jan. 1977

ACKNOWLEDGMENT: FRA

17 099419

**FINANCIAL ACCOUNTING AND REPORTING ELEMENTS (FARE), TASK V**

Under this phase of the FARE project, additional effort to develop management information systems, using the FARE data base will be undertaken. Requirements for improvement management information-handling capabilities will be assessed, and concepts for a standardized, integrated management information system will be designed for sample operations. In addition a computer-oriented processing plan for FARE external reporting will be designed.

PERFORMING AGENCY: Andersen (Arthur) and Company  
SPONSORING AGENCY: Urban Mass Transportation Administration  
RESPONSIBLE INDIVIDUAL: Pierce, RE Tel (202) 426-9274

IT-06-0094

STATUS: Active NOTICE DATE: Aug. 1976 TOTAL FUNDS: \$860,000

ACKNOWLEDGMENT: UMTA

17 129722

**GTW CAR CONTROL AND ACCOUNTING SYSTEM**

Participate in the Grand Trunk Western "RAILS" computerized tele-processing car control and accounting system to permit incorporation of additional features to allow simulation. Project will serve as a prototype interface between a large terminal information and management system and a railroad-level system.

REFERENCES:

Detailed Functional Specifications for the Rails System Grand Trunk Western Railroad Company, June 1975

PERFORMING AGENCY: Grand Trunk Western Railroad  
INVESTIGATOR: Tischler, H  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Shamberger, RC Tel (202) 426-2608

Contract DOT-FR-4-5020

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: July 1974 COMPLETION DATE: Oct. 1977 TOTAL FUNDS: \$850,000

ACKNOWLEDGMENT: FRA

17 138526

**MISSOURI PACIFIC'S COMPUTERIZED FREIGHT CAR SCHEDULING SYSTEM**

To develop and implement an automated freight car scheduling system. A prototype capability will first be developed. This research and demonstration project will establish the feasibility and determine the operational benefits of automated freight car scheduling. The project will provide considerable impetus to interline freight car scheduling reports and demonstrations will be made available to the railroad industry and the procedures, computer programs and related documentation of MoPac's Transportation Control System including the automated freight car scheduling system will be made available to interested railroads.

**REFERENCES:**

- State-of-the-Art Survey Apr. 1976
- Project Work Plan Mar. 1976
- System Functional Requirements July 1977

**PERFORMING AGENCY:** Missouri Pacific Railroad

**INVESTIGATOR:** Sines, GS

**SPONSORING AGENCY:** Federal Railroad Administration

**RESPONSIBLE INDIVIDUAL:** Shamberger, RC Tel (202) 426-2608

Contract DOT-FR-65139

**STATUS:** Active **NOTICE DATE:** Feb. 1978 **START DATE:** Nov. 1975 **COMPLETION DATE:** Feb. 1979 **TOTAL FUNDS:** \$5,500,000

**ACKNOWLEDGMENT:** FRA

17 139172

**FLOW MANAGEMENT AND CONTROL TRANSPORTATION NETWORK ANALYSIS AND DECOMPOSITION TECHNIQUES**

The application of network analysis to the problems of freight flow and vehicle routing, for both rail and road systems. Emphasis was on improvements to Bender's decomposition technique for solving large-scale, mixed-integer problems. Specific topics addressed included network synthesis, networks improvement, multicommodity flows, facility location and urban goods movement.

Final Contract Report to be published in 1978.

**REFERENCES:**

- Bibliography of Network Models in Transportation Kivester, P; Simpson, RW, MIT/CTS Report (To be Published)
- Optimization for Sparse Systems Magnanti, TL, MIT/ORC, TR119, Nov. 1975
- Vehicle Routing Problems Golden, B, MIT/ORC, TR113, Aug. 1975
- Implementing Vehicle Routing Algorithms Golden, B; Magnanti, TL; Nguyen, HQ, MIT/ORC, TR115, Sept. 1975

**PERFORMING AGENCY:** Massachusetts Institute of Technology

**INVESTIGATOR:** Simpson, RW Magnanti, TL

**SPONSORING AGENCY:** Office of the Secretary of Transportation

**RESPONSIBLE INDIVIDUAL:** Crosby, RW Tel (202)426-9638

Contract DOT-TSC-1058

**STATUS:** Completed **NOTICE DATE:** Feb. 1978 **START DATE:** Sept. 1975 **COMPLETION DATE:** Sept. 1977 **TOTAL FUNDS:** \$200,000

**ACKNOWLEDGMENT:** OST

17 148331

**FEASIBILITY OF AND DESIGN OF COST EFFECTIVE COMPUTER BASED INFORMATION SYSTEMS TO INCREASE PRODUCTIVITY OF PRESENT AND FUTURE URBAN TRANSPORTATION SYSTEMS**

This research shall analyze potential benefits and associated costs of improving information systems for a range of urban modes including bus, rail, carpool, and vanpool as well as air. In order to limit the scope of the research to manageable proportions, the project will particularly focus on an investigation of the feasibility of providing information to urban transit riders by means of telephone accessed computer aided information systems. Results of this research are expected to identify those information system configurations with the highest potential payoff which warrant further development of demonstration. The analysis will be conducted within a cost-benefit framework. In addition to assessing the applications of computer technology, manually operated telephone information systems and simpler means (maps or charts) will be briefly evaluated. Costs for each system will be examined in light of the potential transit demand. The research is not intended to be a theoretical study developed in insolation from actual transit information operation. Rather, it will survey selected

transit properties to obtain first hand experience on performance of current information systems and their portential for modification/deployment to better meet transit information needs.

**PERFORMING AGENCY:** Purdue University, Department of Aeronautics and Astronautics

**INVESTIGATOR:** Drake, JW

**SPONSORING AGENCY:** Urban Mass Transportation Administration

**RESPONSIBLE INDIVIDUAL:** Durham, JS Tel (202) 426-4022

Contract DOT-OS-60148

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **TOTAL FUNDS:** \$69,755

**ACKNOWLEDGMENT:** DOT

17 148350

**EMPLOYEE INFORMATION SYSTEM**

To review and analyze for validity and usefulness currently available railroad employee wage and employee operating statistics and to develop an employee information system that will consist of valid and useful data from currently available sources in a form readily transferable to research and publication. Preliminary productivity measurements will be developed and recommended to the FRA.

**PERFORMING AGENCY:** Booz-Allen Applied Research, Incorporated

**SPONSORING AGENCY:** Federal Railroad Administration

**RESPONSIBLE INDIVIDUAL:** Collins, DM Tel (202) 472-7280

Contract DOT-FR-T5164

**STATUS:** Active **NOTICE DATE:** Feb. 1978 **START DATE:** Sept. 1976 **COMPLETION DATE:** May 1977 **TOTAL FUNDS:** \$69,768

**ACKNOWLEDGMENT:** FRA

17 152648

**GEOGRAPHICAL DECOMPOSITION OF TRANSPORT NETWORKS**

Determining the appropriate extent of various transport systems is a major issue of national policy. In the analysis of transport networks, particularly for investment appraisal, it is desirable in many instances to concentrate attention and calculations within a limited geographical radius. The dilemma facing the analyst lies between achieving a sufficient degree of detail to be of worth in design terms and tracing the spread of interaction throughout such an integrated system. As the net is cast wider to capture more distant effects, so the computational capacity required to record and manipulate the network expands exponentially. Complete coverage of a city or nation's transport system can only be achieved at a considerable cost in simplifying the representation of the network. One way around this problem is to seek to decompose the network. The objective of this research is to produce a set of rules for dividing a transport network into regions. These divisions should be such that the significant repercussions of changes in the network in one such region are contained within the region or transmitted to the outside via clearly identified articulation points in the network. The task of evaluating benefits and costs arising from particular projects, or designating an optimal set and consequence of additions or deletions to a network, would be made vastly easier if the search for interactions between links could be confined to a small region. The empirical contexts for this search for decomposition principles will be the Chicago Regional Transportation Authority's rail transit planning program and the rail branch line closure process in the State of Illinois.

**PERFORMING AGENCY:** Northwestern University, Evanston, Department of Geography

**INVESTIGATOR:** O'Sullivan, P

**SPONSORING AGENCY:** National Science Foundation, Division of Social Sciences, SOC76-16832

**STATUS:** Active **NOTICE DATE:** Aug. 1976 **START DATE:** June 1976 **COMPLETION DATE:** May 1977 **TOTAL FUNDS:** \$27,600

**ACKNOWLEDGMENT:** Smithsonian Science Information Exchange (GSS 6090)

17 159625

**FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, TASK 1. STRUCTURING ORGANIZATIONAL CONTROL MECHANISMS TO IMPROVE CAR UTILIZATION**

Examine information systems and corporate relationships which foster utilization improvements. Case studies will be conducted which focus on those decisions which require joint analysis by various departments. Based



on this analysis, a new approach will be developed and tested and recommendations then will be made to the industry. Investigate the most critical information needs associated with improved car utilization and the changes in the line of responsibility required to facilitate effective use of the information.

PERFORMING AGENCY: Association of American Railroads  
SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Shamberger, RC Tel (202) 426-2608  
Wooden, DG Tel (202)293-5018

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 COMPLETION DATE: July 1979 TOTAL FUNDS: \$295,000

ACKNOWLEDGMENT: AAR

#### 17 159628

##### FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, TASK 4. NATIONWIDE FREIGHT CAR MANAGEMENT

To begin planning a more efficient nationwide freight car management system. Continue the evaluation of the expended Clearinghouse Experiment. Continue the evaluation of Car Service Rules, Orders, and Directives. Design and implement a car grading and commodification to support national level car distribution. Evaluate the impact of customer regulations on the utilization of cars moving in international service. Evaluate the conflict between owner's equity and car utilization embodied in current and proposed freight car management systems. Initiate and freight car management experiments considered necessary. Using the information gained, recommend a nationwide freight car distribution and management system.

PERFORMING AGENCY: Association of American Railroads  
SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Shamberger, RC Tel (202) 426-2608  
Wooden, DG Tel (202)293-5018

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 COMPLETION DATE: July 1979 TOTAL FUNDS: \$300,000

ACKNOWLEDGMENT: AAR

#### 17 159631

##### RAILROAD OPERATIONS MODULAR PROCESSING SYSTEMS (ROMPS)

The purpose of the project is to demonstrate the feasibility of a geographically shared railroad operations data processing capability oriented towards satisfying the AAR's TRAIN II information requirements as well as the basic information needs common to principally small railroads. In concept, a single hardware/software system satisfying these needs within a common geographical area would be used by those railroads which cannot economically justify computer systems for themselves. The participating railroads would be connected to a centrally located mini-computer system via a communication link for the transmission and receipt of information as required by the system. The nucleus of the participants would be located in

a common geographical area with the remainder situated throughout the country.

PERFORMING AGENCY: Association of American Railroads

SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Shamberger, RC Tel (202) 426-2608  
Wooden, DG Tel (202)293-5018

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1977 COMPLETION DATE: July 1979 TOTAL FUNDS: \$700,000

ACKNOWLEDGMENT: AAR

#### 17 159648

##### NETPAC/2 PROJECT COST AND RESOURCE ACCOUNTING COMPUTER PROGRAM DEVELOPMENT

To produce a resource and cost accounting system for project planning and control to be added to an existing critical path time program (NETPAC/1). The program will produce 7 report classes (1) progress data (2) project cost (3) cost of work (4) cumulative cost (5) cost histogram (6) resource histogram (7) account code. The program is intended to provide reasonable accurate but timely cost and resource usage information on demand.

##### REFERENCES:

Handbook of Critical Path Law, CE; Lach, DC, Published by the Authors, 9th Printing, 1975

Project Management and Cost/Budget Control AREA Conference, Pittsburgh, Penn, 19-20 Oct 1976.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 5.63.76

INVESTIGATOR: Law, CE Tel (613)547-5777 Lockhart, M

SPONSORING AGENCY: Canadian Institute of Guided Ground Transport

RESPONSIBLE INDIVIDUAL: Law, CE Tel (613)547-5777

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Aug. 1967 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$64,000

ACKNOWLEDGMENT: CIGGT

#### 17 160402

##### FAST DATA MANAGEMENT AND ANALYSIS

To provide a data management system for the Facility for Accelerated Service Testing (FAST) test data, conduct appropriate data analysis and evaluation efforts, and report the resultant conclusions. FAST data analysis and report will provide the foundation for engineers in the railroad industry to make technical and economic decisions to update and improve railroad design, maintenance, and operations practices.

PERFORMING AGENCY: Association Of American Railroads, 1920 L Street, NW

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Gray, D Tel (202) 755-1877

Contract DOT-FR-74293 (CR)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1977 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$454,094

ACKNOWLEDGMENT: TRAIS

18 059221

**GROUP RAPID TRANSIT ELEVATED GUIDEWAY COST**

The contractor shall develop guideway structure cost estimation techniques which are capable of being applied to any elevated concrete guideway rubber-tired vehicle system. These techniques shall be demonstrated by performing ride quality cost projections for a hypothetical (Group Rapid Transit) type system.

PERFORMING AGENCY: Massachusetts Institute of Technology

SPONSORING AGENCY: Transportation Systems Center, R6537

RESPONSIBLE INDIVIDUAL: Sussman, ED Tel (617) 494-2041

Contract DOT-TSC-1206 (CR)

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: May 1976 TOTAL FUNDS: \$74,780

ACKNOWLEDGMENT: TRAIS (R6537)

18 059894

**STUDY OF FEASIBILITY AND IMPACTS OF ALL-INCLUSIVE TRANSPORTATION TRUST FUNDS AS A MECHANISM FOR TRANSPORTATION FINANCE**

This study will study the feasibility of designing and implementing multi-modal transportation trust funds at the Federal state and regional level. The feasibility analysis will address the following factors: 1) existing and potential funding sources at the respective levels; 2) compatibility among the funds and their levies; 3) institutional changes required to implement these funds; 4) effect on political decision-making process; and 5) flexibility to meet differing transportation needs in the various states and localities.

PERFORMING AGENCY: Polytechnic Institute of New York

INVESTIGATOR: Roess, RP

SPONSORING AGENCY: Urban Mass Transportation Administration, NY-11-0014

RESPONSIBLE INDIVIDUAL: Stratton, J

Grant NY-11-0014

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1976 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$50,000

ACKNOWLEDGMENT: TRAIS (NY-11-0014)

18 059896

**ALLOCATION OF TRANSIT SUBSIDIES**

The objective is to develop an analytical methodology for the rational allocation of subsidies to different transit lines and modes. The proposed research makes use of a simple analytical structure for the management of transit systems. Based on the demand and cost modes, explicit expressions can be derived for any measure of equity or efficiency such as subsidy per passenger, cost per passenger mile, etc.

PERFORMING AGENCY: Princeton University

INVESTIGATOR: Lion, PM

SPONSORING AGENCY: Urban Mass Transportation Administration, NJ-11-0004

RESPONSIBLE INDIVIDUAL: Hughes, PG

Grant NJ-11-0004

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1976 TOTAL FUNDS: \$58,062

ACKNOWLEDGMENT: TRAIS (NJ-11-0004)

18 059897

**REGIONAL FINANCING ALTERNATIVES FOR MASS TRANSIT**

The project will compare alternative regional financing mechanisms for mass transit in terms of their economic efficiency, equity, fiscal impact, locational and land use incentives, and administrative feasibility. Six alternative revenue sources will be analyzed and evaluated according to the following criteria: 1) property (and land) taxes; 2) income taxes; 3) sales taxes; 4) user charges; 5) intergovernmental grants; and 6) general revenues.

PERFORMING AGENCY: Syracuse University

INVESTIGATOR: Puryear, D

SPONSORING AGENCY: Urban Mass Transportation Administration, NY-11-0003

RESPONSIBLE INDIVIDUAL: Jasper, N Tel (202) 426-0081

Grant NY-11-0003

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Oct. 1976 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$98,062

ACKNOWLEDGMENT: TRAIS (NY-11-0003)

18 059931

**DEVELOPMENT OF COMPUTER SYSTEM FOR COST-EFFECTIVE MAINTENANCE OF RAIL EQUIPMENT IN URBAN MASS TRANSIT SYSTEMS**

Objective: Development of a model to aid transit management in the evaluation of existing vehicle maintenance schedules and the development of new/revised schedules. The following factors are considered in the model: 1) budgetary constraints 2) manpower availability and productivity 3) vehicle breakdown patterns 4) composition of vehicle fleet 5) transit service objectives.

PERFORMING AGENCY: Boston University, Department of Business Administration

INVESTIGATOR: Herniter, JD Tel (617)353-4606

SPONSORING AGENCY: Urban Mass Transportation Administration, MA-06-0073

RESPONSIBLE INDIVIDUAL: Hallmann, AB Tel (202)426-9274 George, BF Tel (202)426-9274

Grant DOT-MA-06-0073

STATUS: Active NOTICE DATE: July 1977 START DATE: Mar. 1976 COMPLETION DATE: Apr. 1977 TOTAL FUNDS: \$47,382

ACKNOWLEDGMENT: TRAIS (MA-06-0073)

18 080324

**THE RAILWAY FREIGHT RATE ISSUE IN CANADA**

The historical development of the railway freight rates in Canada is traced to provide the basis for explaining the complex roles played by freight rates and their evolution from an economic function to a sociological or political phenomenon. The inhibiting effects on the development of sound transportation and regional development policies are also analysed. /RTAC/

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 4.33.74

SPONSORING AGENCY: Canadian Institute of Guided Ground Transport; Canadian National Railways; Canadian Pacific

RESPONSIBLE INDIVIDUAL: Schwier, C Tel (613) 547-5777

STATUS: Inactive NOTICE DATE: Feb. 1978 START DATE: May 1974 COMPLETION DATE: Dec. 1978 TOTAL FUNDS: \$30,000

ACKNOWLEDGMENT: CIGGT

18 129724

**FREIGHT CAR AND LOCOMOTIVE COSTING**

Develop a set of methodologies and procedures for use in estimating the nature of cost and its variability in purchasing, maintaining, and operating freight cars and locomotives with application to pricing control and other management purposes.

PERFORMING AGENCY: Peat, Marwick, Mitchell and Company; Southern Railway System; Reebie (Robert) and Associates, Incorporated

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Lawler, JD Tel 202-426-0771

Contract DOT-FR-55055

STATUS: Active NOTICE DATE: July 1976 START DATE: June 1975 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$485,021

ACKNOWLEDGMENT: FRA

18 138472

**EFFECTS OF PEAK/OFF-PEAK DEMAND ON COSTING OF RAILWAY SERVICES**

An introduction to the basic peak-load pricing model is presented and then a discussion of some preliminary estimates of cost relationships are reported. There is evidence of considerable economies of scale, a somewhat unusual result given the findings for U.S. railroads based on cross-section studies, and a significant effect of peaking on costs. Alternate model specifications are being investigated currently; for example, the translog functional form. The study is unique in three respects. It deals with monthly time-series data as opposed to cross-section data; it investigates empirical aspects of peaking in rail service demand in the non-passenger sector; it incorporates two companies--one privately controlled and the other publicly controlled.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport

INVESTIGATOR: Bernard, JT Hartwick, JM

SPONSORING AGENCY: Canadian National Railways; Canadian Institute of Guided Ground Transport

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1976 COMPLETION DATE: Apr. 1977 TOTAL FUNDS: \$17,558

ACKNOWLEDGMENT: CIGGT, Roads and Transportation Association of Canada

18 138474

#### LONG-TERM IMPACT OF REPLACEMENT VALUE COSTING

The study, funded by Canadian National, is essentially a conceptual examination and critical analysis of replacement value costing principles as they might be applied to railway operations. The recommendations, concerning the use of a replacement value system, particularly address the selection of cost information pertinent to the service pricing decision. Freight car capital charges are an important and relatively uncomplicated component of unit costs, and hence were chosen as an example. The development was directed towards the determination of a realistic unit capital charge per unit time (cost per car per year).

#### REFERENCES:

Replacement value costing-concepts and methodology Lake, RW; MacDonald, JA; and Schwiier, C, CIGGT RPT #77-7, June 1977

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 4.53.76

INVESTIGATOR: Lake, RW Tel (613) 547-5777 MacDonald, JA Schwiier, C

SPONSORING AGENCY: Canadian National Railways

RESPONSIBLE INDIVIDUAL: Lake, RW Tel (613) 547-5777

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: Mar. 1976 COMPLETION DATE: 1977 TOTAL FUNDS: \$6,000

ACKNOWLEDGMENT: CIGGT, Roads and Transportation Association of Canada

18 138512

#### ACCESSORIAL SERVICES COSTING METHODOLOGY

To develop, test and justify a set of methodologies and procedures to be used for estimating the costs of providing, maintaining and operating railroad accessorial services and their application to pricing, control, investment and other management purposes.

Contract not yet awarded.

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Lawler, JD Tel (202) 426-0771

Contract DOT-FR-5168

STATUS: Proposed NOTICE DATE: July 1976 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: FRA

18 138513

#### TRAIN OPERATION AND CONTROL COSTING METHODOLOGY

To develop, test, and justify a set of methodologies and procedures to be used for estimating the costs of providing, maintaining and operating train operating and control facilities and their application to pricing, control, investment and other management purposes.

PERFORMING AGENCY: Young (Arthur) and Company

INVESTIGATOR: Kerridge, J Tel (202) 785-4747

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Lawler, JD Tel (202) 426-0771

Contract DOT-FR-65141

STATUS: Active NOTICE DATE: July 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$241,175

ACKNOWLEDGMENT: FRA

18 138514

#### GENERAL AND ADMINISTRATIVE SERVICES COSTING METHODOLOGY

To develop, test, and justify a set of methodologies and procedures to be used for estimating the economic costs of providing and maintaining railroad general administrative services and for management control and decision making.

PERFORMING AGENCY: Price Waterhouse and Company

INVESTIGATOR: Scanlan, J

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Lawler, JD Tel (617)423-7330 x219

Contract DOT-FR-5167

STATUS: Proposed NOTICE DATE: July 1976 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: FRA

18 148332

#### PLANNING MODEL FOR HIGH ACCESSIBILITY URBAN CORRIDORS

The primary objective of this research program is to develop a method for the planning and institution of capital and operational improvements in high accessibility urban transportation corridors. The corridor model allows a more detailed evaluation of a greater number of transportation alternatives than can be accomplished through conventional long-range planning techniques. The method is directed toward short (1 to 3 years) and medium range (4 to 10 years) planning horizons, within which the development and implementation of new facilities and major operations improvements typically occur. The method is designed to explore a wide range of new facility and operational options within a corridor and to evaluate these not only from the traditional standpoint of transportation user and system operator costs; but also to quantitatively assess community impacts such as land consumption, air and noise pollution, and national impacts such as energy use. A model for the planning of major transit improvements in densely developed urban corridors has been developed as an operational computer model. This model considers: Various forms of bus and rail transit, costs and environmental impacts, level of usage of new and existing facilities, and the levels-of-service offered by new and proposed transit services. This model is specifically designed to provide trade-off information so that the most cost-effective alternative, given a budget constraint and/or a specification of minimum levels-of-service to be offered, can be selected. The methodology is designed to use data which is readily available in urban transportation studies for large metropolitan areas. Sample corridor travel demand data was reduced from the Chicago Area Transportation Study's household interview files, and all programs and procedures used in this analysis are being documented.

#### REFERENCES:

Development and Testing of a Transportation Planning Model for High Accessibility Urban Corridors, Final Rpt., Vol. 1, 1975

for High Accessibility Urban Corridors Final Rpt., Vol. 2, 1975

Urban Corridor Transportation Planning Model, Version 1 Morlok; EK; Akylmaz, ML, 1974

Integration of the Urban Corridor Transportation Planning Model into the Urban Transportation Planning Process, Working Paper No. 10

PERFORMING AGENCY: Pennsylvania University, Philadelphia, Department of Civil and Urban Engineering

SPONSORING AGENCY: Department of Transportation

RESPONSIBLE INDIVIDUAL: Weiner, E

Contract DOT-OS-40092

STATUS: Active NOTICE DATE: Feb. 1977 TOTAL FUNDS: \$96,905

ACKNOWLEDGMENT: DOT

18 148357

#### RAIL SYSTEM INVESTMENT ANALYSIS

This study will assist in developing recommendations concerning future investments in the railroad system. The objectives of the project are to: Evaluate different categories of rail investments and identify logical priorities among alternative rail investment opportunities; develop a recommended approach for general application by the federal government in evaluating alternative investments of rail program funds; Provide railroad decision makers with a theoretically and practically sound approach for evaluating investments of company resources. The contractors have reviewed the approaches of 13 railroad companies to project evaluation, and obtained data on selected investment projects. Individual investments are being analyzed in detail to assess the rate of return which they will yield to the railroad, the rail industry and the national economy. The investments considered include roadway and route improvements, signals and communications projects, yard and terminal projects, and additions to rolling stock. 411 reports are to be published by U.S. D.O.T.

#### REFERENCES:

Rail System Investment Analysis: Literature Search Ernst & Ernst and Banks (RL) & Assoc.

Rail Investment Analysis: Description of the Railroad Investment Process, Ernst & Ernst and Banks (RL) & Assoc.

Rail System Investment Analysis: Financial Analysis of Sample Investment Projects., Ernst & Ernst and Banks (RL) & Assoc.

PERFORMING AGENCY: Ernst and Ernst; Banks (RL) and Associates, Incorporated

INVESTIGATOR: Robers, PD Tel (202)296-8300 Lutes, GS French, P

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Harman, J Tel (202)426-4214

Contract DOT-OST-50097

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$339,000

ACKNOWLEDGMENT: Ernst and Ernst

#### 18 159635

##### RAILWAY COSTING ORDER REVIEW

This work is not a stand-alone project, but consists of integrating CIGGT costing work with that of research teams assembled by the Canadian Transport Commission for the purpose of thoroughly revising railway costing order procedures.

##### REFERENCES:

Railway Costing Study. Phase I Canadian Transport Commission, Draft Rpt., Nov. 1977

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 8.36.77

INVESTIGATOR: Lake, RW Tel (613) 547-5777 Schwier, C Roney, MD

SPONSORING AGENCY: Canadian Transport Commission

RESPONSIBLE INDIVIDUAL: Lake, RW Tel (613) 547-5777

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1977 COMPLETION DATE: June 1978 TOTAL FUNDS: \$70,000

ACKNOWLEDGMENT: CIGGT

#### 18 159647

##### FORECASTING CHANGES IN COST COMPONENT PROFILES

It is intended that the study will investigate the forces which will cause differential cost escalation, develop cost level forecasting techniques, and prepare a set of indices that can be applied to railway cost component estimates beyond the normal planning horizon.

##### REFERENCES:

Railroad Cost Forecasting (In Preparation) Daub, M, CIGGT, No. 77-8, July 1977

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 4.59.76

INVESTIGATOR: Daub, M Tel (613) 547-3075

SPONSORING AGENCY: Canadian National Railways; Canadian Transport Commission

RESPONSIBLE INDIVIDUAL: Lake, RW Tel (613) 547-5777

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: Mar. 1976 COMPLETION DATE: July 1977 TOTAL FUNDS: \$7,800

ACKNOWLEDGMENT: CIGGT, Roads and Transportation Association of Canada

#### 18 159651

##### CAPITAL NEEDS STUDY

Under Section 504 of the Railroad Revitalization and Regulatory Reform Act of 1976 the following studies are required: (1) Estimates of deferred maintenance and delayed capital expenditures as of 1975 for all Class I railroads except Conrail; (2) Projection of the total maintenance and capital needs of the Class I railroads for each of the years 1976 through 1985; (3) Recommendations as to the amount and type of federal financial assistance, if any, to be provided to the railroads to help meet these projected needs.

##### REFERENCES:

Capital Needs Report

PERFORMING AGENCY: Federal Railroad Administration, Office of Policy and Program Development

INVESTIGATOR: Till, TA Tel (202)426-0382

SPONSORING AGENCY: Federal Railroad Administration

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: Aug. 1977 COMPLETION DATE: Feb. 1978

20 055810

## TRANSPORTATION SYSTEM DEVELOPMENT FOR ALASKA

This project is directed at the analysis of policy and transportation system development alternatives upon the economy of the State of Alaska as well as upon the performance of the intercity freight transportation networks. A macroeconomic model, previously developed by the Brookings Institution shall be adopted for use in representing the basic structure and interrelationships of the Alaskan economy. A transportation network simulation model shall also be developed as part of this effort which includes each of the major intercity freight carrying modal systems operating or expected or be operating in Alaska.

A recent Federal Railroad Administration study used the research demand forecasting models to predict Alaska Railroad freight flows by commodity type. Rail data was also used by the Canadian government in studying the feasibility of a Canadian railroad system extension to Alaska.

PERFORMING AGENCY: Alaska University, College

INVESTIGATOR: Gorsuch, L

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Swerdloff, CN

Contract DOT-OS-40008 (CS)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1973 COMPLETION DATE: June 1979 TOTAL FUNDS: \$222,959

ACKNOWLEDGMENT: TRAIS (PR# PUR-2-30685)

20 058460

## TRANSPORTATION REQUIREMENTS FOR COAL MOVEMENTS THROUGH 1985

Develop and analyze rail and barge industry estimates of the total coal flows by 1985 and the equipment and facilities required to handle increased coal traffic. Critical system constraints that may hinder traffic growth will be determined and carrier solutions sought. The rail and barge industry planning processes to 1985 will also be examined and discussed.

### REFERENCES:

Rail and Water Transportation Requirements for 1980 U.S. Coal Flows, IOCS, Cambridge, Mass., Oct. 1977

PERFORMING AGENCY: Input Output Computer Services Incorporated

INVESTIGATOR: Desai, SA Tel (617) 661-8700 Witten, J

SPONSORING AGENCY: Transportation Systems Center, OP-602

RESPONSIBLE INDIVIDUAL: Vance, L Tel (617) 494-2668

Contract DOT-TSC-1282

STATUS: Active NOTICE DATE: Oct. 1977 START DATE: June 1975 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$155,000

ACKNOWLEDGMENT: TRAIS, OST

20 058467

## DATA REQUIREMENTS ON INTERCITY FREIGHT DEMAND PLANNING

The objective is a critical review of present data sources and reporting methods. Emphasis is on the usefulness of the data in calibration and estimation of existing forms of demand models and recommendations on better sources or collection techniques for more effective forecasting of commodity flows. Data of primary concern are indications of shippers' choice; commodity attributes; production, consumption and pricing of commodities; and transportation attributes. A careful review of the form of the model and variables needed to predict modal choice by shippers is made. Various methods of data collection, processing, storage and retrieval and their related costs are evaluated for achieving the goals.

### REFERENCES:

Design of a Structure and Data Analysis Scheme for Intercity Freight Demand Forecasting, Chung, C; Roberts, PO, CTS Rept. #75-15, 154 pp, Sept. 1975

A Commodity Attribute Data File for Use in Freight Transportation Studies, Samuelson, RA; Roberts, PO, CTS Rept. #75-20, 27 pp, Nov. 1975

Developing Freight Origin-Destination Data for Use in Freight Planning, Roberts, PO, CTS Rept. #76-3, Feb. 1976

PERFORMING AGENCY: Massachusetts Institute of Technology, Center for Transportation Studies

INVESTIGATOR: Roberts, PO Tel (617) 253-7123

SPONSORING AGENCY: Transportation Systems Center, OP-509

RESPONSIBLE INDIVIDUAL: Wright, DG Tel (617) 494-2196

Contract DOT-TSC-1005 (CR)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Apr. 1975 TOTAL FUNDS: \$38,000

ACKNOWLEDGMENT: TRAIS, Massachusetts Institute of Technology

20 058489

## TRANSPORT OF SOLID COMMODITIES VIA FREIGHT PIPELINE

Objectives are: (1) to explore the feasibility and viability of the freight pipeline as an effective mode of transporting solid commodities over long distances, and (2) if the conclusion of that exploration is positive, to evaluate the issues surrounding the freight pipeline. The research shall focus on evaluation of the concept through a technical and market feasibility study. In specific terms, the study is expected to quantify, as much as possible, the traffic, social, economic, energy, legal, regulatory, institutional, political, and environmental impacts of freight pipeline within the context of a number of varied, but possible, scenarios. STATUS: The types of "freight pipeline" examined were: 1) slurry pipeline--liquid medium mixed with transported commodity; 2) pneumatic pipeline--air medium mixed with transported commodity, and 3) capsule pipeline--containerized freight in either liquid (hydro) or gas (pneumatic) medium. Through actual utilization, slurry, pneumatic, and pneumatic capsule pipeline were found to be technically feasible. Hydro capsule pipelines, have not yet demonstrated their reliability. Pneumatic capsule technology was selected for the indepth analysis of the economic feasibility of freight pipelines. Initial work in this area centered on identifying the markets that would be most suitable for penetration by pneumatic capsule technology; costs for these markets were ascertained. Generally, pneumatic capsule pipeline proves most feasible for total loads in excess of 5 million tons/year, and for distances greater than 500 miles. In investigating the possible demand for pneumatic capsule pipeline, the Chicago/Philadelphia corridor was selected for detailed demand analysis. Both aggregated techniques (using I.C.C. supplied cost functions) and disaggregated methods (using individual shipper cost functions) illustrated that for several types of commodities, the demand was substantial enough to consider construction.

### REFERENCES:

A Comparison of the Work (Energy) Requirements of Line-haul Rail, Truck, and Piggyback Freight Transportation, Morlok, EK, Presented at Annual Meeting of TRB, Jan. 1976

Cost and Performance Characteristics of Rail, TOFC and Highway Intercity Freight Modes, Morlok, EL; Warner, JA, No Date

PERFORMING AGENCY: Pennsylvania University, Philadelphia, Department of Civil and Environmental Engineering

INVESTIGATOR: Zandi, I

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Ryan, DC, Jr Tel 202-4264208

Contract DOT-OS-50119

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: May 1977 TOTAL FUNDS: \$130,529

ACKNOWLEDGMENT: TRAIS (PUR-50030), OST

20 059189

## FORECAST OF NATIONAL ECONOMIC ACTIVITY

The main purposes of this procurement are to obtain from the Bureau of Economic Activity (BEA) the basic data files needed to translate forecasts of national economic activity into regional projections; to obtain examples of applications of the Regional Industrial Multiplier System useful in estimating the direct, indirect and induced effects of changes in the output of an industry on a region; and to obtain research assistance in developing a sound commodity flow projection method.

PERFORMING AGENCY: Department of Commerce, Bureau of Economic Analysis

SPONSORING AGENCY: Transportation Systems Center

IA RA-76-29

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: May 1976 COMPLETION DATE: Sept. 1976 TOTAL FUNDS: \$10,000

ACKNOWLEDGMENT: TRAIS

20 080313

**FREIGHT CAR DEMAND INFORMATION AND FORECASTING RESEARCH PROJECT**

To create a functional design of the elements and processes necessary for a technically advanced system to collect and predict shipper requests (orders for freight cars to load). Such a system must be operationally suitable and economically justifiable for use by individual Class I railroads as part of their system-wide empty freight car distribution activity.

**REFERENCES:**

Freight Car Demand Information and Forecasting Research Project. Phase I: Final Report, Mar. 1975

PERFORMING AGENCY: Association of American Railroads

INVESTIGATOR: Minger, WK Tel (202) 293-5023

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Shamberger, RC Tel (202) 426-2608

Contract DOT-FR-30058

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: Apr. 1973 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$208,491

ACKNOWLEDGMENT: FRA

20 083440

**AN ECONOMIC ANALYSIS OF PRESENT AND POTENTIAL TRADE BETWEEN ALASKA AND WASHINGTON**

The project will identify present and future trade relationships between Alaska and Washington; identify characteristics of the distribution system; suggest innovations needed to improve the performance of the physical distribution system; and considering above, determine the composition of future trade. The investigation is designed to collect and analyze primary data of commodity movements; using the above information plus secondary data, project future trade flows; interview and analyze information on the physical distribution system from selected firms and government agencies involved in commerce between the two states. From these interviews, problem areas will be identified and analyzed and related to the effects on future trade composition. Completed research covers trade flows, barriers to trade and economic impact of trade between Alaska and Washington.

See also RRIS 20A 099627.

**REFERENCES:**

An Overview of Trade Between Alaska and Washington Casavant, K; Thomas, W, Pacific Northwest Conference, Victoria, Canada, May 1976

Trade Interdependencies: The Case of Alaska & Washington Casavant, K; Thomas, W, Am Agric Economics Assoc, Pennsylvania, Aug. 1976

Trade Interdependencies: The Case of Alaska & Washington, Agroborealis, Casavant, K; Thomas, W, 9:1, Jan. 1977

Input-Output Tables for Alaska's Economy: A First Look Logsdon, CL; Casavant, K; Thomas, W, Alaska University, Agric Experimental Station, Bulletin 48, Mar. 1977

PERFORMING AGENCY: Alaska University, College, Department of Agricultural Sciences

INVESTIGATOR: Thomas, WC

SPONSORING AGENCY: Department of Agriculture, ALK-274-5584

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Oct. 1973 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0064860)

20 083479

**IMPACT OF CHANGING TRANSPORTATION SYSTEMS ON LOCAL GRAIN AND FARM SUPPLY FIRMS**

**OBJECTIVES:** Estimate quantities of grain that will move through country elevators and commercial channels in 1975 and 1980 by counties; estimate demand for feed and fertilizer. Project alternate changes in grain transportation; determine economic feasibility of alternative systems of grain movement from producers to destinations; determine effect of changes listed under C and D on number, size, type and location of country elevators and on local employment and services; determine consequences of projected transportation changes on distribution of feed and fertilizer; and develop guidelines which individual firms can use in investment and transportation decisions. **APPROACH:** Will obtain data through survey schedules, transportation rate information and published reports. Develop models which will give estimates by counties and geographic units, evaluate alternative modes of transportation, project changes, and generate least cost information for various situations. Iowa, Kansas and Nebraska will participate in objectives A, B, C, D, F, and G. Iowa and Nebraska will participate in objective E. Illinois will participate in objectives A, B, C, D,

and E. The effects of railroad reorganization and branch-line abandonment were found to be related to the available alternatives. In areas with access to water or with nearby processing points on main rail lines the effects on costs, volumes, growth, and agricultural production were negligible. In areas presently dependent on rail transport to distant destinations such as export, rail abandonment increased costs and shifted volumes among elevators. A case study of two areas where rail service had been discontinued showed a minor effect on grain elevators within trucking distance of the river, but more distant elevators experienced a relative decrease in grain shipments when compared with similar elevators retaining the rail service. Fertilizer and feed firms showed little changes in volume but an increase in costs of transportation. Introduction of user charges on barges also shifted volumes of grain among modes and destinations. Small increments, 0.05 cent to 0.1 cent per ton mile had negligible effects. Lower rail rates (specifically unit train rates to the Gulf) were not reflected in higher prices to farmers, at least in the 3-year period studied. No significant differences levels of variance in prices paid to farmers as a result of the introduction of unit trains.

**REFERENCES:**

The Impact of Unit Trains on Corn Price Relationships at Country Elevators: Two Case Studies, Hoffman, LA; Birmingham, SC; Hill, LD, Illinois Agricultural Economics, July 1976

PERFORMING AGENCY: Illinois University, Urbana, Department of Agricultural Economics, ILL U-05-366

INVESTIGATOR: Hill, LD

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1971

ACKNOWLEDGMENT: Illinois University, Urbana (CRIS 0064467), Smithsonian Science Information Exchange (gy 64467 1)

20 083533

**ECONOMIC ANALYSIS OF THE UNITED STATES GRAIN EXPORTING SYSTEMS**

Evaluate private versus state trading systems for grain with respect to: Returns to producing, marketing and processing firms; relative market power between countries with different systems; comparative advantage; relative efficiencies of time, farm and place utilities under different systems; rate of technological change and progress including capital losses and replacement; their respect to commodity futures markets. Evaluate alternative export marketing techniques and strategies with respect to: the adequacy of the U.S. system of grades and standards; the logistics of costs of marketing and transportation. Comparative data will be collected on Canadian and U.S. grain handling costs and procedures. Structural and policy differences will be compared wherever possible. System performances will be compared on the basis of handling costs and producer returns. Analysis of capital investment decisions in the two systems will also be made. Data on price quality relationships for wheat will be collected and analyzed to determine the validity of present grading factors. North Dakota production data will be assembled on a county basis for use in a transportation model designed to analyze various rate policies for west bound shipments of wheat and barley. Existing transportation rates will be used to generate optimal flow patterns. Alternative rate policies will be compared to existing rate solutions. A manuscript is in process on a study of North Dakota Farmers Grain Marketing Strategies. The major factors influencing the selection of market outlet by farmers were price, convenience, grading practices, loyalty to firm, credit provisions for purchases and availability of farm supplies. Price and availability of labor were major factors in determining timing of grain sales. A survey of country elevators designed to basic marketing strategies and to review sale and procurement practices used by a random sample of firms was initiated. This study was a part of a regional study of country elevator marketing practices. The state and regional data are being analyzed and a Master's thesis is expected to be completed in early 1976. Preliminary results indicate that country elevators make limited use of futures markets in covering grain purchases. To-arrive contracts with terminal grain merchants are the predominant method of covering long grain positions in most states. The predominant method of transfer of grain ownership is still cash purchase at delivery by farmers; however forward contracting and farming of deferred pricing and pooling arrangements are becoming popular in several states of the North Central Region.

**REFERENCES:**

The Cost of Seed Processing Anderson, DE, NDSU, Agricultural Experiment Station, Nov. 1973

Grain Marketing Methods in the United States: Theory Assumptions and Approach, Anderson, DE, NDSU, Agricultural Experiment Station, AA-EA-CAES-WAEA Conf Paper, Aug. 1973



A Budget Analysis of the Logistics System for North Dakota Small Grains, Jensen, RC, NDSU, Department of Agricultural Economics, Unpublished MS Thesis, May 1974

North Dakota Farmers Grain Marketing Strategies Bedker, GM, NDSU, Department of Agricultural Economics, Unpublished MS Thesis, Mar. 1974

North Dakota Farmers Grain Marketing Practices Bedker, GM; Anderson, DE, NDSU, Agricultural Experiment Station, North Dakota Farm Research, Oct. 1974

PERFORMING AGENCY: North Dakota State University, Department of Agricultural Economics, ND01354

INVESTIGATOR: Anderson, DE

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1971 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: North Dakota State University (CRIS 0060238)

20 099645

## EVALUATION OF PUBLIC TRANSPORTATION POLICIES AFFECTING AGRICULTURE

Assess on a regular basis the economic performance of the general-purpose transportation system for agriculture and the effect on efficiency and equity of proposed adjustments in services and rates. Project short and long-run needs for transportation services by agriculture and evaluate resource allocation processes in the privately operated transportation system. Determine capacity, growth, economies of size and other factors about for-hire livestock truckers and trucking. Measure modal and cross-modal elasticities for transport demand by agricultural shippers for basic information for use in policy analyses. Develop weighted aggregative indexes of railroad weights for specific commodity groups food commodities combined and all commodities combined. Use surveys and other appropriate techniques to obtain primary data as required to carry out specified research. For-hire livestock truckers were found to be principally small but quite stable businesses. Utilization of equipment was high, and rates charged were highly correlated with distance and size of truck. Little basis was found for believing that economic regulation at the interstate level would improve trucking performance. Analysis of a transshipment model of a corn-soybean producing area showed that adverse impacts from rail line abandonment are not likely to be uniform. Certain local marketing firms were shown to lose substantial volumes of patronage by farmers, even though the total marketing costs for the area increased by only 0.1 percent in response to abandonments. The application of waterway user charges sufficient to cover Federal expenditures on waterways were estimated to cause a two-percent increase in marketing costs. Data were assembled for analysis of the cost of operating refrigerated trucks for hauling produce. Also, a survey of truck brokers to determine their role in exempt trucking was performed, and a number of rate, service and other proposals for change in transportation were analyzed for their impacts on agriculture.

### REFERENCES:

Grain and Soybean Transportation Problems in Fiscal 1974 Umberger, DE; Hutchinson, TQ, Economic Research Service, Marketing and Transportation Sit., MTS-191, pp 22-28, Nov. 1973

The Price of Agricultural Transportation Gerald, JO, Grain Transportation Forum, Bismarck, North Dakota, Mar. 1974

Nature and Quality of Livestock Transportation Services Used by Shippers, Hoffman, LA, Transportation Committee of American Nat'l Cuttleman's Ass, Jan. 1974

Changing Technology in Grain Transportation Hutchinson, TQ, International Conr Quality Conference, Champaign, Illinois, Oct. 1973

Problems in Transporting Fiscal 1974 Grain and Soybean Exports, Umberger, DE; Hutchinson, TQ, Economic Research Service, For. Agri. Trade of U.S., pp 18-24

PERFORMING AGENCY: Washington State University

INVESTIGATOR: Casavant, KL

SPONSORING AGENCY: Department of Agriculture, NEA-14-125-53-01-X2

Contract 12-17-04-8-917-X

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1974 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (G4 41788 46 286117)

20 099646

## EVALUATION OF PUBLIC TRANSPORTATION POLICIES AFFECTING AGRICULTURE

Assess on a regular basis the economic performance of the general-purpose transportation system for agriculture and the effect on efficiency and equity of proposed adjustments in services and rates. Project short and long-run needs for transportation services by agriculture and evaluate resource allocation processes in the privately operated transportation system. Determine capacity, growth, economies of size and other factors about for-hire livestock truckers and trucking. Measure modal and cross-modal elasticities for transport demand by agricultural shippers for basic information for use in policy analyses. Develop weighted aggregative indexes of railroad weights for specific commodity groups food commodities combined and all commodities combined. Use surveys and other appropriate techniques to obtain primary data as required to carry out specified research. For-hire livestock truckers were found to be principally small but quite stable businesses. Utilization of equipment was high, and rates charged were highly correlated with distance and size of truck. Little basis was found for believing that economic regulation at the interstate level would improve trucking performance. Analysis of a transshipment model of a corn-soybean producing area showed that adverse impacts from rail line abandonment are not likely to be uniformly borne. Certain local marketing firms were shown to lose substantial volumes of patronage by farmers, even though the total marketing costs for the area increased by only 0.1 percent in response to abandonments. The application of waterway user charges sufficient to cover Federal expenditures on waterways were estimated to cause a two-percent increase in marketing costs. Data were assembled for analysis of the cost of operating refrigerated trucks for hauling produce. Also, a survey of truck brokers to determine their role in exempt trucking was performed, and a number of rate, service and other proposals for change in transportation were analyzed for their impacts on agriculture.

### REFERENCES:

Livestock, Trucking Services: Quality, Adequacy and Shipment Patterns, Hoffman, LA; Boles, PP; Hutchinson, TQ, Economic Res Service, AFR-312, Oct. 1975

Operations of For-Hire Livestock Truckers Boles, PP, Economic Res Service, AER-342, July 1976

Impact of Higher Gasoline Prices on Rural Households, Hoffman, LA, Economic Res Service, 4 pp, Apr. 1976

Discussion of a Sequential Link Approach to Evaluating Transportation Facility Adjustments, Gerald, JO, Sou. Journal of Agric Econ., V8 N1, pp 35-37, July 1976

Estimation of Demand for Transp of Agric Commod Miklius, W; Casavant, KL; Garrod, PV, Amer Journal of Agric Econ, V58 N2, pp 217-223, May 1976

PERFORMING AGENCY: Economic Research Service, Department of Agriculture

INVESTIGATOR: Gerald, JO Hutchinson, TQ

SPONSORING AGENCY: Department of Agriculture, NEA-14-125-11-00

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1974 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (G4 41660)

20 099647

## EVALUATION OF PUBLIC TRANSPORTATION POLICIES AFFECTING AGRICULTURE

Assess on a regular basis the economic performance of the general-purpose transportation system for agriculture and the effect on efficiency and equity of proposed adjustments in services and rates. Project short and long-run needs for transportation services by agriculture and evaluate resource allocation processes in the privately operated transportation system. Determine capacity, growth, economies of size and other factors about for-hire livestock truckers and trucking. Measure modal and cross-modal elasticities for transport demand by agricultural shippers for basic information for use in policy analyses. Develop weighted aggregative indexes of railroad weights for specific commodity groups food commodities combined and all commodities combined. Use surveys and other appropriate techniques to obtain primary data as required to carry out specified research. For-hire livestock truckers were found to be principally small but quite stable businesses. Utilization of equipment was high, and rates charged were highly correlated with distance and size of truck. Little basis was found for believing that economic regulations at the interstate level would improve trucking performance. Analysis of a transshipment model of a corn-soybean

producing area showed that adverse impacts from rail line abandonment are not likely to be uniformly borne. Certain local marketing firms were shown to lose substantial volumes of patronage by farmers, even though the total marketing costs for the area increased by only 0.1 percent in response to abandonments. The application of waterway user charges sufficient to cover Federal expenditures on waterways were estimated to cause a two-percent increase in marketing costs. Data were assembled for analysis of the cost of operating refrigerated trucks for hauling produce. Also, a survey of truck brokers to determine their role in exempt trucking was performed, and a number of rate, service and other proposals for change in transportation were analyzed for their impacts on agriculture.

## REFERENCES:

Grain and Soybean Transportation Problems in Fiscal 1974 Umberger, DE; Hutchinson, TQ, Economic Research Service, Marketing & Trans Sit., MTS-191, pp 22-28, Nov. 1973

The Price of Agricultural Transportation Gerald, JO, Grain Transportation Forum, Bismarck, North Dakota, Mar. 1974

Nature and Quality of Livestock Transportation Services Used by Shippers, Hffman, LA, Transportation Com Amer Nat'l Cattlemen's Ass, San Diego, Jan. 1974

Changing Technology in Grain Transportation Hutchinson, TQ, International Corn Quality Conference, Champaign, Ill.

Problems in Transporting Fiscal 1974 Grain and Soybean Exports, Umberger, DE; Hutchinson, TQ, Economic Research Service, For. Agri. Trade of U.S.

PERFORMING AGENCY: Illinois University, Urbana, USDA, National Economic Analysis Division

INVESTIGATOR: Bunker, AR

SPONSORING AGENCY: Economic Research Service, Department of Agriculture, NEA-14-125-17-01

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1974 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Current Research Information Service (GY 41787), Smithsonian Science Information Exchange (CRIS 0041787)

## 20 128022

## DOCK STRIKES AND EXPORT LOSSES IN THE INTERNATIONAL GRAIN TRADE

The study will be limited to international trade in grain (wheat, barley, oil-seeds). Also, estimates of the financial impact of such strikes on the economy will be limited to Canada and the United States (North American Exporters). In line with the above-mentioned objectives, this study is an attempt to develop a model which will allow accurate estimation of the impact of future strikes of various duration and location. Such estimates will be in terms of losses to the struck economy and gains to its neighbor and additional gains to its chief competitors in the market. An important practical advantage of this analysis would be that by application of the model to estimate results of potential strikes in advance of their occurrence, public and private officials would be able to formulate appropriate marketing and transportation policies to cushion the estimated adverse impacts of such strikes. Further work on the project will focus attention on such questions as: (1) What is the critical duration for a strike during which serious shifts in the Canadian grain export markets may be expected to occur? (2) What factors influence the duration of the strike? (3) How can these shifts be measured?, and (4) What are the policy implications of these critical durations for the government and grain handling firms. /RTAC/

PERFORMING AGENCY: Manitoba University, Canada, Center for Transportation Studies

INVESTIGATOR: Tangri, OP

SPONSORING AGENCY: Transport Canada Research and Development Centre

STATUS: Active NOTICE DATE: July 1976 START DATE: June 1973 COMPLETION DATE: 1977

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

## 20 129727

## DOMESTIC AND INTERNATIONAL TRANSPORTATION OF U.S. FOREIGN TRADE: 1976-GENERAL CARGO COMMODITIES (PHASE II)

Objective is to obtain, (a) New Data on the domestic origins and destinations, and the characteristics of domestic transportation, for commodities being transported via international air and vessel movements in

U.S. foreign trade, and (b) New data on the transshipment of this type of commodity by truck and rail between U.S. and Canada (or Mexico) for trade with other foreign countries. Data will be collected by a sample survey (50,000 observations) and merged with existing data on international trade.

Co-sponsors are St. Lawrence Seaway Development Corp., U.S. Dot; U.S. Army Corps of Engineers, Institute for Water Resources, Ft. Belvoir, Virginia; Maritime Admin, Dept of Commerce.

## REFERENCES:

Domestic & Intl Transportation of U.S. Foreign Trade: 1975- Gen Cargo Commodity; Phase I: Prelim Studies, Spec & Plans, Bureau of the Census

PERFORMING AGENCY: Department of Commerce, Economic Surveys Division, 63-7108

INVESTIGATOR: Torene, R Tel (202)763-5430

SPONSORING AGENCY: Office of Policy, Plans and International Affairs; Department of Transportation, Office of Systems Analysis and Information

RESPONSIBLE INDIVIDUAL: Murphy, RD Tel (202)426-4448

Contract DOT-AS-50059

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Oct. 1975 COMPLETION DATE: June 1978 TOTAL FUNDS: \$600,000

ACKNOWLEDGMENT: Office of Policy, Plans and International Affairs

## 20 136085

## STUDY OF RADIOACTIVE MATERIAL TRANSPORT PROBLEMS 1976-2000

The aim of the project is to examine future transportation systems, trends, and problems associated with transport of radioactive and fuel cycle materials to assure a more orderly problem solving approach. Work areas include: (1) characterize the current transportation systems; (2) project future transportation needs and systems; (3) identify and analyze potential future transportation problems; (4) suggest actions to minimize impact of potential problems.

PERFORMING AGENCY: Battelle Memorial Institute/Pacific Northwest Labs, RL 6617B

INVESTIGATOR: Loscutoff, WV Tel (509) 946-2768 Hall, JH

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA Tel (301) 973-5361

Contract ERDA-AT-(45-1)-1830

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$275,000

ACKNOWLEDGMENT: Energy Research and Development Administration

## 20 136118

## ANALYSES OF REGIONAL DEVELOPMENT AND GROWTH IN THE UNITED STATES

OBJECTIVE: Develop and maintain data related to economic development and growth in the nation's regions and rural areas. Identify differences in economic development and growth. Evaluate the factors that cause some regions to develop and grow faster than others. Identify links between types of economic development and underlying factors. PROGRESS: Work on a historical analysis of the economic, social and institutional factors underlying variations in regional development was partially completed. Attention was given to determining general forms of casual linkages between the level of regional development and the quality of basic determinants of regional development. The determinants considered are natural resource endowments; labor; public and private capital; education, political and legal institutions; and production, transportation and communication technology. The relationships between basic determinants and level of development are examined for regions in several periods of time between 1790 and 1970's. Emphasis is placed on those determinants which, when considered together, provide an integrated, chronological perspective on lagging levels of economic activity and low incomes characteristic of some U.S. regions. Major service activities--Coordinated ERS's activities for and prepared two background papers for the Interagency Task Force that prepared the 1974 National Growth Report to the Congress (0.4 man-years).

PERFORMING AGENCY: Department of Agriculture, Economic Development Division

INVESTIGATOR: Coltrane, R

SPONSORING AGENCY: Department of Agriculture, Economic Development Division, 0041986 ED-60-440-11-00

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GY 41986 1)

20 138123

## IMPACT OF CHANGING TRANSPORTATION SYSTEMS ON GRAIN AND FARM SUPPLY MARKETING FIRMS

**OBJECTIVE:** Estimate the quantities of grain that will move through South Dakota country elevators and commercial channels in 1980. Estimate the South Dakota demand for feed grains, processed feed and fertilizer in 1980. Project alternate changes in grain transportation for South Dakota. Determine the economic feasibility of alternative modes of grain movement from producers to shipment destinations. **APPROACH:** Develop estimates by crop reporting district of the quantities of grain and livestock produced and grain marketed to 1975 and 1980. Formulate similar estimates of the demand for feed and fertilizer to 1975 and 1980. Project changes on grain transportation including railroad abandonment and equipment availability. Determine transportation rates of various modes of transportation available to shippers in the crop reporting districts. Develop cost estimates of alternative systems of grain transportation. **PROGRESS REPORT:** Analysis of truck transportation costs completed and applied to an area of proposed rail abandonment to estimate income loss to producers and effects on grain elevators.

**PERFORMING AGENCY:** South Dakota State University, Department of Economics

**INVESTIGATOR:** Payne, WF

**SPONSORING AGENCY:** Department of Agriculture, South Dakota Cooperative State Research Service, 0065580 SD00694

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** July 1974 **COMPLETION DATE:** June 1977

**ACKNOWLEDGMENT:** Current Research Information Service (0065580)

20 138364

## EVALUATION OF ALTERNATIVE TRANSPORTATION SYSTEMS AND POLICIES FOR RURAL MISSOURI

Estimate transport requirements to 1985 and 1990. Estimate economic effects of alternative rural transport systems. Assess state and federal roles in setting transport policy and planning and regulating transport systems. Study economic effects of alternate plans and policies on carriers, shippers and rural areas. Present Missouri rural transport system will be described. Demand for services will be measured and projected to 1985 and 1990. Expected changes in the system will be identified. Cost and service levels will be compared under simulated modal combinations and regulatory patterns. Merits of alternative systems and policies will be evaluated. 1. A study of grain production and marketing in Northwest Missouri has been completed together with a projection of transportation demand for movement of grain to 1980 and 1985, to determine a grain distribution system which would yield the highest net return to producers and marketers within the region. Study results indicate the possibility of a contribution of as much as \$2.6 million per year in farmer net income, before considering transportation and elevator upgrading costs, through adjustment of assembly and storage patterns to permit long-haul transport in larger volume shipments at lower cost. 2. A study of the condition, capacity and impediments to efficiency in Missouri's transportation system has been finalized for publication. The study documents the need for special attention to upgrading of rural roads and bridges; identifies segments of the railroad system with service limitations requiring attention; and highlights the possibilities for improved utilization of our underemployed inland waterway resources as a promising target for further study. Findings of this study have important implications for both public and private sector decision making. 3. Data collection is proceeding for estimation of transportation demand for grain and fertilizer, on a state-wide basis by counties, in 1980 and 1985.

### REFERENCES:

Missouri Rural Transportation in Jeopardy Moser, DE, Missouri University, Extension Division, Vol. 18; No. 8, Aug. 1975

**PERFORMING AGENCY:** Missouri University, Columbia, Department of Agricultural Economics, MO00040

**INVESTIGATOR:** Moser, DE

**SPONSORING AGENCY:** Department of Agriculture, Cooperative State Research Service

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** July 1975 **COMPLETION DATE:** June 1980

**ACKNOWLEDGMENT:** Current Research Information Service (CRIS-0068730)

20 138365

## TRANSPORTATION MODEL OF THE GRAIN AND FERTILIZER SECTOR OF NORTHWEST OHIO

Describe the present condition of the rural transportation system in selected areas of Ohio. Estimate flow of grain and fertilizer, in selected areas of Ohio. Estimate the optimal flow of commodities between production and consumption points through the network. Trace the effects of alternative government transportation policies on the operation of the transportation system. Conduct cost-benefit analyses of alternative investments in the rural transportation system. Develop a transportation model to evaluate the impact of changes in the transportation system and government policy on the movement of agricultural commodities and future needs of the transport industry. The research to date on this project has focused on identifying the branch rail lines which will be abandoned in the study area and the number and size of grain and fertilizer firms located on the branch lines. The rail abandonment problem has been conceptualized as a transshipment problem in a transportation network of links and nodes with specified capacity constraints. Data collection will begin in the near future.

### REFERENCES:

Rail Transportation Problems in Ohio Larson, DW, Ohio State University, Dept Agri Econ and Rural Soc, No. 577

The World Food Crisis: Implications for Trade and Aid Larson, DW, Ohio State University, Dept Agri Econ and Rural Soc

**PERFORMING AGENCY:** Ohio State University, Department of Agricultural Economics and Rural Sociology, OH000534

**INVESTIGATOR:** Larson, DW

**SPONSORING AGENCY:** Department of Agriculture, Cooperative State Research Service

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** July 1975 **COMPLETION DATE:** June 1978

**ACKNOWLEDGMENT:** Current Research Information Service (CRIS-0067954)

20 138367

## NATIONAL TIMBER AND WOOD PRODUCTS REQUIREMENTS

Analyze the present and prospective consumption of timber and wood products in the national economy by components and relate these requirements to the national to the national timber supply situation. Develop and apply sampling systems to measure quantities consumed in construction, manufacturing, shipping, and other major end uses. Develop and employ accurate models which monitor shifts in wood raw materials use. Develop and apply techniques for converting wood product consumption estimates into estimates of timber supply requirements. **PROGRESS REPORT:** A study of nonresidential and nonhousekeeping building construction activity found it increased from 1 billion square feet in 1961 to 1.7 billion square feet in 1973. The largest increase was in commercial buildings such as stores, warehouses, and office buildings. Nonhousekeeping, hospital, and other buildings also showed increases. Construction of industrial, religious, and educational buildings declined during the period. Lumber, plywood, hardboard, and particleboard usage in these structures increased during the period, while glue-laminated lumber, insulation board, and structural wood-fiberboard decreased. Construction value for all building increased from \$16.05 per square foot of floor area in 1961 to \$24.15 in 1973--an average annual rate of 3.5 percent. A computer retrieval and compiling system has been established, containing primary wood processing mill capacity, type, and location for analysis of trends and regional patterns in timber requirements. Annual woodpulp capacity in the U.S. has increased from 4.4 to 51.5 million tons since 1920, with average mill capacity increasing nearly ten times to 426 tons per day. Kraft pulp capacity now dominates the industry with the South leading in total pulp capacity. Panelboard production capacity data have been collected.

**PERFORMING AGENCY:** Forest Products Laboratory, FPL-4202

**INVESTIGATOR:** Stone, RN Marcin, TC Reid, WH

**SPONSORING AGENCY:** Department of Agriculture, Cooperative State Research Service

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** Apr. 1975 **COMPLETION DATE:** Apr. 1980

**ACKNOWLEDGMENT:** Current Research Information Service (CRIS-0042894)

20 138370

**EVALUATION OF PUBLIC TRANSPORTATION POLICIES AFFECTING AGRICULTURE**

Assess on a regular basis the economic performance of the general-purpose transportation system for agriculture and the effect on efficiency and equity of proposed adjustments in services and rates. Project short and long-run needs for transportation services by agriculture and evaluate resource allocation processes in the privately operated transportation system. Determine capacity, growth, economies of size and other factors about for-hire livestock truckers and trucking. Measure modal and cross-modal elasticities for transport demand by agricultural shippers for basic information for use in policy analyses. Develop weighted aggregative indexes of railroad weights for specific commodity groups food commodities combined and all commodities combined. Use surveys and other appropriate techniques to obtain primary data as required to carry out specified research. **PROGRESS REPORT:** For-hire livestock truckers were found to be principally small but quite stable businesses. Utilization of equipment was high, and rates charged were highly correlated with distance and size of truck. Little basis was found for believing that economic regulation at the interstate level would improve trucking performance. Analysis of a transshipment model of a corn-soybean producing area showed that adverse impacts from rail line abandonment are not likely to be uniformly borne. Certain local marketing firms were shown to lose substantial volumes of patronage by farmers, even though the total marketing costs for the area increased by only 0.1 percent in response to abandonments. The application of waterway user charges sufficient to cover Federal expenditures on waterways were estimated to cause a two-percent increase in marketing costs. Data were assembled for analysis of the cost of operating refrigerated trucks for hauling produce. Also, a survey of truck brokers to determine their role in exempt trucking was performed, and a number of rate service and other proposals for change in transportation were analyzed for their impacts on agriculture.

**REFERENCES:**

Effects of the Proposed Northeast-Midwest Rail Reorganization on Rural Areas, U.S. Senate, Agriculture and Forestry Comm, Mar. 1975

**PERFORMING AGENCY:** Kansas State University, USDA Transportation Economics Division, NEA-14-125-53-01-X1

**INVESTIGATOR:** Casavant, KL

**SPONSORING AGENCY:** Department of Agriculture, Cooperative State Research Service

**STATUS:** Active **NOTICE DATE:** Aug. 1977 **START DATE:** July 1974 **COMPLETION DATE:** July 1979

**ACKNOWLEDGMENT:** Current Research Information Service (CRIS-0041974)

20 138376

**IMPACT OF CHANGES IN WORLD FOOD SUPPLY-DEMAND UPON SELECTED AGRICULTURAL MARKETS**

Estimate input usage to achieve the projected agricultural production, considering probable price and availability of farm inputs. Determine the adaptability of the existing agricultural input market organization to meet projected changes in agricultural output (and to suggest alternative organization in case input market structure is found to be inadequate). Input usage ranges will be estimated based on technical coefficients from secondary sources: input studies, farm management budgets and LP analyses. Consideration will be given to likely changes in resources mixes. Budgeting or linear programming procedures will be used to determine expected future resource utilization rates. Production projections from secondary sources will be used in estimating total input requirements. A multiple-product (LP) cost evaluation model will be used to measure the effect of price changes on farm input retailing costs. Sensitivity analysis applied to cost coefficients will facilitate the measurements. The effects of factor and product price changes on scale, volume and product diversity economies will be measured by rerunning the LP model using alternative price assumptions. Results of the LP runs will be used to compare optimum-cost structural conditions with actual assess operational efficiency.

**PERFORMING AGENCY:** Nebraska University, Lincoln, Department of Agricultural Economics, NEB-10-060

**INVESTIGATOR:** Anderson, DG Lytle, PW

**SPONSORING AGENCY:** Department of Agriculture, Cooperative State Research Service

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** Aug. 1971 **COMPLETION DATE:** June 1977

**ACKNOWLEDGMENT:** Current Research Information Service (CRIS-0060266)

20 148327

**ANALYSIS OF FREIGHT MARKETS**

A major capability needed for national transportation planning is an ability to determine the way in which shippers will respond to changes in freight service. During the first year of the contract, the research objective was the extension of an existing set of computer techniques for determining freight modal choice and shipment size. Using origin-destination data from the Commodity Transportation Survey, the techniques attempted to give the planner the ability to simulate shipper's behavior. This approach involves a procedure for determining the optimal inventory, control, and shipment strategy of a shipper who is assumed to be fiscally responsible for the maintenance of each of a series of commodities. The program minimized the total logistics cost of ordering, transportation, storing, capital carrying, and possible stockout. During the second year of the contract, the research will focused on the supply side and examined the carrier rather than the shipper or receiver. Within this framework, the overall goals of the carrier will be analyzed. Choice variables for vehicle type, scheduling and routing will be identified. From analysis of these attributes, cost and performance functions will be developed. The overall methodology, including the demand models developed in the previous years will be tested in an example problem, and a final report will be delivered. Computer models, simulating the decision making processes of individual shipping firm pertaining to mode choice, shipment size, and shipping frequency, have been developed. In addition, the research team has gathered data on routine shipments of more than 500 commodities for a major food chain. Form this data base, presently fully computerized, three freight markets have been selected for further analysis. Data for these three markets has been used to three freight markets have been selected for further analysis. Data for these three markets has been used to calibrate the demand side modelling techniques.

**REFERENCES:**

Factors Influencing the Demand for Goods Movements Roberts, PO, CTS Rept. #75-16, 34 pp, Sept. 1975

**PERFORMING AGENCY:** Massachusetts Institute of Technology, Department of Civil Engineering

**INVESTIGATOR:** Roberts, PO Tel (617) 253-7123

**SPONSORING AGENCY:** Department of Transportation

**RESPONSIBLE INDIVIDUAL:** Harman, J

**Contract DOT-OS-50112**

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **TOTAL FUNDS:** \$168,832

**ACKNOWLEDGMENT:** DOT

20 153650

**MULTI-MODAL, MULTI-STATE TRANSPORTATION SYSTEM EVALUATION**

Evaluate the feasibility of a multi-modal, multi-state corridor extending from Kansas City, Missouri to Jacksonville, Florida for the movement of goods and people.

**PERFORMING AGENCY:** University of North Florida, Jacksonville, Department of Transportation and Logistics, DOT-OS-60512; Georgia Institute of Technology, 225 North Avenue, NW

**INVESTIGATOR:** Jones, PS Tel (404) 894-2308 Smith, JA

**SPONSORING AGENCY:** Department of Transportation, Office of University Research; University of North Florida, Jacksonville

**RESPONSIBLE INDIVIDUAL:** Jones, PS Tel (404) 894-2308

**Contract DOT-OS-60512**

**STATUS:** Active **NOTICE DATE:** Feb. 1977 **START DATE:** Aug. 1976 **COMPLETION DATE:** Aug. 1977 **TOTAL FUNDS:** \$295,000

**ACKNOWLEDGMENT:** University of North Florida, Jacksonville

20 156542

**EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION**

Estimate rural freight transportation requirements to 1985 and 1990. Estimate the optimal rural freight transportation storage and distribution system. Evaluate the economic effects of alternative railroad ownership and financial policies.

**PERFORMING AGENCY:** Michigan State University, East Lansing, Department of Agricultural Economics, CSRS MICL

INVESTIGATOR: Thompson, SR  
SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, MICL01254

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070878)

20 156591

## EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION, STORAGE, AND DISTRIBUTION SYSTEMS

The project at Minnesota is designed to analyze the impact of alternative methods of rail rate-making on grain flows and the location and logistics of grain processors. The study examines the current regulatory process as it applies to rates and proposed reforms in the process. Then, comparisons between the existing rate structure and costs of service will be made. In this way, the social cost and benefits of regulation can be determined.

### REFERENCES:

Railroad, Grain Transportation and the Interstate Commerce Commission, Martin, M; Dahl, R, Minnesota Agricultural Economist, Jan. 1977

PERFORMING AGENCY: Minnesota University, St Paul, Department of Agricultural and Applied Economics, CSRS MIN

INVESTIGATOR: Dahl, RP Tel (512)276-3436 Martin, MV

SPONSORING AGENCY: Department of Agriculture, MIN-14-043; Minnesota University, St Paul, Department of Agricultural and Applied Economics

RESPONSIBLE INDIVIDUAL: Dahl, RP Tel (612)376-3436

STATUS: Active NOTICE DATE: June 1977 START DATE: Oct. 1976 COMPLETION DATE: Oct. 1981 TOTAL FUNDS: \$6,200

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0071288), Minnesota University, St Paul

20 156604

## EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION SYSTEMS

The project will: estimate rural freight transportation requirements to 1985 and 1990, estimate the optimal rural freight transportation, storage and distribution system; evaluate the economic effects of alternative federal, state and local government policies on carriers, shippers, receivers and rural communities. The present rural transport system will be described. Demand for transportation services will be measured and projected to 1985 and 1990. Expected changes in the system will be identified. Cost and service levels will be compared under simulated model combinations and regulatory patterns. Merits of alternative systems and policies will be evaluated.

PERFORMING AGENCY: Missouri University, Columbia, Department of Agricultural Economics, CSRS MO

INVESTIGATOR: Moser, DE

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, M000040-1

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070255)

20 156714

## EVALUATION OF ALTERNATIVE RURAL FREIGHT, TRANSPORTATION STORAGE AND DISTRIBUTIVE SYSTEMS

To estimate rural freight requirements to 1985 and 1990. To estimate the optimal rural freight transportation storage and distribution systems. To evaluate the economic effects of alternative railroad ownership and financial policies. To evaluate the economic effects of alternative federal, state and local government policies on carriers, shippers and receivers.

PERFORMING AGENCY: Ohio State University, Department of Agricultural Economics and Rural Sociology, NC-137 CSRS OHO

INVESTIGATOR: Larson, DW

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, OHO00572

RESPONSIBLE INDIVIDUAL: Larson, DW Tel (614)422-6731

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0071704), Ohio State University

20 164822

## ONTARIO FREIGHT MODEL

The design of this model will meet the following specific objectives: The development of an understanding of commodity movements and factors influencing commodity movements to and from, through and within the Province of Ontario; assistance to the planning of capital improvements to the transportation network; the provision of data and expertise to assist in the development policy for the regulation of movements on the transportation network; the production of a tool to aid in the effective operation of the existing system. The project is divided into 8 phases: (1) Review of Data and Existing Work, (2) Selection of Commodities, (3) Determination of Functional Relationships, (4) Definition of the Network, (5) Model Development and Timing, (6) Model testing, (7) Monitoring model usage, and (8) Model review. /RTAC/

PERFORMING AGENCY: Ontario Ministry of Transportation & Communication

INVESTIGATOR: Kher, R

SPONSORING AGENCY: Ontario Ministry of Transportation & Communication

STATUS: Active NOTICE DATE: Dec. 1976 COMPLETION DATE: Dec. 1979

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

21 099387

**FREIGHT CAR MANAGEMENT PROGRAM**

This program presently involves four phases: (1) Systems Operations including service reliability studies, data interface standards and car cycle sampling; (2) Operating Practices as involved with Car Service rules, per diem rates and car distribution procedures; (3) Information Technology developing Car Assignment Model and Demand Forecast Model; (4) Operating Systems with the Line Operations phase involving Grand Trunk Western and Missouri Pacific and the Yard Operations phase involving the Kansas City Southern at Shreveport, La., and the Chicago Railroad Terminal Information System.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Systems Analysis and Program Development

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Braddock, C Tel 202-4262920

STATUS: Active NOTICE DATE: Feb. 1976

ACKNOWLEDGMENT: FRA

21 107295

**UTILIZATION AND IMPROVEMENT OF VEHICLES FOR TRANSPORT OF GRAIN**

The objectives are to improve the utilization of present transport equipment for grain and to develop new transport concepts, in order to hold down transport costs and reduce loss and damage to grain in transit. The approach will be to study present equipment, methods, and techniques for the transport and physical distribution of grain, evaluate each phase of distribution on the basis of cost and performance, and develop concepts for changes in equipment and methods with a view toward: better utilization of present equipment; development of improved transport equipment and techniques; faster loading and unloading of vehicles; reducing overall physical distribution time; reducing the number of times the product is handled and transferred; evaluating and testing new ideas. The Progress Report will include: Exploratory work was continued to determine if it might be feasible to increase the utilization of railroad boxcars through heavier loading of cars. Data were obtained on 2,000 box car loads of wheat and corn handled at Chicago, Minneapolis, and Kansas City. That data indicated that boxcars have an average load limit of about 65 tons, and that the average weight of grain loaded into the cars is about 60 tons. Although it would appear that cars could, on the average, be loaded with 5 more tons of grain, it was found not feasible to do so. There are four factors which, in combination, prevent heavier loading. They are: Variation in load limits of cars; variation in grain weight; grain door height (some open space above door must be allowed through which to insert the loading spout); and, some space must be allowed between the top of the load of grain and the car roof so that a man has room to maneuver to insert a grain probe. Research was initiated on development of a new concept for storage and transport of grain which would feature recyclable metal containers for use in movement of the product from farm to end user. Numerous combinations of container shapes and sizes and special handling equipment were considered and evaluated. Although a final decision has not yet been made, a container with a capacity of about 1,500 pounds appears to be the most feasible, and work in FY 77 will be directed toward a system using a container of that approximate capacity.

PERFORMING AGENCY: Agricultural Research Service, Transportation Facilities Division, 1104-15841-006

INVESTIGATOR: Guilfooy, RF, Jr

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: June 1972 COMPLETION DATE: June 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (CRIS 0022877)

21 129729

**RAILROAD YARD OPERATIONS COSTING METHODOLOGY**

To develop, test, and justify a set of methodologies and procedures to be used for estimating the cost of providing, maintaining, and operating Yards and Terminals and their application to pricing, control, investment and other management purposes.

PERFORMING AGENCY: Haskins and Sells; Seaboard Coast Line Railroad; Whitten (Herbert O) and Associates

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Lawler, JD Tel 202-426-0771

Contract DOT-FR-65135

STATUS: Active NOTICE DATE: July 1976 START DATE: June 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$482,299

ACKNOWLEDGMENT: FRA

21 129730

**RAILROAD LABOR STUDY-LINE HAUL**

Expand experiments at St. Louis terminal to other terminals and conduct line-haul experiments to improve car utilization, employee productivity and capital utilization.

PERFORMING AGENCY: Association of American Railroads

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Economics and Policy Development

RESPONSIBLE INDIVIDUAL: Collins, DM Tel (202) 472-7280

Contract DOT-FR-43003

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$670,000

ACKNOWLEDGMENT: FRA

21 130499

**SOLID WASTE RAIL HAUL AND DISPOSAL SYSTEM**

The City of Philadelphia has received an Environmental Protection Agency Grant to design and implement a demonstration rail haul and disposal system of 1,000 tons of refuse. The objective is to demonstrate that municipalities can effectively work together such that solid waste can be transported from a local transfer station to a sanitary landfill at least 100 miles from Philadelphia in an environmentally and economically acceptable manner utilizing a railroad carrier. Phase I of the grant is for a six (6) month period and involves the U.S. Environmental Protection Agency, the State of Pennsylvania Department of Environmental Resources and the City of Philadelphia in finding an environmentally sound strip mine landfill in Pennsylvania at least 100 miles from Philadelphia. During this period, the County in which this land is located would be aided in forming the necessary legal structure to enter into a contract with the City of Philadelphia for receipt of the material and operating the disposal facility. Phase II is for one (1) year and involves design and construction of the facilities to operate the system. The present approach to handling the refuse, is to load containers using the City's truck transfer stations, hauling the containers by tractor trailer to a railroad transfer site where the containers will be loaded on to flatcars. At the disposal site, the containers will be unloaded from the flatcar on to specially designed hauling vehicles. These vehicles will transport the containers to the active face of the landfill and unload them. The empty container will be returned to the rail site and loaded back on to flatcars. The empty train with the containers will be returned to Philadelphia. The total round trip for container through loading, hauling, unloading and return haul would be 3 days, requiring 3 trains in some stage of operation at all times. Phase III is for one (1) year and involves operation and evaluation of the system.

PERFORMING AGENCY: Philadelphia, City of, Pennsylvania, Department of Streets

INVESTIGATOR: Smith, G

SPONSORING AGENCY: Environmental Protection Agency, Office of Research and Development

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (AO 20448)

21 138372

**IMPROVING RAILROAD REFRIGERATED TRANSPORTATION OF FRESH MEATS**

Improve the efficiency of transporting fresh meats from packinghouses to consignee using railroad refrigerated trailers. Studies designed to evaluate and improve the present handling procedures and equipment performance will be conducted to determine where significant improvements can be made in the distribution of fresh meat. Equipment cleaning and pretripping maintenance practices will be thoroughly reviewed to provide information where improvements in the present distribution systems need to be made, than a series of recommended procedures will be developed. Handling techniques will also be reviewed and improved. Suggestions for improvement will be applied to actual meat shipments and evaluated by a team of researchers and industry representatives. Cooperation with APHIS, Associ-

ation of American Railroads, individual railroad companies, refrigeration equipment companies, and other Government Agencies will be encouraged. The practices and procedures followed by three railroads and three truck cleaning facilities for the preparation of refrigerated meat trailers prior to loading with carcass or boxed meat were reviewed to obtain information on such items as water volume, water temperature, detergents and cleaning agents used, sanitation program followed, and cleaning of meat hooks. Since railroad piggyback meat trailers have a longer turn-around time between loading a packinghouses than do truck meat hauling trailers, they are more difficult to clean. A cleaning and sanitizing program for refrigerated meat trailers is being developed.

PERFORMING AGENCY: Agricultural Research Service, Agricultural Marketing Research Institute, 1104-15841-011

INVESTIGATOR: Hoke, KE

SPONSORING AGENCY: Agricultural Research Service, Department of Agriculture, 0041945

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Nov. 1974 COMPLETION DATE: Nov. 1977

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0041945), Smithsonian Science Information Exchange (GY 41945 2)

## 21 138527

### CHICAGO TERMINAL PROJECT

To increase the reliability, speed and efficiency of car movements through a major existing railroad terminal so that the quality and saleability of rail transportation is improved, thereby attracting additional traffic improving employment opportunities. The improvements are to be made without capital expenditures. This objective is being achieved through a series of experiments involving changes in operating practices, labor agreements, rates, and regulations.

Co-sponsors include Railroad Labor Organizations, Association of American Railroads and Chicago Railroad Terminal Information System.

PERFORMING AGENCY: Task Force on Rail Transp of the Labor/Mgmt Comm, Federal Railroad Administration

INVESTIGATOR: Adamson, E McGuire, T

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Collins, DM Tel (202)472-7280

STATUS: Active NOTICE DATE: Feb. 1978 TOTAL FUNDS: \$682,050

ACKNOWLEDGMENT: FRA

## 21 148807

### IOWA RAIL YARD AND TERMINAL STUDY

The objective of this research is to investigate the functioning of rail terminal facilities in Des Moines and Marshalltown, Iowa, and to recommend changes in physical layout or operating procedures that will enhance the efficiency of terminal services at these locations. Actual car holding times are analyzed for comparison with theoretical minima based on scheduled train arrival and departure times, switch crew assignments, power availability, and other factors.

#### REFERENCES:

Railroad Yard Operation Case Study. Marshalltown Shirazian, GR, Iowa State University, Unpublished MS Thesis, 1977

PERFORMING AGENCY: Iowa State University, Ames, Engineering Research Institute

INVESTIGATOR: Carstens, RL Tel (515) 294-6777 Kannel, EJ

SPONSORING AGENCY: Iowa State University, Ames, Engineering Research Institute

RESPONSIBLE INDIVIDUAL: Peterson, PW Tel (515) 294-2336

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1976 COMPLETION DATE: June 1978 TOTAL FUNDS: \$2,300

ACKNOWLEDGMENT: Iowa State University, Ames

## 21 157598

### HOUSTON TERMINAL PROJECT

The purpose is to establish a cooperative railroad labor-management experimental program for the Houston Railroad Terminal. The Houston terminal continues to experience significant car delays. Therefore, the principal objective of this project is to improve the efficiency of rail terminal operations in the Houston area.

Additional funding provided by railroad labor organizations and Houston, Texas, area Railroads.

PERFORMING AGENCY: Task Force on Rail Transp of the Labor/Mgmt Comm, Federal Railroad Administration

INVESTIGATOR: Spitz, J Tel (713)224-3662 Dessens, F Tel (713)224-3662

SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Collins, DM Federal Railroad Administration Tel (202)472-7280

Contract DOT-FR-75244 (CC)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Aug. 1977 COMPLETION DATE: Aug. 1978 TOTAL FUNDS: \$75,000

ACKNOWLEDGMENT: FRA

## 21 157902

### INTERMODAL FREIGHT SERVICES EAST OF THE HUDSON RIVER

The objective is to improve rail freight connections with truck and marine operations in the New York City and Long Island areas. In addition to New York City, the Long Island counties of Nassau and Suffolk will be involved in the study.

Announcement of this study was published in Traffic World, V 171, N 1 (July 4, 1977), P 18.

PERFORMING AGENCY: New York City Planning Commission, New York City Department of City Planning; New York State Department of Transportation, Planning Division

SPONSORING AGENCY: New York State Legislature

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 TOTAL FUNDS: \$400,000

## 21 159624

### FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II

As freight car utilization is a nationwide problem beyond the ability of a single railroad to solve, a cooperative research program (Phase I) between the railroad industry and the Federal Government was started in 1975 and completed in 1977. The second phase of this program will oversee the establishment and conduct of six different task forces to address and overcome those critical facets of the freight car utilization problems identified in Phase I. These task forces will structure case studies and demonstration programs which will facilitate the adoption of improvements throughout the industry. Each group will address a different facet of the utilization problem to include management organizations and practices, utilization impacts of railroad operating plans, railroad customer coordination, nationwide freight car management, railroad freight car distribution, and utilization impacts of freight car design and serviceability. All will emphasize the need for explicit adoption of systems which respond to the need to more actively and integrally manage the car fleet.

PERFORMING AGENCY: Association of American Railroads

SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Shamberger, RC Tel (202) 426-2608 Wooden, DG Tel (202)293-5018

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 COMPLETION DATE: July 1979 TOTAL FUNDS: \$2,388,420

ACKNOWLEDGMENT: AAR

## 21 159626

### FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, TASK 2. UTILIZATION AND SERVICE RELIABILITY IMPACTS OF OPERATING PLANS

Identify those operating practices which most directly impact utilization or service reliability. Needed mechanisms to initiate change will be developed. Theoretical work coupled with demonstration project will be used to define those strategies which best integrate operating decisions. Physical and financial changes resulting from the implementation of hourly car hire will be measured. Major elements of existing labor rules will be analyzed as they relate to the relationships between operating plans and car utilization. Continue previous analysis of the car cycle.

PERFORMING AGENCY: Association of American Railroads

SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Shamberger, RC Tel (202)426-2920 Wooden, DG Tel (202)293-5018



STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1977 COMPLETION DATE: July 1979 TOTAL FUNDS: \$370,000

ACKNOWLEDGMENT: AAR

#### 21 159627

### FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, TASK 3. UTILIZATION IMPACTS OF CUSTOMER-RAILROAD RELATIONSHIPS

Improved rail-customer coordination is necessary for many strategies to improve freight car utilization. Car studies will be developed quantifying the impact which specific customer practices have on railroad service and fleet utilization. Initiate studies designed to reduce the number of cars needed in specific assigned pools. Develop a theoretical framework which permits an explanation of potential improvements in car distribution efficiency through demand levelling. Define additional strategies to improve rail-customer coordination.

PERFORMING AGENCY: Association of American Railroads  
SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads  
RESPONSIBLE INDIVIDUAL: Shamberger, RC Tel (202) 426-2608  
Wooden, DG Tel (202)293-5018

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 COMPLETION DATE: July 1979 TOTAL FUNDS: \$265,000

ACKNOWLEDGMENT: AAR

#### 21 159638

### FEASIBILITY-ANALYTIC LINE CAPACITY MODEL

This project extends the available analytic models of rail lines to improve their capability to predict the capacity of a line. These models are described in "the railcar network model", edited by E.R. Petersen and H.V. Fullerton, CIGGT Rpt. No. 75-11, in RRIS Bulletin 7701, 21 141124.

#### REFERENCES:

Capacity of a Single Track Railway Line Queen's University, School of Business, Working Paper 77-38

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 5.73.76  
INVESTIGATOR: Petersen, ER Tel (613) 547-3109  
SPONSORING AGENCY: Canadian Institute of Guided Ground Transport  
RESPONSIBLE INDIVIDUAL: Law, CE Tel (613) 547-5777

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1977 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$45,000

ACKNOWLEDGMENT: Queen's University, Canada

#### 21 159653

### INTERMODAL SYSTEM DEMONSTRATION

Test and demonstrate new concepts in intermodal services on designated routes. The AAR will subcontract with railroads through competitive bidding and will provide management to monitor and coordinate demonstrations. It will also collect and analyze data and make a final report. Among techniques to be tested are piggyback trains providing direct origin-to-destination service without intermediate yarding; scheduled services with two or more departures daily, increased labor productivity; improved terminal connections; and specialized information and control systems to respond to market changes.

PERFORMING AGENCY: Association of American Railroads  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Minger, WK Tel (202) 293-5323

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1977 COMPLETION DATE: 1980 TOTAL FUNDS: \$1,300,000

#### 21 160397

### SYSTEMS ENGINEERING FOR INTERMODAL FREIGHT SYSTEM

The Federal Railroad Administration (FRA) is involved in a substantial program to stimulate the development of rail/highway/marine and other types of intermodal freight service. The distinguishing characteristic of this type of service is the sequential transport of sealed containers of freight by both the rail and other modes. Presently, the containers are either entire highway trailers or demountable containers of similar dimensions designed for both maritime and overland transportation.

PERFORMING AGENCY: Kearney (AT) and Company Incorporated  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Blanchfield, JR Tel (202) 426-0808

Contract DOT-FR-748-4336 (FFP)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Aug. 1977 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$249,988

ACKNOWLEDGMENT: TRAIS

#### 21 160398

### SYSTEMS ENGINEERING FOR INTERMODAL FREIGHT SYSTEM

The Federal Railroad Administration (FRA) is involved in a substantial program to stimulate the development of rail/highway/marine and other types of intermodal freight service. The distinguishing characteristic of this type of service is the sequential transport of sealed containers of freight by both the rail and other modes. Presently, the containers are either entire highway trailers or demountable containers of similar dimensions designed for both maritime and overland transportation.

PERFORMING AGENCY: Peat, Marwick, Mitchell and Company  
SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Blanchfield, JR Tel (202) 426-0808

Contract FR-749-4273 (FFP)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Aug. 1977 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$250,000

ACKNOWLEDGMENT: TRAIS

#### 21 170596

### NETWORK FREIGHT FLOW

The project has two main thrusts: (a) railcar blocking and train scheduling models and (b) traffic assignment with elastic demand. Both investigations rely on the technique of formulating a large scale problem as a number of subproblems. Under (a) above, these are formulated as a set of dynamic programming/shortest path problems, and under (b) as a set of linear complementary problems.

PERFORMING AGENCY: Massachusetts Institute of Technology  
INVESTIGATOR: Magnanti, TL  
SPONSORING AGENCY: Department of Transportation  
RESPONSIBLE INDIVIDUAL: Crosby, RW Tel (202) 426-0638

STATUS: Programmed NOTICE DATE: Feb. 1978 TOTAL FUNDS: \$80,000

ACKNOWLEDGMENT: DOT

#### 21 170620

### RAILROAD CLASSIFICATION YARD DESIGN METHODOLOGY STUDY

This research is to establish a set of practical guidelines, procedures, and principles which will facilitate the process of classification yard design and engineering. Phase I includes preparation of a basic methodology in preliminary form. In Phase II these procedures will be applied to a case study involving a cooperating railroad. The third phase will comprise refinement and expansion of the preliminary methodology, and documentation in a user-oriented form.

PERFORMING AGENCY: SRI International, 6364-1  
INVESTIGATOR: Wong, PJ Tel (415) 326-6200 X2104  
SPONSORING AGENCY: Transportation Systems Center; Federal Railroad Administration, Office of Research and Development  
RESPONSIBLE INDIVIDUAL: Hopkins, JB Tel (617) 494-2023

Contract DOT-TSC-1337

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1977 COMPLETION DATE: Oct. 1980 TOTAL FUNDS: \$428,000

ACKNOWLEDGMENT: TSC, FRA

#### 21 170622

### ST. LOUIS TERMINAL PROJECT

This project is an expansion of the original St. Louis Terminal Project. The original pilot project involved the St. Louis terminal of the Missouri Pacific Railroad. With the success of this pilot, the involved parties expanded the Task Force concept of experimentation to include the entire St. Louis Terminal. The gist of the Task Force concept is to create a mechanism whereby labor and management can work in cooperation to solve mutual

problems. As the original St. Louis Project has shown, significant improvements in operating efficiencies can be brought about if the proper labor-management environment is produced.

PERFORMING AGENCY: Federal Railroad Administration, Task Force on Rail Trans of Labor/Management Committee

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railroad Labor Organizations

RESPONSIBLE INDIVIDUAL: Collins, DM Tel (202) 472-7280

Contract 75232

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1976 COMPLETION DATE: Apr. 1978 TOTAL FUNDS: \$300,000

ACKNOWLEDGMENT: AAR

## 21 170664

### INTERNATIONAL GOVERNMENT-INDUSTRY RESEARCH PROGRAM ON TRACK TRAIN DYNAMICS: PHASE III. TASK 3--TRAIN OPERATION AIDS

This task will develop computer-assisted train operation and makeup aids to improve current system safety and reliability without significant hardware changes and take advantage of rapidly developing microprocessor technol-

ogy. The subtasks: (3.1) Determine the manner in which an on-board computer can interface with operating personnel to assist in safe train operation; (3.2) Develop the technical requirements for reliable on-board microprocessor systems to help monitor/control conditions on locomotives and in the train; (3.3) Identify the sensor systems with the best near-term potential for use in future on-board monitoring and train signal and control systems; (3.4) Use locomotives in FAST test service at Pueblo to obtain early experience with on-board computer-assisted operations; (3.5) Develop a yardmaster's minicomputer to optimize train makeup based on delivery efficiency and dynamic stability.

PERFORMING AGENCY: Association of American Railroads Technical Center

INVESTIGATOR: Hawthorne, KL Tel (312) 567-3584

SPONSORING AGENCY: Association of American Railroads; Federal Railroad Administration; Railway Progress Institute; Transport Canada Research and Development Centre

RESPONSIBLE INDIVIDUAL: Moyer, GJ Tel (312) 567-3602

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1978 COMPLETION DATE: 1979

ACKNOWLEDGMENT: AAR

22 080323

**DEVELOPMENT OF A MATHEMATICAL MODEL OF THE FREEZING OF BULK MATERIALS DURING RAIL TRANSPORTATION**

When moist materials E.G. copper and zinc concentrates coal are transported in railcars during winter, freezing of the material in the car can occur. This freezing can make the cargo difficult to discharge in order to evaluate means of over coming the problem, it is important to be able to predict the extent of the freezing that will occur under a particular set of circumstances. The purpose of the present study is, therefore, the development of a simple numerical model that will allow such a prediction to be made. A series of computer models for various types of car, have, therefore, been developed and are being used to study the effect of various parameters on the degree of freezing. A supporting laboratory program has also been undertaken.

**REFERENCES:**

A Numerical Study of Freezing and Thawing of Bulk Materials During Rail Transportation, Oosthuizen, PH; Rush, CK, ASME, 75WA/HT-87, Nov. 1975

Freezing Problems During Rail Transportation, State-of-the-Art Study. Part 1, Colijn, H, Canadian Institute of Guided Ground Transport, Report 72-13, July 1972

Field Survey Study, Freezing Problems During Rail Transport Colijn, H, Canadian Institute of Guided Ground Transport, Report 76-12, Nov. 1976

A Numerical Evaluation of the Proposed Thunder Bay Thaw Shed, Oosthuizen, PH, Canadian Institute of Guided Ground Transport, Report 77-3, Apr. 1977

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 3.49.76

INVESTIGATOR: Oosthuizen, PH Tel (613) 547-6246. Rush, CK

SPONSORING AGENCY: Canadian Institute of Guided Ground Transport

RESPONSIBLE INDIVIDUAL: English, GW Tel (613) 547-5777

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1974 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$9,660

ACKNOWLEDGMENT: CIGGT

22 083483

**ECONOMIC ANALYSIS OF THE UNITED STATES GRAIN EXPORTING SYSTEMS**

Evaluate alternative inventory and export policies with respect to: Market efficiency, price stability, producer and consumer utility, their effects on private state trading systems, servicing the export markets, and the effects of export embargoes on prices and market share. Use historical data to estimate and project demand and supply imbalance in world grain trade. Calculate the variability in supply and demand and surplus and deficits under alternative assumptions of world production and consumption. Develop models that will show the effects of alternative inventory policies on the size and variability of world grain surplus or deficit. Estimate the effects of alternative inventory policies on farm income, U.S. and world grain prices, and the variability of grain marketing firms. Estimate the costs and other economic effects of alternative policies and alternative ownership arrangements for given levels of inventory. Estimate the relationship between alternative inventory policies and volume and destination of exports. Further work was done on a study of grain marketing patterns by Indiana farmers. A survey of truck shipments of grain by Indiana country elevators for the 1973-74 marketing year was tabulated and preparation of a manuscript for publication was begun. Truck shipments accounted for 64 percent of total grain handled by country elevators in 1974-75, up from 58 percent in the 1968-69 marketing year. This was a continuation of a long time trend. A manuscript was prepared summarizing the results of a study of vertical coordination in cooperative grain marketing systems.

**REFERENCES:**

Vertical Coordination in Cooperative Grain Marketing Systems, Schwartz, DR, Purdue University, Unpublished PhD Thesis, 1974

PERFORMING AGENCY: Purdue University, Department of Agricultural Economics, IND01732

INVESTIGATOR: Jones, BF

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1971 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Purdue University (CRIS 0060205)

22 083506

**DETERMINE COSTS FOR DIFFERENT SYSTEMS FOR MARKETING POTATOES FROM THE GROWER TO THE RETAIL STORE**

Develop the least cost system(s) for handling, distributing, storing, processing and packaging potatoes by improving the efficiency for each function in the marketing systems. Establish the cooperation of growers, packers, processors, wholesalers, retailers and transportation firms to participate in the study. Run test shipments from the producing areas to the retail store level. Make industrial engineering studies, economic analyses and cost evaluation comparisons to determine the optimum system(s) for marketing potatoes. It will be necessary to enlist the aid of Federal and State agriculture extension personnel, land grant colleges, potato associations and the knowledge of other laboratories within the Agricultural Marketing Research Institute. This work has been divided into three phases. The first phase included the harvesting, loading the trucks or trailer, transporting the potatoes from the field to the packing shed and unloading at the packing shed. This phase of the total system study of marketing potatoes has been completed. By using a truck and trailer combination instead of a truck alone for harvesting, transporting and unloading potatoes at the packing plant, an 18 percent savings is realized or \$0.49 per ton. Projecting these savings to the 2-1/2 billion pounds of potatoes harvested in 1972, a savings of over \$600,000 could be realized. The second part of the study will analyze operations at the packing shed. Research was started in June 1974 and is now about 70 percent completed. The third phase of the study will be conducted at the receiving wholesaler's warehouse and will include delivery to the retail foodstore. Research on the third phase will begin in the first quarter of FY 76.

**REFERENCES:**

A Cost Evaluation for Two Systems of Handling Bulk Potatoes from Field to Packing Shed, Volz, MD; Anthony, JP, Jr; Mongelli, RC, Oct. 1974

PERFORMING AGENCY: Agricultural Research Service, Agricultural Marketing Research Institute, 1104-15842-001

INVESTIGATOR: Volz, MD Anthony, JP Bouma, JC

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: May 1973 COMPLETION DATE: May 1978

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0040246)

22 083511

**IMPROVED SYSTEMS FOR SHIPPING AND HANDLING GROCERIES FROM MANUFACTURER TO WHOLESALE WAREHOUSE**

Measure the cost for less-than-truckload (LTL) shipments of groceries from manufacturer to wholesaler and determine feasibility of reduced cost with a regional warehouse to store products of several manufacturers and ship full truckloads of grocery products from several manufacturers. Determine extent of less-than-truckload (LTL) receipts of grocery products at wholesale warehouses, measure labor productivity, detention charges, and other costs for LTL shipments. Develop a model based on actual productivity in receiving utilized truckloads of groceries, intermediate warehousing and transportation costs. Enlist the support and cooperation of the National American Wholesale Grocers Association, National Association of Food Chains, and Super Market Institute. Data were obtained from 129 food warehouse operators concerning truck receipts of grocery products. The typical warehouse received 60 percent of its groceries by carrier truck, 30 percent by railroad, and 10 percent by backhaul. Of carrier truck arrivals, 60 percent were full truckloads and 40 percent were less-than-truckload. The typical firm had received only 10 percent of its carrier truck receipts in unitized form although 92 percent of the firms had received products that were unitized on pallets and 28 percent had received products on slipsheets. Standard productivity in unloading trucks by handstacking cases on pallets and removing the unit load with a pallet jack averaged 5 tons per man-hour compared with 59 tons per man-hour for unloading unitized products. Efficiency of truck receiving can be improved by use of the following principles: (1) Schedule incoming truck receipts; (2) specific unitized loads when ever possible; (3) provide sufficient temporary storage area; (4) keep temporary storage clear as much as possible; and (5) provide proper type and quantity of materials handling equipment.

**REFERENCES:**

Methods for Receiving Groceries by Truck Bouma, JC, Nat American Wholesale Grocers' Assoc, Chicago, Proceedings, Mar. 1975

PERFORMING AGENCY: Agricultural Research Service, Agricultural Marketing Research Institute, 1104-15864-001

INVESTIGATOR: Bouma, JC

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Nov. 1973 COMPLETION DATE: Nov. 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0040668)

## 22 083516

### CONTROL OF DAMAGE AND LOSS IN DISTRIBUTION

Find characteristics of commodities and items which are damaged in distribution, determine environment factors causing damage, propose methods of damage reduction and develop an economics of distribution loss control. Procure damage histories for specific commodities and items. Analyze package systems used in connection with damage history in the laboratory and in the field. Using established design procedures, redesign packages to reduce loss. Establish total economic advantages in use of redesigned package including resource use and the ecological impact. Using information assembled in case by case approach, establish generalities relating to damage control. Develop sub-projects to explore specific problems in the areas of cushion properties, distribution environment, item fragility and system evaluation procedures. Damage boundary technique applied to container survival. Conducting testing audit of specification properties of corrugated fiber board. Conducted material tests of plastic corrugated board.

#### REFERENCES:

A Critical Analysis of Vibration Measurement of the Transportation Environment, Hausch, JR, Michigan State University, School of Packaging, Tech Rpt 23, Sept. 1975

PERFORMING AGENCY: Michigan State University, East Lansing, School of Packaging, MICL 03108

INVESTIGATOR: Goff, JW

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug. 1971 COMPLETION DATE: July 1999

ACKNOWLEDGMENT: Michigan State University, East Lansing (CRIS 0060632)

## 22 099623

### FUTURE ECONOMIC ADJUSTMENTS IN THE MARKETING OF SELECTED NORTHEAST FRUITS AND VEGETABLES

Determine the economic impact of changes in consumption and buying patterns for apples, potatoes and tomatoes in fresh and/or processed form in the Northeast on: cost, margins, and price making practices at each transfer point in the marketing channels. Producer decisions concerning alternative markets. Conduct a mail survey to evaluate the usefulness of market information currently available to potato growers. Analyze the nature and extent of the impact of potato market information upon the price making mechanism. Review the basic objectives for and alleged advantages and disadvantages of trading in Maine potato futures, and investigate the alternatives for improving flow patterns of nonregulated trucks for Maine, and the Boston and the New York market areas. Identify shortages in supply (trucks available for loading) and the causes, investigate means of alleviating shortage in supply to specific areas. Analyze capabilities of existing potato storage and marketing facilities, and relate to projected changes in market channels. A mail survey of Maine potato growers indicated that market information on potato prices and quantities was most frequently used in determining the quantity and variety of potatoes to plant, timing sales, and potato utilization. The most frequently used sources were radio, television, dealers and brokers, and government agencies. A relationship between information use and performance was found where futures and historical prices, acreage, production, and fresh stocks estimates were used to determine time of year to sell potatoes. A conceptual algorithm for analyzing price and quantity data has been developed. Two statistical series concerning production and marketing data have been prepared. Analysis of truck shipment concerning availability of trucks from origins to destinations, and seasonality of movements of Maine potatoes continued. Greater percentage of shipments (74 crop) extended beyond Northeastern states. Over 90% moved over highway compared to 80-85% in 3 previous seasons. Truck shortages reported 7% of time, compared to 45 and 35% previous 2 seasons. Freight rates for Maine potatoes by truck vs. rail compared at current levels. Storage facilities data collection interrupted and delayed.

#### REFERENCES:

An Analysis of the Impact of Market Information Upon Maine Potato Prices, Green, RC, Maine University, Department of Agr. & Resources Economics, Masters Thesis, June 1974

Marketing Characteristics in Shipments of Maine Tablestock Potatoes, Johnston, EF; Pelsue, NH, Jr, Maine University, Maine Experiment Station, Mis. Rpt. No 163, Sept. 1974

Potatoes: Planting and Production Estimates, Research in the Life Sciences, Pelsue, NH, Jr, Maine University, Life Sciences & Agr. Experiment Station, V22 N4, Nov. 1974

Demand Relationships and Pricing Implications for Selected Potato Products, Pelsue, NH, Jr, American Potato Journal, V52 N2, pp 39-45, Feb. 1975

Utilization of Production and Marketing Information by Maine Potato Producers, Pelsue, NH, Jr, Maine University, Orono, Bulletin 716, July 1975

Marketing Characteristics in Shipments of Maine Tablestock Potatoes, 1966-1973, Johnston, EF; Pelsue, NH, Jr, Maine University, Orono, Report 172, Nov. 1975

Potato Statistics-Revised 1975 Pelsue, NH, Jr; Kalaw, T, Maine University, Orono, Report 171, Nov. 1975

PERFORMING AGENCY: Maine University, Department of Agricultural and Resource Economics

INVESTIGATOR: Johnston, EF Pelsue, HN, Jr

SPONSORING AGENCY: Department of Agriculture, ME00293

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1973 COMPLETION DATE: June 1977

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0064637)

## 22 099624

### IMPROVING TRANSPORT AND HANDLING OF CONCENTRATED FORAGE PRODUCTS TO OVERSEAS MARKETS

Develop and evaluate improved methods and equipment for transporting and handling overseas shipments of concentrated forage products. Evaluate present forms and methods of concentrating forage products, and handling, storing, transporting and using the products. Determine how these steps interface and the effect of such interfacing. Develop improved equipment and techniques or modifications of present technology. Evaluate improvements in commercial shipping experiments to overseas markets. Determine comparative handling and transport efficiencies in terms of physical performance and costs. Recommend best equipment and methods and develop guidelines for their use. Research for improved transport of concentrated forage products is at a stage of development that waits for suitable densification machinery.

PERFORMING AGENCY: Agricultural Research Service, Western Region Oregon-Washington Area

INVESTIGATOR: Fountain, JB

SPONSORING AGENCY: Department of Agriculture, 5805-15880-001

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Nov. 1973 COMPLETION DATE: Nov. 1978

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0040669)

## 22 099629

### ORGANIZATION AND MANAGEMENT OF FARM SUPPLY FIRMS

Identify and evaluate the potential impact on firms of changes in structure and operating methods of farm supply industries. Develop and test management practices and procedures for farm supply industry firms. The existing market structure for Missouri farm supply industries will be determined. Expected changes in industry structure will be identified. The potential impact of structural change on industry firms will be examined. As new products or practices are introduced, their potential impact on the operations of individual firms will be studied. Operations research and simulation techniques will be adopted to the types of managerial problems faced by agribusiness firm managers. Areas of work which will receive attention include local distribution, inventory control, and management planning. (1) Further testing was conducted on the Financial Simulator Model for Country Elevators. This computerized model has been designed to assist managers in the evaluation of long range plans for their firms. More efficient operations should result from the use of this management tool. (2) A bulletin which describes an Inventory Control Model for fertilizer Retailers was published. This model is designed to assist management in minimizing inventory holding costs. (3) Work was completed on a study of Financial Conditions Supporting Growth in Local Farmer Cooperatives.

This study should assist managers of credit institutions in evaluating the growth potential of local cooperatives. A thesis has been written. A paper was presented at the 1977 American Agricultural Economics Assoc. meeting. Two Departmental papers have been prepared.

## REFERENCES:

Transportation Change and Missouri's Agribusiness Future Moser, DE, Missouri University, Columbia, Extension Division, Agri-Business Newsletter, Mar. 1974

Transportation Problems and Policy Concerns of Agriculture Moser, DE, Missouri University, Columbia, Extension Division, Agri-Business Newsletter, Nov. 1974

A Computerized Model for Retail Fertilizer Dealers Inventory Management, Devino, GT; Dever, LA, Jr, Missouri University, Agricultural Exp Station, S.R. 185, June 1976

PERFORMING AGENCY: Missouri University, Columbia, Department of Agricultural Economics

INVESTIGATOR: Devino, GT Moser, DE

SPONSORING AGENCY: Department of Agriculture

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Jan. 1972 COMPLETION DATE: July 1977

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0061002)

## 22 099636

## ECONOMICS OF CONSUMPTION, DISTRIBUTION, AND PRODUCTION OF SECONDARY MANUFACTURED WOOD PRODUCTS

Improve the efficiency of performance of the markets for secondary manufactured wood products in Eastern United States in satisfying the needs of society and using available resources effectively. The major research will be concerned with the pallet, furniture, and flooring industries. Studies will seek to determine the optimum raw material mix. Industrial trends and consumer preferences will be studied. Wooden pallet standards will be developed. Studies will be made to develop a model for optimizing the flow of pallets to meet the demands for shipment, handling and storage of product. This will include evaluation of a pallet exchange pool. Other studies will be concerned with developing alternatives to the labor intensive nature of the production of many wood products. The two requirements of a successful pallet exchange system are guaranteed uniform-valued pallets and an agency to provide the guarantee to the pallet user. Pallet construction standards have been written and tested that insure that species and grades are compatible with the fastening system and that pallet production procedures assure uniform performance. The design objective is uniform performance in service, irrespective of the materials used. The grading and utility-rating standard establish uniform shock-performance classes; and account must be taken in design of the differences between the classes in order to build pallets that perform in a uniform manner. To insure equal quality in a pallet exchange program, the pallets should be produced and procured under the auspices of a third-party inspection and certification system. This third party would also be responsible for maintaining the value of the pallet during its life and managing the exchange pallet inventory. The time appears right for the establishment of a major pallet exchange program in the U.S.

## REFERENCES:

Required Pallet Research: Economic Aspects Opportunities for Virginia's Pallet, Industry, Proceedings, Wallin, WB, VPI & State University, 121, pp 32-38, 73

The Performance of Wooden Pallets in Pallet Exchange Programs, Sardo, WH, Jr; Wallin, WB

Quality Distribution of Pallet Parts From Low-Grade Lumber Large, HR; Frost, RE, USDA Forest Service Research, Paper NE-266, 6pp, illus, 1974

Factors Influencing the Selection of State Office Furniture Anderson, RB, USDA Forest Service Research, Paper NE-266, 6 pp, illus., 1973

Factors Affecting the Use of Hardwood Flooring in Urban Rehabilitation, Nevel, RL, Jr, USDA Forest Service Research, Paper NE-273, 7 pp, illus., 1973

Design of Pallet Deckboard-Stringer Joints Part II: Reinforced Aspen Pallet Joints and Aspen Pallets, Stern, EG, VPI and State Univ, Wood Res & Wood Constr Lab, Bulletin 133, 24 pp, 1975

Recent Pallet Fastening Research can Reduce Pallet Costs, Stern, EG, VPI & State Univ., Wood Res & Wood Constr Lab, Bulletin 128, 8 pp, 1974

Tentative Nailing Standards for Warehouse and Exchange Pallets, Wallin, WB; Stern, EG, VPI & State Univ., Wood Res & Wood Constr Lab, Bulletin N129, 16 pp, 1974

PERFORMING AGENCY: Northeastern Forest Experiment Station

INVESTIGATOR: Martens, DG

SPONSORING AGENCY: Department of Agriculture, NE-4304

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Sept. 1967 COMPLETION DATE: May 1978

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0023183)

## 22 099637

## IMPROVED PACKAGING OF AGRICULTURAL PRODUCTS

Reduce product damage, develop and evaluate new materials or ways of using substitute packaging materials for those in short supply that will reduce the cost of packaging, handling, and transport of perishable agricultural products. In cooperation with package and container manufacturers develop new containers, packages, or packaging materials such as air cushion bags and plastic corrugated boxes. Test the physical performance of such materials in protecting the packaged product in the laboratory, commercial packing plants, and through distribution systems. Gather data on cost of materials, packing, handling, storage, transport, and distribution and data on the suitability of the new containers, packages, or packaging materials for meeting the requirements of the marketing system and consumers of the product. Compare the cost of using the new packages, containers, or packaging materials and the efficiency with which they can be packed, shipped, and handled on pallets or in some other type of unit load with conventional forms of packaging in current use. In response to a request from New York State lettuce growers and retail distributors, one test shipment of lettuce packed in 48-by 40-inch bulk bin-boxes was made from Oswego, N.Y., to Baltimore, Md. The multi-wall bin-box was constructed from two layers of double-wall corrugated fiberboard. The bin-boxes and the lettuce arrived in good condition, but the bin-boxes were difficult to deliver to and handle in retail stores. Additional tests were planned and conducted on the use of air-filled plastic bags and other cushioning materials for apples in loose-filled boxes. Laboratory tests conducted in the Yakima, Wash., Packaging and Transport Research Laboratory indicated that polyethylene-foam pads show enough promise to warrant further testing, but the plastic film (Surllyn/Mylar) bags failed to provide a satisfactory cushion because of their vulnerability to stem punctures and seal failures. A corrugated, rigid, plastic box (mixture of high-density and low-density polyethylene resin) was also evaluated for shipping celery and cut flowers. These boxes are being redesigned to give them additional strength needed in the physical distribution system.

## REFERENCES:

Economic Aspects of Prepackaging Stokes, DR, OECD, Paris France, Doc No. DAA 1066, Mar. 1974

PERFORMING AGENCY: Agricultural Research Service, Agricultural Marketing Research Institute

INVESTIGATOR: Stokes, DR

SPONSORING AGENCY: Department of Agriculture, 1104-15841-001

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Oct. 1968 COMPLETION DATE: May 1977

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0020042)

## 22 099638

## EVALUATE SYSTEMS FOR HANDLING AND TRANSPORTING FROZEN FOOD FROM PROCESSING PLANT TO WHOLESALE

Determine and evaluate various systems for handling and transporting frozen food from processing plant to wholesaler and to develop methods for improving the efficiency for the total system.

This project will be conducted in cooperation with the American Frozen Food Institute which will assist in establishing industry contacts and evaluating research findings. Project leadership will be provided by the Market Operations Research Laboratory. The objectives will be approached by detailed studies of the layout, methods, equipment, and labor required in processor warehouses on frozen foods from storage through loading of transport vehicles; at public or regional frozen food warehouses on receiving, storing, and loading, and at wholesale warehouses on receiving and storing frozen foods. Evaluations will be made of various systems for handling and transportation frozen food from the processing plant to wholesale warehouses and if possible, develop systems that will reduce the cost. Labor, equipment, methods and handling costs at the various facilities for different systems will be analyzed and evaluated.

Studies were initiated to determine the most economical systems for handling and transporting frozen foods from processing plant to wholesaler.

ers, including direct shipments and through regional and public warehouses. Preliminary studies were made in four processing plants in New Jersey, Maryland, and Virginia to try to determine the magnitude and complexity of frozen food products, handling, and marketing characteristics, and to determine what aspects of the frozen food industry would be studied first. Plans were made to analyze the major marketing systems from processing plant to wholesaler with emphasis on obtaining labor, equipment, and material inputs and costs on the distribution systems studied. Research was completed at two public refrigeration warehouses and at a corporate chain warehouse. Research has been initiated on handling methods and loading costs, both manual and unitized, in four processing plants in Florida.

PERFORMING AGENCY: Agricultural Research Service, Agricultural Marketing Research Institute

INVESTIGATOR: Mongelli, RC

SPONSORING AGENCY: Department of Agriculture, 1104-15864-004

STATUS: Active NOTICE DATE: July 1975 START DATE: May 1974 COMPLETION DATE: May 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0041067)

#### 22 099639

##### SYSTEMS FOR MARKETING BEEF FROM SLAUGHTERHOUSE TO RETAIL FOOD STORE

Determine costs for various systems of marketing beef from slaughterhouse to retail food store and to develop improvements in these systems or develop a composite of two or more systems that would reduce marketing costs. Leadership will be provided by the Market Operations Research Laboratory. The objective will be met by detailed cost studies of 11 different systems for marketing beef. Cost data will be gathered from 16 firms including slaughterers, packers, central processors, and retail stores. Data gathered will include transportation methods and cost, labor cost and productivity, cutting losses, product shrinkage, description of methods, and other pertinent information. Most information will be based on company records with labor costs verified by time studies. Upon completion of data gathering, an analysis will be made to determine the most efficient system. Following this, field tests will be implemented to verify findings as to the system that appears to hold the greatest potential for cost reduction.

A study was initiated to compare the costs of two systems for handling prefabricated cuts of beef between the wholesale chain warehouse and retail stores. One system utilizes wire baskets stacked on a four-wheel dolly; the other utilizes cardboard boxes on pallets. The data-gathering stage is nearly complete and rough draft report should be initiated by June, 1975.

PERFORMING AGENCY: Agricultural Research Service, Agricultural Marketing Research Institute

INVESTIGATOR: Goulston, CL

SPONSORING AGENCY: Department of Agriculture, 1104-15864-005

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug. 1974 COMPLETION DATE: Aug. 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0041735)

#### 22 099640

##### MAINTAINING AND IMPROVING QUALITY AND MARKET LIFE CALIFORNIA-ARIZONA CITRUS IN FOREIGN MARKETS

Determine the effects of transit temperatures and relative humidities, postharvest fungicidal treatments, and handling, packaging, palletizing and containerization on arrival condition and appearance, quality, and market life of California-Arizona citrus in foreign markets. Ship citrus fruit, or hold in simulated transit conditions, after treating with individual or combinations of fungicides. Determine fungicide concentrations necessary to control storage decays and fruit spoilage. Determine fungicide residues on or in fruit at time of treatment and upon arrival in Europe or Japan. Develop and improve analytical methods for fungicides now used or expected to be used, as needed. Compare palletized and hand stacked shipments in mechanical and iced rail cars and containers for fruit cool-down rates, uniformity of fruit temperature control, and fruit injury and carton deterioration due to cargo shifting during loading, unloading and in transit. Citrus fruit are not adequately cooled in mechanically refrigerated rail cars during warm weather. Cooperative arrangements were initiated with ARS, rail and citrus groups to modify the air distribution system of a rail car for test purposes. A reversed air flow system was developed by ARS for evaluation in this rail car application. A laboratory procedure was devised for the quantitative determination of benomyl, a fungicide used on citrus after harvest. The method is less accurate than existing methods but is faster, more convenient and useful when greater accuracy is not necessary.

#### REFERENCES:

Recommendations for Exporting Florida Lemons Hale, PW; Houck, LG; Risse, LA, Citrus and Vegetable Magazine, V37 N7, 4 pp, Mar. 1976

PERFORMING AGENCY: Agricultural Research Service, Market Quality Laboratory

INVESTIGATOR: Houck, LG Norman, SM

SPONSORING AGENCY: Department of Agriculture, 5210-15880-001

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Mar. 1974 COMPLETION DATE: Mar. 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0041023)

#### 22 099641

##### MAINTAINING QUALITY IN EXPORTED TEXAS FRUITS AND VEGETABLES

Determine the most effective methods for protecting, improving, and maintaining quality and condition of Texas fruits and vegetables exported to foreign markets. Explore packaging and unitization systems as they relate to citrus fruit quality during overseas shipment and movement throughout foreign market channels. Factors including temperature, relative humidity, and atmospheric composition will be monitored during accompaniment of shipments. Stacking patterns will be tested to determine the most effective utilization of the ship's ventilation system. Based on the above relationships, recommendations will be made with respect to minimizing losses and maintaining quality of exported fruits and vegetables. An experimental shipment of 10 van containers of Texas grapefruit (10,000 boxes) was exported to Rotterdam, The Netherlands. All containers were met at their destination points throughout Europe by ARS personnel. Experiment 1 consisted of 8 containers & compared 4 fungicide treatments, 2 box loading patterns and 2 types of refrigeration units. Container refrigeration units without a constant air flow feature did not reduce fruit temperatures quickly or uniformly throughout the load whenever a solid (in-register) loading pattern was utilized. Refrigeration units employing a constant air flow feature uniformly reduced temperatures to a constant level regardless of stacking pattern. Neither type of refrigeration unit reduced fruit temperatures from ambient as quickly as is desirable. Thus, precooling of all export fruit is highly recommended. Intermittent air flow units should not be used in combination with an in-register stacking pattern. No significant differences in decay nor increases in CO (2), O(2) or C(2)H(4) (ethylene) were found among treatments. Moisture content of cartons increased equally in all containers. Carton failure and fruit deformation tended to be greater in the air flow stacking pattern. Experiment 2 consisted of 2 containers modified to force cooled discharge air directly through the boxes of fruit.

PERFORMING AGENCY: Agricultural Research Service, Nematology Research Laboratory

INVESTIGATOR: McDonald, RE

SPONSORING AGENCY: Department of Agriculture, 7202-15880-002

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1974 COMPLETION DATE: July 1977

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0041394)

#### 22 099642

##### MARKETING MARGINS AND COST COMPONENTS IN THE OIL CROPS INDUSTRY

Determine price spreads and cost components in producing, transporting, storing, and manufacturing oil crops and major products; and relate changes in structure, technology, and practices to changes in prices, margins and costs. Determine farm-to-retail price spreads from secondary data and develop cost components from special studies and surveys, using economic-engineering data and budget analyses. Develop costs for producing, storing, transporting and manufacturing oil crops and major products with initial attention being given to costs of manufacturing margarine, cooking and salad oil, and crushing soybeans. Progress was made toward improved ability to respond effectively to requests for marketing margins and cost components information. Close working relationships were maintained with VPI on cooperative work relating to costs of crushing and manufacturing salad dressing and mayonnaise. A cost simulation model, developed at VPI is now operational for crushing soybeans, refining soybean oil, and manufacturing margarine, cooking oil, mayonnaise, and shortening. These models along with information now in the FEDS provide a basis for estimating costs from the production of soybeans through the processing sector. The overall system can also provide information and resource use including capital, labor, energy, etc. The system was used during the year to develop a staff report on energy uses in the crushing sector.

## REFERENCES:

US Situation for Oil Crops-Soybeans, Cottonseed, Peanuts, Sunflower, Safflower and Other Oilseeds, Doty, Ho, Jr, Res to Meet U.S. & World Food Needs, ARPAC Conf, Vol 1, pp 150-173, July 1975

Decision Making in Oilseed Processing Doty, Ho, Jr, Oil Mill Gazetteer, pp 20-26, Aug. 1975

A Representative and Deterministic Cost Component Model of the U.S. Vegetable Oil Industry, Lamm, RM, Jr; Johnson, JM, VPI and State Univ in Coop with Econ Res Service, Bulletin 107, 93 pp, Dec. 1975

PERFORMING AGENCY: Economic Research Service, Department of Agriculture

INVESTIGATOR: Doty, HO

SPONSORING AGENCY: Department of Agriculture, CE-07-062-11-00

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1974 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0041588)

## 22 099643

### ORGANIZATION AND EFFICIENCY OF THE PRODUCTION AND MARKETING SECTOR FOR OIL CROPS

Develop a structural schematic for producing, storing, processing, and distributing products in the oil crops industry. Analyze the competitive position of the oil crops industry with competing commodities and with the same commodities from competing countries. Evaluate the impacts of changes in economic, technical, and regulatory factors on the organization and efficiency of the oil crops industry. Determine the present economic structure of the oil crops industry and quantify the product flow through the various marketing channels as background to the development of the oil crops research program. Evaluate marketing patterns, regional competition, stock management and storage and transportation problems. Develop a spatial-temporal model for soybeans to analyze the impacts on industry organization and efficiency of changes in supply, demand, cost and institutional factors. Research on world relationships in the oil crops complex continued with the preparation of a paper for the World Soybean Research Conference held at the University of Illinois. World historical data were collected and used to estimate intercorrelations among several fats and oils to estimate consumption functions for fats and oils in several countries. Staff papers were prepared which analyzed alternative peanut policy proposals related to changes in legislation and administrative provisions of current law. Progress was made on the compilation and analysis of survey data on the capacity of the fats and oils refining industry. A 100-percent enumeration of the refining industry was completed and the data analyzed to determine the total and regional capacity of the oil refining industry. This work resulted in the publication of a special article in the Fats and Oils Situation. Data tables on energy used by type of energy, by month, and by State for the 1974 soybean, peanut, and flaxseed crops were prepared.

## REFERENCES:

Storage Utilization in a Deficit Region Boutwell, A; Kenyon, E, Southern Journal of Agricultural Economics, V5, N1, pp 233-237, July 1973

Grain Storage in the Deficit South Atlantic Region Kenyon, E; Boutwell, A, VPI and State University, Research Division, Bull N90, 69 pp, May 1974

Cost of Producing Soybeans in the US, 1974 Walter, AS, Economic Res Service, FOS-281 pp 34-40, Feb. 1976

Costs of Production for Soybeans, Peanuts and Flaxseed for 1974, 75 and 76, Walter, AS; Garst, GD, Economic Res Service, Bulletin 106 pp 28-31, Apr. 1976

PERFORMING AGENCY: Economic Research Service, Department of Agriculture

INVESTIGATOR: Boutwell, WA

SPONSORING AGENCY: Department of Agriculture, CE-07-064-11-00

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1974 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0041590)

## 22 100472

### THE ECONOMICS OF PRODUCT ASSEMBLY AND DISTRIBUTION

This project is for the purpose of conducting field trials to prove the practicability of research discoveries. It is attempting to develop a body of economic knowledge concerning the relationships between costs and physical handling of farm products. It will assemble rates charged for transport by truck, rail, barge, air, and pipeline, and relate these to the

warehousing and inventory practices of agribusiness firms as these effect marketing costs of farm products and purchased supplies. /SIE/

PERFORMING AGENCY: Kansas State University, Agricultural Experiment Station

INVESTIGATOR: Schruben, LW

SPONSORING AGENCY: Kansas, State of, 0061020 KAN-05-231

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1972

ACKNOWLEDGMENT: Kansas State University, Smithsonian Science Information Exchange (GY 61020 2)

## 22 129732

### A LONG-TERM STUDY OF TRANSPORTATION AND DISTRIBUTION OF PERISHABLE FOODS

The study seeks to improve the efficiency of the transportation and distribution of perishable foods by identifying both implementable short run opportunities and potential long term changes in the industry. The study is divided into four parts. The first two seek to understand and describe the composition and functioning of the industry and to identify the cost and service parameters of its transportation and distribution system. The latter two stages will identify alternative transportation and distribution systems and investigate possible long run changes in technology.

Subcontractor: Reebe Associates, P.O. Box 1436, 200 Railroad Avenue, Greenwich, Connecticut 06830.

## REFERENCES:

Transportation & Distribution of Fresh Fruits and Vegetables. A Bibliography, Schrier, E; Ainsworth, DP, NTIS, Apr. 1976

PERFORMING AGENCY: Manalytics, Incorporated

INVESTIGATOR: Schrier, E Tel (415) 788-4143 Ainsworth, DP Hill, SG

SPONSORING AGENCY: Federal Railroad Administration; National Bureau of Standards, Department of Commerce

RESPONSIBLE INDIVIDUAL: Newkirk, JL Tel 202-426-0771

Contract DOT-FR-65024

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug. 1975 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$731,746

ACKNOWLEDGMENT: FRA

## 22 130967

### CONTAINERIZED ORDNANCE TRANSPORTATION EQUIPMENT

Explore new concepts and techniques for shipping containerized naval ordnance on existing DOD/commercial flatbed trailers and rail flatcars. Establish feasibility and develop technological guidelines for future engineering of portable adapters for locking standard cargo containers to flatbed trailers and railcars. Investigate the feasibility of permanent and temporary modifications to existing equipment to meet containerized ordnance transportation requirements.

PERFORMING AGENCY: Department of the Navy, Weapons Handling Laboratory

INVESTIGATOR: Wilner, I

SPONSORING AGENCY: Naval Sea Systems Command, Department of the Navy, DN597250

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQN597250 1)

## 22 130968

### CONTAINERIZED ORDNANCE TRANSPORTATION EQUIPMENT

Explore concepts and techniques for internal restraint systems and dunnaging techniques for qualifying commercial containers for intermodal shipment of ordnance. Determine strength characteristics of the major types of commercial containers currently available in industry. Investigate available restraint methods for possible application. Design new restraint systems where required. Test and evaluate prototype containers to determine feasibility of qualifying commercial containers.

PERFORMING AGENCY: Department of the Navy, Weapons Handling Laboratory

INVESTIGATOR: Delatash, J

SPONSORING AGENCY: Naval Sea Systems Command, Department of the



Navy, DN597251

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1977

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZQN597251 1)

## 22 134796

### SYSTEM FOR HANDLING AND TRANSPORTATION OF TRANSURANIC CONTAMINATED WASTE

The purpose here is to provide an integrated study and development of a standardized packaging, package container, handling, and transportation system for the safe, timely, and economical relocation of transuranic wastes. The following situations will be considered: (1) interim retrievable storage; (2) pilot permanent repository; (3) permanent repository. The approach to this problem emphasizes coordinating and balancing the requirements of the various elements of the TRU waste chain.

PERFORMING AGENCY: Rockwell International Division, International Atomic, AL 2117A

INVESTIGATOR: Merlini, RJ Tel (30) 497-2631

SPONSORING AGENCY: Energy Research and Development Administration

RESPONSIBLE INDIVIDUAL: Sisler, JA Tel (301) 973-3561

Contract E-(29-2)-3533

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$105,000

ACKNOWLEDGMENT: Energy Research and Development Administration

## 22 135001

### ALTERNATIVE SYSTEMS FOR TRANSPORTING AGRICULTURAL OUTPUTS TO MARKET AND INPUTS TO PRODUCTION AREAS

OBJECTIVE: Determine the optimal transportation systems and facilities for transporting grain and fertilizer to maximize producer income. APPROACH: Estimate demand for transportation; estimate costs of alternative modes and handling facilities; estimate optimal transportation modes, system and location and types of facilities. PROGRESS REPORT: Optimal solutions for the grain and fertilizer distribution and transportation systems for the entire state of Iowa have been obtained. These solutions have been used to compute benefit cost ratios for upgrading 71 branch rail lines in Iowa.

PERFORMING AGENCY: Iowa State University, Ames, Agricultural Experiment Station

INVESTIGATOR: Baumel, CP

SPONSORING AGENCY: Department of Agriculture, Iowa Cooperative State Research Service, 0065178 IOW02016

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1974 COMPLETION DATE: June 1979

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GY 65178 1)

## 22 136086

### A SAFETY AND ECONOMIC STUDY OF SPECIAL TRAINS

The aim of the project is to evaluate the safety and economics of special trains for the shipment of nuclear fuel cycle materials and compare them with those of regular trains. The transportation system and shipments affected will be identified; the economic and logistics aspects of special trains will be evaluated; safety of such trains will be assessed; and the costs and benefits of special trains will be compared to use of regular trains.

PERFORMING AGENCY: Battelle Memorial Institute/Pacific Northwest Labs, RL 6717A

INVESTIGATOR: Loscutoff, WV Tel (509) 946-2768 Hall, RJ

SPONSORING AGENCY: Energy Research and Development Administration, Environmental Control Technology Division

RESPONSIBLE INDIVIDUAL: Sisler, JA Tel (301) 973-5361

Contract ERDA-AT(45-1)-1830

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975 TOTAL FUNDS: \$90,000

ACKNOWLEDGMENT: Energy Research and Development Administration

## 22 138363

### NEW AND IMPROVED SYSTEMS TO HANDLE PEANUTS AT COMMERCIAL STORAGES

Develop new or improved systems to handle peanuts as they are received, dried, stored, graded, shelled, bagged, and shipped. Presently used systems of handling peanuts will be evaluated for efficiency and cost. Where needed new or improved facility layouts, handling or flow processes, bagging and bulk handling, and sampling methods and equipment will be developed to reduce marketing cost and maintain quality as peanuts move through marketing channels. A sampler for use in automatic dump scales was modified for the Federal-State Inspection service because new regulations and use of bulk container units made existing sampling methods inadequate. An investigation of dimensional changes in peanuts as moisture is removed during drying indicated that most of the change occurs as moisture is reduced down to 15%. Below 15% moisture changes are measurable but not significant. Shelled and in-shell Virginia, runner and Spanish peanuts were free-fall impacted upon wood, steel, concrete, and peanut surfaces. Peanut temperatures of 76 deg F and 35 deg F were used. Factors such as split kernels, foreign material, loose shelled kernels, etc. were used to evaluate damage. Damage were significant when drop heights exceeded 12 feet for in-shell peanuts and 2 feet for shelled peanuts. The 35 deg F temperature peanuts damaged more easily than the 76 deg F peanuts. Peanuts impacted on peanuts caused less damage than other impact surfaces and some difference in damage was noted between peanut types. A new method of packaging shelled peanuts is being investigated cooperatively by container Corporation of America, Insects Investigations Lab at Savannah and the Quality and Engineering Labs of the National Peanut Research Laboratory. The analysis of the 3-month samples indicates no change in quality.

#### REFERENCES:

Dimensional Changes in Peanut Pods, Kernels, and Hulls as Moisture is Removed During Curing, Slay, WO, J Amer Peanut Res and Educ Assoc., 1974

Damage to Peanuts from Free Fall Impact, Slay, WO, J Amer Peanut Res and Educ Assoc., 1975

PERFORMING AGENCY: Agricultural Research Service, Department of Agriculture, 7704-15700-007

INVESTIGATOR: Slay, WO

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Nov. 1974 COMPLETION DATE: Nov. 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0041935)

## 22 138366

### INCREASING EFFICIENCY IN THE GRAIN HANDLING STORAGE AND TRANSPORTATION SYSTEM SERVING THE SOUTH PLAINS

Develop a detailed description of spatial and temporal grain flows and alternative mode freight rates. Determine least-cost grain distribution patterns and most efficient mode use for described grain flow. Estimate least-cost number, size and location of country elevators and feed mills to serve cattle feeding industry. Develop an interregional competition model of feed grain sector with emphasis on South Plains. Via personal interview and main questionnaires of grain handlers, transportation companies and truck brokers existing grain flows and utilized mode freight rates estimated. These data entered into a spatial model to resolve least-cost distribution patterns and modes and then contrasted with actual distribution and utilized modes. Grain elevator, feed mill and transport cost functions and feed grain production data estimated and entered into model to optimize industry organization serving area cattle feeding industry. Spatial analysis of feed grain sector accomplished by estimation of regional demand and supply functions and transport costs which are data inputs for spatial equilibrium model. Operations research procedures necessary for rationalizing a regional grain handling, storage and transportation system are being developed and tested. Several out-of-kilter and implicit enumeration techniques show promise. A main and telephone survey of Texas' grain elevators, feedyards, feedmills, broiler and dairy operations has been completed. The purpose of the survey is to determine structural characteristics of the grain handling industry interstate and interstate grain flows of Texas originated grain, origin of out-of-state produced grain which enters Texas and modes of transportation utilized in alternative grain flows. Analysis of this data will not new commence. These data are being used by the Texas grain dealers association.

## REFERENCES:

A Modification of the Modified Stollsteimer Model Fuller, S, Southern Journal of Agricultural Economics, Vol. 7, No. 1, July 1975

Plant Location Involving a Discontinuous Plant Cost Function Fuller, S, Paper presented at Southern Agricultural Econ Assoc, Feb. 1975

Optimizing Subindustry Marketing Organization: A Large Scale Fuller, S, Paper presented at American Agricultural Econ Assoc, Aug. 1975

PERFORMING AGENCY: Texas A&M University, Agricultural Economics Department, TEX-6087

INVESTIGATOR: Fuller, SW

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Mar. 1975 COMPLETION DATE: Mar. 1980

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0067558)

## 22 138368

**IMPROVED HANDLING AND DISTRIBUTION METHODS FOR DOMESTIC MARKETING OF FRUITS AND VEGETABLES**

Find more efficient and effective ways of handling and distributing perishable products from Florida to domestic markets and determine their effects on market quality and consumer preferences. Test and evaluate improved handling methods under simulated and commercial environmental conditions. Develop and test methods for filling, handling, and transporting bulk pallet bins bagged or bulk citrus. Develop and test pallets and/or slipsheets for unitized handling of citrus peppers, and celery from production areas to retail warehouses. Explore possibilities for developing methods whereby railcars can be used more effectively in transporting citrus and winter vegetables from Florida production area. PROGRESS REPORT: Under commercial packinghouse conditions, tested the assembly and filling with bagged grapefruit, a two-piece, 275-lb-test corrugated bulk bin using Signode angleboard and nylon strapping. Additional holding and shipping tests are needed before conclusions can be made. This test showed it is physically feasible and economical to pack bagged grapefruit in an inexpensive bulk-bin concept which can be distributed to and merchandised directly from retail produce departments of major supermarkets. Tested under commercial packinghouse conditions, the assembly, filling, and gassing of tomatoes in wooden bulk pallet bins compared with conventional practices of using fiberboard cartons. Results indicate similar ripening pattern of mature green tomatoes compared with ripening in conventional cartons. Additional replications of holding tests are necessary before sound conclusion can be made.

PERFORMING AGENCY: Department of Agriculture, Horticultural Research Laboratory, 7606-15840-004

INVESTIGATOR: Miller, WR Hatton, TT

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Nov. 1975 COMPLETION DATE: Nov. 1978

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0042873)

## 22 138375

**IMPROVED PACKAGING, HANDLING, AND TRANSPORT OF WESTERN FRUITS AND VEGETABLES**

Improve efficiency of packaging palletization, handling, and transport of western fruits and vegetables to reduce marketing costs and maintain product quality. New packages and methods of palletizing or unitizing these packages will be developed for efficient handling, transport, and marketing of fruits and vegetables. Research will determine package strength, will relate design and loading patterns to cooling rates and transit temperatures, and will correlate packaging, handling, and transport systems to maintenance of product quality. Research will include studies on new packaging and handling systems compatible with mechanical produce and with efficient use of transport vehicles. PROGRESS REPORT: Lettuce: A new carton with outside dimensions of 20-3/4 x 11-1/4 x 16 inches has been developed, which can be unitized on inexpensive slip sheets and mechanically loaded in rail cars and trucks. About the same amount of lettuce in the new carton size can be loaded in trucks as with the conventional carton, but about 6 thousand more head can be loaded in rail cars. Additionally, about 50 percent less lettuce is lost due to physical damage in the new carton. Corrugated fiberboard, solid fiber, high density polyethylene, and polypropylene

slip sheets have been adequate for handling lettuce when the fork truck driver was competent. Use of bulk bins has resulted in good arrivals and an adequate load can be obtained in rail cars and trucks when bins are handled on slip sheets instead of pallets. Stone Fruits: Peaches and nectarines shipped in jumble-filled 35-pound boxes were equal in quality to those shipped in the conventional jumble-filled 25-pound box or two-layer place-packed box. Bliss-style corrugated fiberboard boxes and tray-style corrugated fiberboard boxes performed equally well.

## REFERENCES:

Unitized Handling of Western Iceberg Lettuce Hinds, RH; Hinsch, RT; Intl Conf Handling Perishable Agr Commodities, Mich., Proceedings (27th) pp 130-33, 1975

A Mechanical Handling System for Lettuce--Can It be Done?, Hinsch, RT; Hinds, RH, Produce Marketing Assoc. Yearbook, 3 pp, 1975

Packing and Shipping Mechanically-Harvested Lettuce Hinsch, RT; Rij, RE, US Dept of Agriculture, Res Report 1049, 7 pp, 1976

Current Practices & Trends in Marketing Western Iceberg Lettuce in Relation to Other Produce, Rij, RE; Hinds, RH; Hinsch, RT; Harris, CM, US Dept of Agriculture, Res Report 1052, 9 pp, 1976

Temperature Requirements for Shipping California Green Peppers, Lipton, WJ, Produce Marketing Assoc. Yearbook, 3 pp, 1975

PERFORMING AGENCY: Agricultural Research Service, Department of Agriculture, 5202-15840-001

INVESTIGATOR: Hinsch, RT Rij, RE

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Oct. 1969 COMPLETION DATE: July 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0020846)

## 22 138378

**ALTERNATIVE STRUCTURES FOR INCREASING EFFICIENCY IN INTER-AND INTRA-REGIONAL GRAIN MARKETING SYSTEMS**

OBJECTIVES: Indicate ways to increase the economic efficiency of grain marketing, transporting and processing following dramatic changes since 1972 in marketing institutions, operational structure and policies related to industry. Evaluate the impact of alternative transportation rate structures on the organization of the grain industry. Examine alternative national grain inventory policies and their effects on market organization and performance. Based on results develop a set of recommendations for improving efficiency and/or reducing costs of inter-and intra-regional marketing of grain. APPROACH: Georgia will participate in the work of four objectives as outlined in the regional project statement. The work will include a survey of grain farms serving the Southern region to determine changes in marketing functions related to movement and storage of grain; the development of grain transfer costs for alternative modes of transportation; an analysis of grain inventory policies on storage and transportation needs; and recommendations from data obtained to guide grain firms on needed marketing facility investments under alternative situations. PROGRESS REPORT: Estimated costs of handling grain for various firm sizes in Georgia. Initial estimates of grain utilization by grain and class of livestock for several years in Georgia. Have begun revising an LP model of grain flows for the state of Georgia. This and related work has been done in cooperation with regional project SM-42. Presented seminar and several talks to civic groups on grain situation and foreign trade.

## REFERENCES:

75 corn Crop Uncertain Bateman, WL, Farmers and Consumers Market Bulletin, Vol. 61 No. 4, Jan. 1975

PERFORMING AGENCY: Georgia Agricultural Experiment Station, Agricultural Economics Department, GEO01185

INVESTIGATOR: Anderson, RF Huang, CL

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: July 1974 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0065175)

22 138390

**IMPROVING RELATIVE HUMIDITY LEVELS AND CONTROL IN REEFER VAN TRAILERS AND CONTAINERS**

The aim of the project is to determine prevalent relative humidity levels and control in conventional equipment; develop methods/systems to optimize the RH levels and control. The approach will be to: measure and record relative humidity levels in a statistically valid sample of reefer van cargo spaces, loaded and unloaded; evaluate data; define the prevalent functional level and control parameters; postulate the causes for deviation from the optimum levels; hypothesize the methods/systems required to optimize the levels and control; empirically test the hypothesis on prototype equipment; report the results and recommend methods/systems.

PERFORMING AGENCY: Department of Agriculture, Horticultural Research Laboratory, ARS 7606

INVESTIGATOR: Goddard, WF

SPONSORING AGENCY: Department of Agriculture, 7606-15840-002

STATUS: Active NOTICE DATE: July 1976 START DATE: June 1975 COMPLETION DATE: June 1978

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0042497), Smithsonian Science Information Exchange (GU 42497 1)

22 138400

**REDUCING PHYSICAL AND QUALITY LOSSES OF WHOLE SOYBEANS IN TRANSPORTATION AND HANDLING**

The objective is to reduce physical and quality losses, handling and transportation costs for seed, food and processing grade soybeans shipped to domestic and world markets. The type, extent, and causes of physical losses and damage and quality deterioration in the whole beans in the various handling, processing, and transport modes will be identified by shipping and handling surveys and experiments. Alternative handling techniques and improvements in transport and handling equipment and transport and storage environments which may reduce such losses will be identified and developed. This will include single mode and multi-modal transport by truck, railroad, van containers, and barge-ship-barge shipments. These innovations will be evaluated in shipping and handling experiments to develop cost and performance data and appropriate recommendations for improving the handling and transport of the products.

PERFORMING AGENCY: Agricultural Research Service, Agricultural Marketing Research Institute, ARS 1104

INVESTIGATOR: Nicholas, CJ Bailey, WA

SPONSORING AGENCY: Department of Agriculture, 1104-15881-004

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1976 COMPLETION DATE: Apr. 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS 0043052)

22 138481

**RAIL WHEAT TRANSPORT EFFICIENCY STUDY**

To enhance and improve the physical efficiency of the marketing/transportation distribution system for grains in the hard winter wheat belt moving to domestic or export points, recognizing and utilizing the inherent advantages of rail transportation. Physical distribution study of alternative marketing/transportation systems.

PERFORMING AGENCY: Texas Transportation Institute

INVESTIGATOR: Richards, HA Tel (713) 845-3321

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Hardesty, F Tel (202) 426-9682 Boone, JW

Contract DOT-FR-65104

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Apr. 1976 COMPLETION DATE: Oct. 1978 TOTAL FUNDS: \$630,000

ACKNOWLEDGMENT: FRA, TRAIS

22 148525

**EFFECTS OF RAILROAD ABANDONMENT ON THE MODAL DISTRIBUTION OF TRAFFIC AND RELATED COSTS**

Estimates will be developed of the potential effects of railroad abandonment on: the modal distribution of traffic; increased transportation costs; the number of affected rail users which will close or relocated all or part of an affected facility; resulting capital investment required by affected rail users, transportation companies, and the public sector; and energy consumption. Estimates of the mileage of potentially uneconomic branch lines have been developed and data on the amount of traffic organized and terminated on

these lines has been acquired. A survey of 309 potentially affected rail users has been completed. The effects associated with these users have been estimated and are being extrapolated on the basis of four universes of potentially affected shipments.

## REFERENCES:

The Potential for Rail-Service Termination by Non-ConRail Carriers, Weinblatt, H, Nat Symp on Transp for Agric and Rural Am, Nov. 1976

Light Density Railroad Line Abandonment: Scaling the Problem, Matzzie, DE; Weinblatt, H; Harman, J; Jones, JR, Presented at the Transp Res Board Ann Meeting, Jan. 1977

PERFORMING AGENCY: CONSAD Research Corporation

INVESTIGATOR: Weinblatt, H Tel (412) 363-5500 Matzzie, DE

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Harman, J Tel (202) 426-4214

Contract DOT-OS-60154

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Dec. 1975 COMPLETION DATE: Apr. 1977 TOTAL FUNDS: \$119,594

ACKNOWLEDGMENT: CONSAD Research Corporation

22 153666

**LASH AND OTHER INTERMODAL SERVICES IN THE PACIFIC NORTHWEST EXPORT DISTRIBUTION SYSTEM**

Identify potential economies that could be obtained from movement of agricultural and forest products from the Pacific Northwest via the Columba-Snake navigation system into overseas markets by recently innovated intermodal transportation systems such as LASH, standard intermodal containers, and ocean-going barges. Identify products that would lend themselves to movement from the Pacific Northwest into foreign markets via the above transportations system and determine least cost routes and modes of moving these products.

## REFERENCES:

The Relationship Between International Trade and Transportation: Theory and Developments, Jones, JR, Nat Symp on Transp for Agriculture and Rural Amer, Paper, Nov. 1976

PERFORMING AGENCY: Idaho University, Moscow, Department of Agricultural Economics, CSRS IDA

INVESTIGATOR: Jones, JR

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, IDA00719

Contract 616-15-85

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Apr. 1976 COMPLETION DATE: Sept. 1980

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070665)

22 153674

**EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION SYSTEMS**

Estimate rural freight transportation requirements to 1985 and 1990. Estimate the optimal rural freight transportation, storage, and distribution system.

PERFORMING AGENCY: Illinois University, Urbana, Department of Agricultural Economics, CSRS ILLU

INVESTIGATOR: Hill, LD Hoffman, L

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, ILLU-05-0344

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070435)

22 153703

**EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION**

Estimate rural freight transportation requirements to 1985 and 1990. Estimate the optimal rural freight transportation, storage and distribution system. Evaluate the economic effects of alternative federal, state and local government policies on carriers, shippers, receivers and rural communities.

PERFORMING AGENCY: Iowa State University, Ames, Department of Economics, CSRS IOW

INVESTIGATOR: Baumel, CP  
 SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, IOWO2173

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070220)

#### 22 153718

##### EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION SYSTEMS

Estimate rural freight transportation requirements to 1985 and 1990, estimate the optimal rural freight transportation, storage and distribution system, evaluate the economic effects of alternate railroad ownership and financial policies.

PERFORMING AGENCY: Kansas State University, Department of Agricultural Economics, CSRS KAN

INVESTIGATOR: Sorenson, LO

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, KAN00966

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070301)

#### 22 156972

##### POTENTIAL IMPACTS OF CONTAINERIZATION AND INTERMODAL MOVEMENTS OF AGRICULTURAL COMMODITIES AND PRODUCTS

This study will evaluate the potential for and assess the economic impact on shippers, carriers, and receivers resulting from increased use of containerization and intermodal movements of agricultural commodities and product inputs. APPROACH: This is a basic line study directed to one area of the abandonment question (i.e. alternatives for meeting increasing freight transportation needs of rural areas). The information developed in this effort will furnish guidelines to decision makers relating to available alternatives for moving inbound and outbound freight in rural areas confronted with rail abandonment. Primary emphasis of this study will be devoted to those rural communities currently receiving rail service on light density on branch lines in Texas and will focus on potential alternatives available to users in rural areas and the benefits and costs of implementing container and intermodal plans.

PERFORMING AGENCY: Texas A&M University, Agricultural Experiment Station, Tex-616-15-90

INVESTIGATOR: Lamkin, JT Owensby, RM

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service.

Contract 616-15-90

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Apr. 1976 COMPLETION DATE: Sept. 1978

ACKNOWLEDGMENT: Current Research Information Service

#### 22 157092

##### EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION SYSTEMS

To estimate the optimal rural freight transportation, storage and distribution system. Evaluate the economic effects of alternative railroad ownership and financial policies. Evaluate the economic effects of alternative federal, state and local government policies on carriers, shippers, receivers and rural communities.

PERFORMING AGENCY: Wisconsin University, Madison, Department of Meat and Animal Science, CSRS WIS

INVESTIGATOR: Vilstrup, RH

SPONSORING AGENCY: Department of Agriculture, WIS02268

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0071499)

#### 22 159641

##### VALIDATION OF A MATHEMATICAL MODEL OF THE FREEZING OF COAL DURING RAIL TRANSPORTATION

A test in which the temperature variation in railcars containing coal was measured during a winter journey was undertaken. A standard Gondola and a Bathtub Gondola car were loaded with coal from a mine in the Crow's Nest Pass area. Thermocouple probes were inserted into the coal and each car and were used to measure the temperature variation in the coal while the cars were being transported to Thunder Bay and while they were standing at Thunder Bay the measured temperature variations were then compared with the predictions given by a computer model.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 3.24.73

INVESTIGATOR: Oosthuizen, PH Tel (613) 547-6246

SPONSORING AGENCY: Canadian National Railways; Canadian Pacific

RESPONSIBLE INDIVIDUAL: English, GW Tel (613) 547-5777

STATUS: Completed NOTICE DATE: Feb. 1978 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$26,000

ACKNOWLEDGMENT: CIGGT

23 058440

## DEVELOP AN AGGREGATE MODEL OF URBANIZED AREA TRAVEL BEHAVIOR

The object of this research is to develop a travel demand model capable of predicting the consequences of alternative transportation actions including investment, operating and pricing changes in the urbanized areas.

### REFERENCES:

Travel Prediction with Models of Individual Choice Behavior Koppelman, FS, CTS Rept. #75-7, 322 pp, Sept. 1975

Criteria and Issues in the Evaluation of Models for Aggregate Prediction, Koppelman, FS; Roberts, PO, CTS Rept. #75-9, 16 pp, Sept. 1975

Alternate Aggregate Procedures Koppelman, FS, CTS Rept. #75-10, 58 pp, Sept. 1975

Disaggregate Three-Mode Choice Model for Aggregate Forecast Testing, Koppelman, FS; Watanatada, T, CTS Rept. #75-11, 23 pp, Sept. 1975

Develop Alternative Aggregate Models for Testing Purposes & Select Procedure for Use with Trans, Koppelman, FS, CTS Rept. #75-12, 38 pp, Sept. 1975

Trans Model Requirements Watanatada, T; Roberts, PO; Ben-Akiva, ME, CTS Rept. #75-13, 30 pp, Sept. 1975

Evaluation of Disaggregate Data Sets for Use in Phase II Koppelman, FS; Ben-Akiva, ME, CTS Rept. #75-14, 11 pp, Sept. 1975

PERFORMING AGENCY: Massachusetts Institute of Technology, Center for Transportation Studies, 82487

INVESTIGATOR: Roberts, PO Tel (617) 253-7123

SPONSORING AGENCY: Office of Policy, Plans and International Affairs

RESPONSIBLE INDIVIDUAL:

Contract DOT-OS-50001 (CR)

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Feb. 1975 TOTAL FUNDS: \$140,319

ACKNOWLEDGMENT: TRAIS, Massachusetts Institute of Technology

23 058544

## DEVELOPMENT OF A DISAGGREGATE BEHAVIORAL DEMAND MODEL

Special emphasis will be placed on variables which are likely to result in variations in the demand for urban transportation services either in total or among modes, and which are likely to be affected by the response to impending issues, such as air quality strategies, energy shortage, urban congestion or land use policy. Subcases under these broad categories shall include such considerations as auto control strategies (i.e. parking changes, road tolls), variations in fuel costs (including taxations and/or price increases), and improvements in public transportation development. Extension of the model to include carpooling will receive special attention.

PERFORMING AGENCY: Charles River Associates, Incorporated

SPONSORING AGENCY: Office of Policy, Plans and International Affairs

Contract DOT-OS-50161 (CPFF)

STATUS: Active NOTICE DATE: Oct. 1975 START DATE: June 1975 COMPLETION DATE: June 1977 TOTAL FUNDS: \$78,586

ACKNOWLEDGMENT: TRAIS (OS-40202)

23 058757

## METHODOLOGY FOR THE DESIGN OF URBAN TRANSPORTATION INTERFACE FACILITIES

The purpose of this research is to: 1. develop a set of flexible criteria for the evaluation of alternative station designs, with emphasis on potential implementation constraints and operational efficiency, 2. develop a standard methodology for the design of the layout of urban transportation terminals, 3. apply the methodology developed to a real world situation as a test of the procedures developed, 4. disseminate this methodology to the transit user community for application. STATUS: During the first phase of the research, emphasis was placed on developing a general station design evaluation framework. Functional components of stations, including pedestrian movement facilities, line haul access areas, and communications facilities were identified. A set of generalized terminal evaluation criteria were adopted, and for each criterion, the viewpoint of the user, the special user, and the operator was examined. These criteria include: 1) Passenger Processing Performance; 2) Environmental Conditions; 3) Fiscal Considerations. The level of satisfaction of these criteria is evaluated through the use of an interest impact matrix. Both a cost-benefit (dollar) and subjective index are used in the ranking of design alternatives. A generalized framework for the use of the impact-interest assessment matrix has been advanced, several computer based planning and design methodologies were examined and included in the

framework, and a user's guide has been completed.

### REFERENCES:

Criteria for Evaluating Alternative Transit Station Design Hoel, LA; Demetsky, MJ; Virkler, MR, Feb. 1976

Methodology for the Design of Urban Transportation Interface Facilities, Hoel, LA; Demetsky, MJ; Virkler, MR, Dec. 1976

Design of Transportation Interface Facilities: A Procedural Guide, Demetsky, MJ; Hoel, LA; Virkler, MR, July 1977

PERFORMING AGENCY: Virginia University, Department of Civil Engineering

INVESTIGATOR: Hoel, LA Demetsky, MJ

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Paulhus, NG, Jr Tel 202-4264208

Contract DOT-OS-50233 (CS)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Aug. 1975 COMPLETION DATE: May 1978 TOTAL FUNDS: \$126,000

ACKNOWLEDGMENT: TRAIS, OST

23 058815

## CONTINUED SUPPORT BY THE BART IMPACT ADVISORY COMMITTEE

The BART Impact Program review effort to be conducted by the Advisory Committee is an extension of the provision of advice and assistance to the Departments during the implementation phase of the program. The Committee shall review and provide consultation in all areas of the program to determine what impacts occur, which are attributable to BART, why they occur, and how this information may best be used by the Bay Area as well as by other metropolitan areas contemplating construction of a rapid transit system.

PERFORMING AGENCY: National Academy of Engineering

SPONSORING AGENCY: Office of the Secretary of Transportation; Department of Housing and Urban Development

RESPONSIBLE INDIVIDUAL: Dye, I

Contract DOT-OS-60092

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Oct. 1973 TOTAL FUNDS: \$154,190

ACKNOWLEDGMENT: TRAIS

23 059225

## UMTA TRANSIT STATION SIMULATION (USS) MODEL DEMONSTRATION AND DOCUMENTATION FILM AND CASE STUDY

The USS transit station simulation model is a mathematical model designed to evaluate alternative transit station designs with respect to pedestrian flow and processing requirements, and thus ultimately arrive at the most cost-effective design. The objective of the documentation film is to introduce potential users in the planning community to the capabilities and basic principles of operation of the USS model. The objective of the slide-cassette case study is to provide a practical example of the application of the USS model.

### REFERENCES:

Simulation Analysis of the Washington Metro Center Station Joline, ES, Aviation Simulations International, Mar. 1977

USS Transit Station Simulation. A Review of Actual and Potential Problem Areas and Program Improvement Effort, Joline, ES, Aviation Simulations International, Apr. 1977

PERFORMING AGENCY: Aviation Simulation International

INVESTIGATOR: Joline, ES Tel (516) 271-6476 Carnwell, B

SPONSORING AGENCY: Transportation Systems Center, R6701; Urban Mass Transportation Administration

RESPONSIBLE INDIVIDUAL: Schiff, SW Tel (617) 494-2552

Contract DOT-TSC-1210 (fP)

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: May 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$63,606

ACKNOWLEDGMENT: TRAIS (R6701)

23 059246

## URBAN TRANSIT PLAN EVALUATION

The objective is to compile and condense the materials and results of the transportation planning process in a city pertinent to an UMTA review of

transportation system implementation plans. Further, UMTA is interested in determining the response of communities to the Transportation Improvements Programs (TIP) guidelines.

PERFORMING AGENCY: Peat, Marwick, Mitchell and Company  
SPONSORING AGENCY: Transportation Systems Center, R6708  
RESPONSIBLE INDIVIDUAL: Rubin, D Tel (617) 494-2160

Contract TSC-1253

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1976 COMPLETION DATE: Mar. 1978 TOTAL FUNDS: \$21,628

ACKNOWLEDGMENT: TRAIS (R6708)

23 059919

#### STUDY OF LOGIT ANALYSIS OF RAPID TRANSIT ACCESS CHOICES

The project will provide an Analysis of Rapid Transit Access Choices by the undertaking of six tasks: 1) Choose Test Sites considering origin-destination data base, representation of rail and bus rapid transit; 2) organize and finalize a data base by processing files for study sites, 3) utilize the task 2 data base to aid in the derivation of disaggregate behavioral models of rapid transit access mode choice behavior; 4) analyze task 3 models as an attempt to explain variations in model parameters; 5) evaluate the application of the logit models in rapid transit modeling and planning by considering issues other than transferability; 6) document the study as a comprehensive analysis of the rapid transit access planning manual as originally planned.

PERFORMING AGENCY: Virginia University

INVESTIGATOR: Hoel, LA

SPONSORING AGENCY: Urban Mass Transportation Administration, VA-11-0005

RESPONSIBLE INDIVIDUAL: Levinsohn, D Tel (202) 426-9271

Grant VA-11-0005

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Jan. 1976 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$98,976

ACKNOWLEDGMENT: TRAIS (VA-11-0005)

23 059921

#### CORRIDOR PLANNING ANALYSIS

The focus of the research is on modeling trip distributions and modal split patterns within major urban corridors. The models will be designed for three types of applications: 1) as inputs in the early stages of planning for major capital improvements; 2) evaluation of low capital cost alternatives and; 3) providing market information.

PERFORMING AGENCY: Illinois University, Chicago

INVESTIGATOR: Sen, A

SPONSORING AGENCY: Urban Mass Transportation Administration, IL-11-0008/2

RESPONSIBLE INDIVIDUAL: Paules, G Tel (202)426-9171

Grant IL-11-0008/2

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$54,997

ACKNOWLEDGMENT: TRAIS (IL-11-0008/2)

23 099391

#### IMPROVED PASSENGER SERVICE PROGRAM

Provide near and long-term technology to permit maximum effective use of the rail passenger systems. Provide technological data and advice to the Secretary of Transportation for use in his responsibility in connection with Amtrak. Provide support to Amtrak in developing new rail passenger equipment. Provide direct R&D support to Northeast Corridor Project. Formal coordination with Amtrak is being developed. Components on which R&D efforts are directed: Suspension support and guidance; signal, control and communications; braking/adhesion; energy management; propulsion; creature comforts; improved passenger train.

PERFORMING AGENCY: Federal Railroad Administration, Office of Passenger Systems Research and Development

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Mitchell, MB Tel 202-426-0966

STATUS: Active NOTICE DATE: Aug. 1975 START DATE: 1966

ACKNOWLEDGMENT: FRA

23 136343

#### TECHNOLOGY ASSESSMENT OF INTERCITY TRANSPORTATION SYSTEMS

The objectives of this RTOP are to enhance NASA's contribution to our nation's ability to provide adequately for its future transportation needs, including model systems and their energy requirements; and to determine the possible impacts on the timeframe and goals of aviation and air transportation R&T of the more promising future intercity transportation systems and corresponding urban structures. The approach will be based on extending the NASA/DOT joint agency Technology Assessment of Intercity Transportation Systems into Phase 2 activities. Phase 2 shall include the selection of initiation of follow-on studies of critical issues, constraints, barriers (identified in the Phase 1 technology assessment) which require further definition toward future objectives of the NASA aeronautics program. The follow-on activities emanating from Phase 1 which are of mutual interest to both NASA and DOT will be jointly funded by the two agencies, and those tasks of sole interest to each agency will be independently funded.

PERFORMING AGENCY: Ames Research Center, Aeronautics and Space Technology Office, NASA

INVESTIGATOR: Hornby, H

SPONSORING AGENCY: Ames Research Center, Aeronautics and Space Technology Office, NASA, 791-40 7670169

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1975

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZH 40922 2)

23 141169

#### RESEARCH INITIATION-CHOICE THEORY MODEL OF URBAN TRANSPORTATION SYSTEMS

This research project will develop choice theory models of urban residential location decisions. These models will explicitly incorporate the simultaneity inherent in location, housing, automobile ownership and mode to work choices, and therefore reflect the most important impacts of alternative transportation engineering designs. Variables used in the models will include measures of the transportation level of service to work, neighborhood characteristics, housing attributes, auto ownership attributes, the accessibility of alternative locations to non-work opportunities, etc. Both the models will use the data from the 1968 Washington, D.C. home interview survey, supplemented with 1970 U.S. census data. Validation tests will be performed on the final models and the effect of a range of alternative transportation system designs will be evaluated.

PERFORMING AGENCY: Massachusetts Institute of Technology, Department of Civil Engineering

INVESTIGATOR: Lerman, SR

SPONSORING AGENCY: National Science Foundation, Division of Engineering, ENG76-09431

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Mar. 1976 COMPLETION DATE: Aug. 1977 TOTAL FUNDS: \$20,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSE 5765)

23 148806

#### NORTHWEST INDIANA CORRIDOR STUDY

With Chicago South Shore and South Bend Railroad having filed to abandon passenger service between Chicago and South Bend, Indiana, the state has requested recommendations for transportation services to meet residents' needs. If continued rail service is recommended, the state will take steps to aid local governments in financing the operation. Alternatives of express bus service, reduced CSS&SB service, continuation of present level of CSS&SB service and even expanded rail service are to be examined. Aside from financial cost and benefits, social benefits involving energy, pollution, congestion and recreation will be evaluated.

Co-sponsors of this project are Northwestern Indiana Regional Planning Commission and the Michigan Area Council of Governments.

PERFORMING AGENCY: Indiana University, Bloomington, Institute for Urban Transport

SPONSORING AGENCY: Northwest Indiana Public Transportation Authority

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1976 COMPLETION DATE: 1977 TOTAL FUNDS: \$65,000

ACKNOWLEDGMENT: Indiana University, Bloomington

23 156666

## IMPROVEMENT OF NORTHEAST CORRIDOR RAIL PASSENGER SERVICE

A study of the state and federal roles in improving rail passenger service in the Northeast Corridor with particular emphasis upon the "Empire State Corridor" from New York City to Buffalo.

### REFERENCES:

The Crisis in Rail Passenger Service in New York State: A Matter of Concern, New York State Select Senate Committee on Transportation, 1974

PERFORMING AGENCY: New York State Legislature, Select Senate Committee on Transportation

INVESTIGATOR: Mitchell, M Tel (518) 472-3333 Zimmerman, JF

SPONSORING AGENCY: New York State Legislature, Select Senate Committee on Transportation

RESPONSIBLE INDIVIDUAL: Mitchell, M Tel (518) 472-3333 Zimmerman, JF

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1974

ACKNOWLEDGMENT: New York State Legislature

23 156668

## LIGHT RAIL TECHNOLOGY

A study of the possible use of Light Rail in Nassau County: A Demonstration Project.

PERFORMING AGENCY: New York State Legislature, Senate Committee on Transportation

INVESTIGATOR: Mitchell, M Tel (518) 472-3333 Zimmerman, JF

SPONSORING AGENCY: New York State Legislature, Senate Committee on Transportation

RESPONSIBLE INDIVIDUAL: Mitchell, M Tel (518) 472-3333 Zimmerman, JF

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1977

ACKNOWLEDGMENT: New York State Legislature

23 157604

## INTERCITY RAIL PASSENGER ENERGY EFFICIENCY

The objective of this study was to develop intercity rail demand models to forecast changes in rail ridership in the NYC-Buffalo Corridor. After a literature search and data collection a two-stage modeling process was selected. Total city-pair traffic by purpose is forecast using simple gravity formulations. The Rail Share is then estimated using binary logit competition models in which rail competes differentially with air, auto and bus modes. Rail service and terminal quality variables, are included, as well as time, cost and frequency. Pivot point analysis is used to increase the accuracy of the forecasts.

### REFERENCES:

Intercity Passenger Demand Models: State-of-the-Art Hartgen, DT; Cohen, GS, New York State Department of Transportation, Preliminary Research Rpt 112

New York State Intercity Travel Data Erlbaum, NS, New York Department of Transportation, Preliminary Research Rpt 113, 1975

Intercity Rail Patronage in the NYC-Buffalo Corridor Models and Forecasts, Cohen, GS; Erlbaum, NS; Hartgen, DT, New York State Department of Transportation, Preliminary Research Rpt 115

PERFORMING AGENCY: New York State Department of Transportation, Planning Research Unit, 23.F

INVESTIGATOR: Hartgen, DT Tel (518) 457-6920 Erlbaum, NS Cohen, GS

SPONSORING AGENCY: New York State Department of Transportation, Planning Division; Department of Transportation

RESPONSIBLE INDIVIDUAL: Hartgen, DT Tel (518) 457-6920

Contract P00731802 UC

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: Oct. 1976 TOTAL FUNDS: \$22,000

ACKNOWLEDGMENT: New York State Department of Transportation

23 159652

## NORTHEAST CORRIDOR TRANSPORTATION REPORTS

Under Section 703(1)(E) of the Railroad Revitalization and Regulatory Reform Act in 1976 the following studies are required: (1) Financial and operating results of the intercity rail passenger service established under the Northeast Corridor Project; (2) Cost-Benefit analysis of improving various

modes to meet future Northeast Corridor intercity passengers transportation needs; (3) Engineering, financial and market demand feasibility of establishing rail trip times of 2-1/2 hours between Washington and New York and 3 hours between New York and Boston.

PERFORMING AGENCY: Federal Railroad Administration

SPONSORING AGENCY: Federal Railroad Administration, Office of Policy and Program Development

RESPONSIBLE INDIVIDUAL: Ditmeyer, SR

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1976 COMPLETION DATE: Feb. 1978

23 164809

## TRANSIT INFRASTRUCTURE PROJECT

The objective of this project is to ensure that the most effective infrastructure can be produced for new transit facilities in Ontario. The infrastructure consists of the fixed facilities which support the vehicles, some of the more obvious elements being guideway structures, (at grade, elevated or underground) track, stations, and power distribution systems. The proposal is for a long-term general project, divided into 3 phases. Phase 1 consists of a state-of-the-art study and report, a report on relevant TDS experience, preparation of a design rationale, identification of R & D activities for Phase 2, along with continuing support for the LRT program. Phase 3 will be preparation of design manuals and codes. /RTAC/

PERFORMING AGENCY: Ontario Ministry of Transportation & Communication

INVESTIGATOR: Billing, JR Grouni, HN

SPONSORING AGENCY: Ontario Ministry of Transportation & Communication, Transit Systems Research and Development

STATUS: Active NOTICE DATE: Mar. 1977 COMPLETION DATE: Dec. 1977

ACKNOWLEDGMENT: Roads and Transportation Association of Canada

23 170597

## RAIL PASSENGER SERVICE AND MARKETING COMMUNICATION

The general research objective is to provide the overall design for evaluating alternative methods for communicating the features of the VIA services to specific market segments. A sample of 400-600 interviews is contemplated. Existing knowledge from other transportation studies will be consolidated, and a preliminary model of the communications process will be formulated based on these findings and those from related studies. Interviews will be held with designated individuals such as CN managers, advertising agency personnel, and government officials. A principal objective of these interviews will be to define the rationale for past communications programs, and to explore the range of possible alternatives. The overall design of a set of market tests for the Kingston area will be specified. These will be suitable for measuring the promise of selected appeals to selected market segments, using selected communications media. This research is intended to facilitate VIA management's subsequent evaluation of alternative communications strategies for rail services, by providing the designs of alternative tests for the Kingston market. The implementation of one or more of the tests may be the topic of future research.

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 4.43.77

INVESTIGATOR: Turner, RE Tel (613) 547-2735 Arnold, SJ

SPONSORING AGENCY: VIA Rail Canada Limited

RESPONSIBLE INDIVIDUAL: Campbell, G

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Oct. 1977 COMPLETION DATE: May 1978 TOTAL FUNDS: \$34,125

ACKNOWLEDGMENT: CIGGT



24 059297

**ANALYSIS OF RAIL TRANSPORTATION**

Tasks include (1) analyze the effects of socio-economic forces on rail transportation; and (2) analyze the effects of Federal actions on rail transportation with respect to financial assistance, economic and labor regulation (excluding labor safety regulation) of rail and the competing modes of air, highway, pipeline and water transportation; and Federal tax policy.

PERFORMING AGENCY: Barber (Richard J) Associates, Incorporated  
SPONSORING AGENCY: Office of Policy, Plans and International Affairs  
RESPONSIBLE INDIVIDUAL: Murphy, TR Tel (202) 426-4303

Contract DOT-OS-60505 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1976 COMPLETION DATE: Jan. 1978 TOTAL FUNDS: \$59,750

ACKNOWLEDGMENT: TRAIS

24 099383

**RAIL INDUSTRY PROBLEMS PROGRAM**

This program presently involves seven phases: (1) Cost Analysis of roadway maintenance, of operation and maintenance of cars and motive power, of yard operation, of communication and of various phases of traffic handling and operations; (2) Commodity Service involving perishable goods, Iowa Rail Plan analysis, coal transport efficiency, wheat gathering analysis; (3) Carrier Financial Analysis including modification of financial forecasting model, data base retrieval and standardization, return-on-investment analysis, government subsidy study, and studies of cost of capital and of financing; (4) Improved Use of Assets involving experiments with work rules agreements, worker training, strike impact analysis economic analysis of rail labor factors, and improvement in employee communications; (5) Waybill Analysis involving process of waybills to build data base, automation of commodity management, and evaluation of sampling and analytical techniques; (6) Railroad Network Model to include building of national network model with geographical backup and expansion of network information base; (7) Nationwide Rail Passenger Data Collection System.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Systems Analysis and Program Development

SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Boone, JW Tel 202-426-9682

STATUS: Active NOTICE DATE: Aug. 1977

ACKNOWLEDGMENT: FRA

24 129733

**EMPLOYEE-MANAGER COMMUNICATIONS IMPROVEMENT**

Improve the communication between employees and management. Sponsor conferences which bring both parties together to discuss selected items such as alcoholism, safety, uniform rule books, etc. through a survey of methods adopted in other industries and by employee questionnaires, prepare documentation on practical methods, etc., railroad industry can adopt to improve communications between employees and management.

**REFERENCES:**

Proceedings 1975--Conf on the Detection, Prevention and Rehab of the Problem Drinking Employee in the RR Industry, Cornell University, Jan. 1976, PB-248906

Conf. Proc. Employee Assistance Programs - An Alternative to Tragedy; Carson Inn Proj. ie Milwaukee Proj, Lab/Mgt Wrkshp, Proceedings 76, 1976

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Economics and Policy Development

RESPONSIBLE INDIVIDUAL: Collins, DM Tel (202) 472-7280

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Apr. 1975

ACKNOWLEDGMENT: FRA

24 148339

**MILWAUKEE PROJECT-LOCAL LEVEL LABOR-MANAGEMENT WORKSHOP**

To develop and promote more open and effective Labor- Management communications, primarily at the local level. Intensive professional discussions are held in relation to job accountabilities and responsibilities, factors of railroad productivity, and the future of the industry. Professionally conducted group interaction sessions will give the participants the human relations tools needed to actively pursue constructive Labor-Management relations in their respective territories.

PERFORMING AGENCY: Chicago, Milwaukee, St. Paul and Pacific Railroad

INVESTIGATOR: Gardner, B

SPONSORING AGENCY: Federal Railroad Administration, Office of Rail Economics and Policy Development

RESPONSIBLE INDIVIDUAL: Collins, DM Tel (202) 472-7280

Contract DOT-FR-T5192

STATUS: Active NOTICE DATE: Jan. 1978 START DATE: Oct. 1976 COMPLETION DATE: Feb. 1978 TOTAL FUNDS: \$22,000

ACKNOWLEDGMENT: FRA

24 148805

**COST-BENEFIT ANALYSIS OF RAILROAD CONSOLIDATION IN CORRIDORS OF EXCESS CAPACITY**

The first phase of this study addressed the question of the nationwide scope (outside of the Northeastern Region) of redundant mainline railroad facilities. A total of 55 mainline corridors are identified as appearing to have redundant mainlines. The second phase of this study involves the development of procedures for determining the effects of railroad consolidation on the full range of interests, including railroad companies, railroad industry, railroad capital requirements, railroad labor, rail users, local communities, and energy consumption, and the application of these cost-benefit procedures to two actual corridors which were identified as having potential for mainline consolidation. The documentation of the procedures and of the case study applications are intended to serve as a guide for evaluating actual consolidation proposals.

**REFERENCES:**

Railroad Mainline Corridors with Operational Consolidation Potential Outside the Northeast, CONSAD Research Corporation, Sept. 1976

PERFORMING AGENCY: CONSAD Research Corporation

INVESTIGATOR: Roszner, E Tel (412) 363-5500 Hillegas, BD Matz-  
zie, DE

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Harman, J Tel (202) 426-4214

Contract DOT-OS-60154

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Apr. 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$50,415

ACKNOWLEDGMENT: CONSAD Research Corporation

24 152647

**THE ASSESSMENT OF TECHNOLOGICAL CHANGE IN REGULATED INDUSTRIES**

The objective of this research project is to develop analytic methods for assessing the impact of regulation on technological change. The approach will be to estimate the impact of regulation on productivity through its impact on technological change by controlling for all major factors other than regulations that influence productivity. The research will compare the performance of selected U.S. and Canadian railroads to estimate the efficiency losses due to regulation in the U.S. The approach will be founded on the use of the Canadian railroads' record. By controlling for those factors other than regulation that affect productivity levels and rate of change, the differences in the Canadian and U.S. records can be attributed to differences in regulation. This research will employ several different methods for examining the impact of regulation on productivity in regulated industry. First, an index number approach will be used looking at aggregate time series data. Second, several econometric modeling techniques will be used, employing cross-section analysis of U.S. and Canadian railroads, time-series analysis of both nations' railroads and time series cross-section analysis to estimate the technological progress of the rail industry in the U.S. and in Canada.

PERFORMING AGENCY: Data Resources Incorporated

INVESTIGATOR: Christensen, LR

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR76-23556

STATUS: Active NOTICE DATE: Jan. 1977 START DATE: Sept. 1976 COMPLETION DATE: Feb. 1978 TOTAL FUNDS: \$137,900

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1697)

24 156651

## DEVELOPMENT OF A FREIGHT ROUTE COMPETITIVE TO CONRAIL

An investigation of the establishment of a private rail system that would be competitive with CONRAIL in the Northeast in general and New York State in particular. This is a continuing study involving the Delaware and Hudson Railway.

### REFERENCES:

Challenge and Decision for New York State: The Northeast Rail Crisis, New York State Senate Committee on Transportation, Jan. 1974

Abandoned Railroad Rights-of-Way New York State Senate Committee on Transportation, Mar. 1976

PERFORMING AGENCY: New York State Legislature, Senate Committee on Transportation

INVESTIGATOR: Mitchell, M Tel (518) 472-3333 Zimmerman, JF

SPONSORING AGENCY: New York State Legislature, Senate Committee on Transportation

RESPONSIBLE INDIVIDUAL: Mitchell, M Tel (518) 472-3333 Zimmerman, JF

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1974

ACKNOWLEDGMENT: New York State Legislature

24 157599

## POST-1990 PLANNING ISSUES FOR THE NORTHEAST CORRIDOR PROJECT

To identify and prioritize planning issues which should be studied over the next four years to determine needs for future improvements to the Northeast Corridor Rail Passenger Service.

PERFORMING AGENCY: Transportation Research Board, Study Comm on Post-1990 Planning Issues for Northeast Corr

INVESTIGATOR: Hoel, LA

SPONSORING AGENCY: Federal Railroad Administration

RESPONSIBLE INDIVIDUAL: Ward, EJ Transportation Research Board Tel (202)389-6337

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: June 1977 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$50,000

24 157600

## MARKET STUDY FOR RAILCARS 1978 AND TO 1985

Determine the number of cars to be produced in the U.S., Mexico and Canada in the year 1978 and with projections to 1985. A similar 1976 study will be the basis, but further definition will include market shares per carbuilder, specific car types and purchasers. Surveys will be the main source of this data. Industry and government data will be reconciled.

PERFORMING AGENCY: Planning and Forecasting Consultants

INVESTIGATOR: Steffes, DW Tel (713)467-4732

STATUS: Active NOTICE DATE: July 1977 START DATE: Aug. 1977 COMPLETION DATE: Dec. 1977

24 159629

## FREIGHT CAR UTILIZATION RESEARCH PROGRAM-PHASE II, TASK 5. RAILROAD FREIGHT CAR DISTRIBUTION

Evaluate the current effectiveness of railroad level car distribution systems. Investigate policies currently used by railroads in inventorying cars to surplus and deficit terminals. Develop an empty car supply forecasting procedure. Design, recommend, and test an improved railroad level car distribution system.

PERFORMING AGENCY: Association of American Railroads

SPONSORING AGENCY: Federal Railroad Administration; Association of American Railroads

RESPONSIBLE INDIVIDUAL: Shamberger, RC Tel (202) 426-2608 Wooden, DG Tel (202)293-5018

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: July 1977 COMPLETION DATE: July 1979 TOTAL FUNDS: \$265,000

ACKNOWLEDGMENT: AAR

24 159645

## EASTERN CANADA RAIL LINE CAPACITY. PHASE I

The first objective is to produce several 'capacity' measures for the major rail links and compare these with existing traffic densities. This may be used along with traffic forecasts to identify the more critical links. The second

objective is to outline the factors which should be considered in a detailed study of any critical links. Most of the measures used will be based on an analytical model of a single track railway developed by E.R. Petersen, Queen's University, and modified by G.W. English, CIGGT.

### REFERENCES:

Eastern Canada Railway Line Capacity (Confidential) English, GW; Schwier, C, CIGGT, No. 77-16, Nov. 1977

PERFORMING AGENCY: Canadian Institute of Guided Ground Transport, 8.31.77

INVESTIGATOR: English, GW Tel (613)547-5777 Schwier, C

SPONSORING AGENCY: Department of Transport, Canada

RESPONSIBLE INDIVIDUAL: English, GW Tel (613)547-5777

Contract B1027

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: Apr. 1977 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$16,700

ACKNOWLEDGMENT: Queen's University, Canada

24 159650

## AMERICAN RAILWAY SYSTEM STUDY

Under Section 901 of the Railroad Revitalization and Regulatory Reform Act of 1976 the following are required: (1) Survey and analysis of the physical and financial condition of the railroad industry; (2) Estimates of potential railroad rehabilitation cost savings that could result from limiting such rehabilitation to essential portions of the rail system; (3) Assessment of benefits of public ownership of rail fixed facilities; (4) Assessment of the effects of alternative rail corporate structures on the rail system; (5) Prioritized listing of rail properties which should be improved to permit high-speed rail passenger or freight service; (6) Cost-benefit evaluation of electrifying high-density rail lines; (7) Identification of rail economies that could result from improving local and terminal operations.

PERFORMING AGENCY: Federal Railroad Administration, Office of Rail Economics and Operations

INVESTIGATOR: Boone, JW Tel (202)426-9682

SPONSORING AGENCY: Federal Railroad Administration

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Aug. 1977 COMPLETION DATE: Jan. 1978

24 170611

## MANAGEMENT DESIGN FOR URBAN TRANSPORTATION

The two year study determined that key aspects of organizational structure can be determined by statistical analysis, including relation of size and technology to number of authority levels, scope of executive responsibility related to hierarchical position, and the overall number of organizations related to organizational size and technology. Positions related to the socio-economic environment, such as labor and regulation show no direct statistical relation to size and technology, but executives in these functions have equal hierarchical status with production-related executives.

PERFORMING AGENCY: California University, Berkeley

INVESTIGATOR: Crossman, ER Wirth, I Carlson, A

SPONSORING AGENCY: Department of Transportation, Office of University Research

RESPONSIBLE INDIVIDUAL: Nupp, B Tel (202) 426-4447

Contract DOT-LS-40079

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: 1975 COMPLETION DATE: 1977

ACKNOWLEDGMENT: OST

24 170612

## ANALYTICAL PROCEDURES FOR THE STUDY OF A MULTIMODAL TRANSPORTATION CORRIDOR FROM BRUNSWICK, GEORGIA TO KANSAS CITY, MISSOURI

The research will formulate workable procedures for the analysis of transportation needs in a corridor from Brunswick, Ga. to Kansas City, Mo. defined as an area roughly 100 miles wide along the corridor. The project consists in several tasks as follows: identify legislative constraints on development, develop initial transportation guidelines, develop techniques for identifying economic development opportunities, develop measures for comparing alternatives mixes of transportation services, formulate analytical models, and develop a data library.

PERFORMING AGENCY: Georgia Institute of Technology, DOT-OS-60512

INVESTIGATOR: Jones, PS Sharp, G

SPONSORING AGENCY: Office of the Secretary of Transportation  
RESPONSIBLE INDIVIDUAL: Nupp, B Tel (202) 426-4447

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Aug. 1976 COMPLETION DATE: Jan. 1979

ACKNOWLEDGMENT: OST

#### 24 170619

##### ST. LOUIS RAILROAD GATEWAY TERMINAL RESTRUCTURING PROJECT--PHASE I

Phase I has been limited to the development and preliminary examination of a physical restructuring plan with order-of-magnitude costs. Phase II will be a comprehensive study to refine the restructuring plan and resolve the various railroad institutional issues such as ownership, finance, and labor as well as the community and environmental impact issues. Phase II will also include comprehensive cost/benefit analysis of the restructuring plan. Upon successful completion of Phase II, including resolution of the various institutional issues, Phase III will include final design engineering, construction/rehabilitation of facilities, and implementation of restructured operations. Phase I has been carried out with an innovative organizational structure. To assure adequate railroad input, FRA provided funds for a contractor to work in a technical support role to the Technical Advisory Committee (TAC) composed of representatives of all 17 railroads operating in the St. Louis Terminal. The TAC has developed the restructuring plan--not the contractor. The TAC's selected plan is a physical concept which is operationally feasible and acceptable in principle to the railroads. The TAC's restructuring plan developed in Phase I affects existing yards in the following manner: Expansion of the ALS Gateway Yard, construction of a "New Yard" in the National City area, modification of the TRRA Madison Yard, and construction of a common TOFC/COFC yard. Gateway and "New Yard" would become common classification facilities. Madison would become an industry support yard. Through consolidation the scale of operations at up to eight other yards could be reduced and up to fourteen other yards could be eliminated. In addition to these yard facilities, the TAC's restructuring plan would provide for 40 track miles of new mainline construction, 68 miles of mainline corridor upgrading, and 78 miles of mainline corridor CTC installation. These facilities would increase the classification capability of the St. Louis gateway sufficient to handle forecasted 1990 car volumes as well as improve through routes and reduce delays. Rehabilitation and expansion of the Carrie Avenue area yards for west side industry support and structural improvement of railroad bridge facilities are options to be considered in Phase II. The approximate capital cost to restructure the gateway is estimated to be \$330 million which, when

escalated to reflect projected construction through 1987, will approximate \$560 million. The estimate of annual railroad operating cost savings is approximately \$560 million in 1977 dollars and car volumes. This does not include savings in car per diem costs or changes in common yard charges. These capital and operating cost estimates will be refined in Phase II.

PERFORMING AGENCY: CONSAD Research Corporation  
INVESTIGATOR: Lewis, DC Tel (412) 363-5500 Hillegas, BD Miller, SM

SPONSORING AGENCY: Federal Railroad Administration  
RESPONSIBLE INDIVIDUAL: Crisafulli, RJ Tel (202) 426-4950

Contract DOT-FR-65181

STATUS: Completed NOTICE DATE: Feb. 1978 START DATE: July 1976 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$298,985

ACKNOWLEDGMENT: FRA

#### 24 170626

##### NORTHEAST CORRIDOR RAIL SERVICE IN NEW YORK STATE

An investigation of action needed to improve Northeast Corridor Rail Service in New York State, including improvements to the East River and other Tunnels, road bed improvements, and a possible link connecting Grand Central Station and Pennsylvania Station in New York City.

PERFORMING AGENCY: New York State Senate Committee on Transportation

INVESTIGATOR: Mitchell, M Tel (518) 472-3333 Zimmerman, JF

SPONSORING AGENCY: New York State Senate Committee on Transportation

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: May 1977

ACKNOWLEDGMENT: New York State Senate Committee on Transportation

#### 24 170627

##### VALUATION OF RAILROAD RIGHTS OF WAY

The study involves valuation of railroad rights of way, specifically properties transferred to Conrail under the Regional Rail Reorganization Act of 1973. Results will be used to support the government's case in the special court which is hearing challenges brought by the trustees of Penn Central and other bankrupt railroads in the Northeast.

PERFORMING AGENCY: Beasley and Beasley, Incorporated

SPONSORING AGENCY: United States Railway Association

STATUS: Active NOTICE DATE: Feb. 1978 TOTAL FUNDS: \$130,275

ACKNOWLEDGMENT: United States Railway Association

25 058351

**ANALYSIS OF A STATE-WIDE INTEGRATED TRANSPORTATION SYSTEM**

Tasks include: 1) Analysis of current status and changing character of transportation modes in Mississippi. 2) Analysis of population characteristics and availability of population to transportation modes. 3) Examine the relationship between the transportation system and views of users and nonusers. 4) Analyze the flow of commodities within and through the state. 5) Analyze present transportation planning processes and develop procedures for implementing new planning processes.

PERFORMING AGENCY: University of Southern Mississippi; Mississippi Research and Development Center; Jackson State University; Mississippi State University; Mississippi University

INVESTIGATOR: Peterson, JR Mississippi Research and Development Center Benjamin, R Jackson State University Smith, R Jackson State University DeLeeuw, SL Mississippi University Hearn, H Mississippi University McArthur, RE Mississippi University Crosslin, RL Mississippi State University Rush, JW Mississippi State University Peden, GT, Jr Mississippi State University Gladden, JW, Jr University of Southern Mississippi McKee, JO University of Southern Mississippi Meador, WT, Jr University of Southern Mississippi

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: MacRae, NK Tel (202) 426-9561

Contract DOT-OS-40089

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Jan. 1974 COMPLETION DATE: Feb. 1977 TOTAL FUNDS: \$195,000

ACKNOWLEDGMENT: TRAIS, Mississippi University

25 058490

**TRANSPORTATION ENERGY CONSUMPTION AND URBAN FORM RELATIONSHIP**

Specific objectives are: a. Develop an analytical tool capable of assessing the relationship between urban land form and energy consumed to satisfy travel requirements. b. Establish the validity of the analytical tool. c. Utilizing the analytical tool, examine the relationship between urban land form and energy consumption for a number of abstracted existing land use patterns as well as a number of proposed or hypothetical land use patterns. d. Identify the policy options that may be realistically implemented to affect land use and the transportation system. e. Explore the impacts of implementing the different policy options and identify their effect on energy consumption.

PERFORMING AGENCY: Northwestern University, Evanston

INVESTIGATOR: Schofer, JL

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Doo, H Tel (202) 426-4168

Contract DOT-OS-50118 (CS)

STATUS: Active NOTICE DATE: Mar. 1977 START DATE: June 1975 COMPLETION DATE: Feb. 1978 TOTAL FUNDS: \$89,800

ACKNOWLEDGMENT: TRAIS (PUR-50032), OST

25 058753

**SCENARIOS FOR ALTERNATIVE ROLES OF THE FEDERAL GOVERNMENT IN TRANSPORTATION**

The research shall evaluate the economic effects of existing and prospective Federal policies governing intercity and international freight and passenger transportation enterprises in the economy of the United States. All modes of transportation shall be encompassed intermodal coordinative institutions, and Federal policies affecting domestic intercity transportation in all phases. Economic evaluation shall include the study of efficient resource allocation and distributional effects of alternative policies together with consideration of both partial and general equilibrium effects. The research shall be interdisciplinary in scope, drawing upon engineering, economic, statistics, law, and administration.

**REFERENCES:**

An Integrated Policy Model for the Surface Freight Transportation Industries, Friedlaender, AF, Center for Transportation Studies, MIT, Report No. 76-12, Sept. 1976

Econometric Estimation of Cost Functions in the Transportation Industries, Spady, R; Friedlaender, AF, Center for Transportation Studies, MIT, Report No. 76-12, Sept. 1976

Information Needs and Performance Measures Center for Transportation Studies, MIT, deNeufville, R; King, C, Report 76-15, Sept. 1976

The Rationale & Scope of Federal Transportation Policy Friedlaender, AF; Simpson, RW; Frankel, EG; deNeufville; Sloss, Center for Transportation Studies, MIT, Report No. 77-4, Mar. 1977

Hedonic Costs and Economics of Scale in the Regulated Trucking Industry, Friedlaender, AF, Center for Transportation Studies, MIT, Report No. 77-5, Jan. 1977

PERFORMING AGENCY: Massachusetts Institute of Technology, Center for Transportation Studies

INVESTIGATOR: Friedlaender, AF

SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation

RESPONSIBLE INDIVIDUAL: Nupp, B Tel (202) 426-4447

Contract OS-50239 (FFP)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1975 COMPLETION DATE: Oct. 1977 TOTAL FUNDS: \$400,000

ACKNOWLEDGMENT: TRAIS

25 059165

**REVIEW OF 1990 PLAN DATA**

The contractor shall perform the following tasks; (1) assemble, review and compare the 1990 Plan data as updated with the 1974 NTS reported data and shall conduct statistical and other analyses, as appropriate, to identify and record differences in physical state, performance and cost within States and urban areas and in the aggregate, (2) conduct analyses to determine shifts in modal emphasis; and (3) conduct analyses to determine shifts in expenditure patterns.

PERFORMING AGENCY: Peat, Marwick, Mitchell and Company

SPONSORING AGENCY: Office of Policy, Plans and International Affairs

RESPONSIBLE INDIVIDUAL: Barbato, PJ

Contract DOT-OS-60182 (CPFF)

STATUS: Active NOTICE DATE: Mar. 1977 START DATE: May 1976 COMPLETION DATE: Nov. 1976 TOTAL FUNDS: \$32,274

ACKNOWLEDGMENT: TRAIS

25 059192

**MATHEMATICAL TECHNIQUES FOR APPLICATION TO TRANSPORTATION PLANNING**

The objective is the development of a methodology for transportation planning which captures the richness of a social system interactions with any proposed change in the transportation system. The methodology to be developed is to utilize the mathematics of non-linear interaction behavior, bifurcation theory and the physical concepts of cooperative-competitive interaction phenomena.

PERFORMING AGENCY: Universite Libre de Bruxelles

SPONSORING AGENCY: Transportation Systems Center

RESPONSIBLE INDIVIDUAL: Kahn, D Tel (614)494-2000

Contract DOT-TSC-1184 (FFP)

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: May 1976 COMPLETION DATE: May 1977 TOTAL FUNDS: \$40,000

ACKNOWLEDGMENT: TRAIS

25 059207

**PROCEDURES FOR INSTITUTING SEPARATE ROUTES FOR DISTINCT RAIL SERVICE**

Determine the elements that constitute basic railroad transportation service, identify theoretical and specific terms of those services which should be included under the rubric of distinct services. This will require identification of the characteristics which make some services distinct and analysis of whether provision of those services results in incremental costs to the railroads. Formulate guidelines to be incorporated into the Commissions rules. Describe the regulatory and institutional barriers to initiation of such pricing procedures.

PERFORMING AGENCY: Gellman Research Associates, Incorporated

INVESTIGATOR:

SPONSORING AGENCY: Office of Policy, Plans and International Affairs

RESPONSIBLE INDIVIDUAL: Bohan, FJ Tel 202-4264860

Contract DOT-OS-606167 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Mar. 1976 TOTAL FUNDS: \$41,502

ACKNOWLEDGMENT: TRAIS

25 059249

**NETWORK AGGREGATION IN TRANSPORTATION PLANNING MODELS**

The objectives are: (1) to initiate a coherent framework for conducting research on network aggregation methods applicable to models used in transportation planning and policy analysis; (2) to provide a preliminary test of the feasibility of using formal network aggregation rules in realistic transportation studies; (3) to continue investigation of promising lines of network aggregation research initiated in 1975; and (4) to accelerate the evolution of research results toward products deliverable to transportation analysts.

PERFORMING AGENCY: Mathematica, Incorporated

SPONSORING AGENCY: Transportation Systems Center, R6511

RESPONSIBLE INDIVIDUAL: Roberts, EJ Tel (617) 494-2000

Contract TSC-1232 (CPF)

STATUS: Completed NOTICE DATE: Jan. 1977 START DATE: June 1976 COMPLETION DATE: June 1977 TOTAL FUNDS: \$99,420

ACKNOWLEDGMENT: TRAIS (R6511)

25 099365

**VALUE CAPTURE POLICY**

This research explores legal, financial and community design issues resulting from the introduction of mass transit station facilities in a community. Collectively termed "Value Capture", these efforts are becoming increasingly important in the evaluation of transit projects. First year efforts developed major concepts and defined and analyzed the critical issues in the three concern areas using Houston, Texas as an example city. Year two took Value Capture and applied it to proposed transit improvements in Los Angeles, Louisville, Kentucky and Chicago. Problems and opportunities for the application of Value Capture techniques by one or more types of public administrative agencies were identified. This included an examination and comparison of significant legal barriers, economic issues, investment opportunities, sources and restrictions on funds, and potential community impacts related to hypothetical examples of transit stop related development. The research teams worked closely with the municipalities involved and the Urban Mass Transit Administration. STATUS: Results from the first year of research detailing the legal, financial and community implications of Value Capture have been published and widely distributed. Second year research has focused on three cities: Los Angeles, Louisville, and Chicago. In each case, prospects for applying Value Capture to proposed mass transit development have been thoroughly evaluated. It was found that there is significant potential for the beneficial application of Value Capture, although the most appropriate techniques for applying it are not the same in each city. In application situations in this work, potential fiscal returns were found to be widely varying depending upon the community under examination, Value Capture techniques used, and the legal basis for their application. In all, it may be summarized that Value Capture's potential success is closely related to the success of the mass transit system itself. Good transit planning will definitely support the success of Value Capture but not insure it.

**REFERENCES:**

Value Capture Policy. 4 Vols. Introduction, Legal Element Financial Element, and Community Enhancement, DOT Publication, DOT-TST-75-85, Nov. 1974

Value Capture and Joint Development Applications Dec. 1975

How to Make Mass Transit Pay its own Fare Design and Environment Magazine, Apr. 1975

Value Capture Policy Planning Mag, Am Soc of Planning Officials, Apr. 1976

Joint Land Use and Transportation Development-Application of the Value Capture Concept, Transportation Research Board, NAS, Jan. 1975

Planning, Financing and Implementing Joint Development A National Transit Symposium, Miami, FLa., Jan. 1975

PERFORMING AGENCY: Rice University, School of Architecture

INVESTIGATOR: Sharpe, CP

SPONSORING AGENCY: Office of the Secretary of Transportation

RESPONSIBLE INDIVIDUAL: Nupp, B

Contract DOT-OS-40007

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Dec. 1976 TOTAL FUNDS: \$175,000

ACKNOWLEDGMENT: DOT

25 128851

**TEXAS RAIL SYSTEM EVALUATION**

The major purpose of this study is to evaluate the Rail System Serving Texas and identify the operating and institutional constraints under which it functions. The study will evaluate the railroads serving Texas and recommend policies and actions which are necessary for the continued financial validity of these private carriers. In addition, the study will investigate the feasibility of increasing rail passenger service within Texas. Primary areas of investigation include transportation user's perception of rail service in Texas, Financial status of carriers in Texas, economic regulation review, rail system descriptions, rail labor, rail safety, grade crossings, state-local taxation of rail properties, energy pollution characteristics review.

**REFERENCES:**

History of Rail Passenger Service in Texas 1820-1970

The Technology of Rail Passenger Service

Amtrak: Its Texas Operations

An Evaluation of Intercity Travel in Major Texan Corridors

Financial Overview of Railroad Companies Operating in Texas

Railroad Employment Analysis

A Survey of Transportation User's Attitudes and Perceptions of Rail Service in Texas

PERFORMING AGENCY: Texas Transportation Institute, Texas A&amp;M University

INVESTIGATOR: Richards, HA Tel (713)845-1717 Sammon, IP

SPONSORING AGENCY: Texas State Government

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: Sept. 1975 COMPLETION DATE: Sept. 1977 TOTAL FUNDS: \$200,000

ACKNOWLEDGMENT: Texas Transportation Institute

25 128852

**PRODUCTIVITY IN TRANSPORTATION AND PIECEMEAL DEREGULATION OF THE INDUSTRY**

The position taken in this proposal is that technological and other changes have significantly altered the competitive situation in transportation. These changes raise the possibility of increasing productivity in transportation by returning to market forces at least partial responsibility for determining prices and outputs. Our specific area of interest is the exempt agricultural commodities. The research will provide useful results on the effects of extending these regulatory exemptions to railroads, including effects on energy consumption, car utilization, and other aspects of productivity. The research will examine the implications of deregulation on the future functioning of railroad rate bureaus and investigate the effects of user charges and subsidies on intermodal competition. A major benefit of the research will be a usable methodology for examining partial deregulation questions. The methodology will consist of a quantitative model of intermodal freight competition and a "users manual". The users' manual will consist of a series of model applications, representing the range of alternative regulatory instruments from direct regulation to subsidies and taxes. We will also publish the methodology and the results as articles in both professional and trade journals. Testimony will be presented to the appropriate committees of Congress.

PERFORMING AGENCY: Northwestern University, Evanston, Transportation Center, Leverone Hall

INVESTIGATOR: Moses, LN

SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: 1975 COMPLETION DATE: Dec. 1977 TOTAL FUNDS: \$110,000

ACKNOWLEDGMENT: Northwestern University, Evanston, Smithsonian Science Information Exchange (GSQ 1407)

25 129738

**URBAN CONSORTIUM FOR TECHNOLOGY INITIATIVES-TRANSPORTATION NEEDS ANALYSIS AND INFORMATION PACKAGE DEVELOPMENT**

Based on previous needs assessment work the Consortium will conduct an analysis of the transportation-related needs, attempting to determine those for which technological solutions have been developed and need only to be applied, and those for which research is necessary. Project specifications and technical information packages will then be assembled, based on these analyses. Manuals on bus priority systems and transportation for the handicapped and elderly are being developed. Needs data are also being revised and updated.

## REFERENCES:

Asphalt Improvements Oct. 1976  
 Institutional Framework for Integrated Transportation Planning, Oct. 1976  
 Integration of Paratransit with Conventional Transit Services, Oct. 1976  
 New Standard Bus Equipment Oct. 1976  
 Traffic Signalization Systems Oct. 1976  
 Transit Systems Productivity Mar. 1977  
 Transportation for Elderly and Handicapped Persons Oct. 1978  
 Transportation Planning and Impact Forecasting Tools Oct. 1976

PERFORMING AGENCY: Public Technology, Incorporated  
 INVESTIGATOR: Burke, AC Tel (202)452-7789  
 SPONSORING AGENCY: Office of Systems Development and Technology, Department of Transportation; Federal Highway Administration; Urban Mass Transportation Administration  
 RESPONSIBLE INDIVIDUAL: Linhares, AB Tel 202-426-4208

Contract DOT-OS-60076

STATUS: Active NOTICE DATE: Aug. 1977 START DATE: Jan. 1976 COMPLETION DATE: June 1978 TOTAL FUNDS: \$735,000

ACKNOWLEDGMENT: DOT

## 25 135744

**DEVELOPMENT OF AN IMPROVED TRANSPORTATION AND LAND USE MODEL PACKAGE**

This project will improve the existing Integrated Transportation and Land Use Model Package (ITLUP) developed previously by a team headed by the present principal investigator. Several existing models will be incorporated into ITLUP, including a basic employment model, a nonbasic employment model based on the Harris model, and a residential model disaggregated by income class based on the DRAM model, a derivative of IPLUM developed by the principal investigator under a previous grant. Several other existing models will be evaluated for possible integration, including modal split models, multipath assignment procedures, and air pollution emission and diffusion models. In addition, an attempt will be made to develop an operational housing characteristics model, and to incorporate simple models to investigate the energy consequences of different urban forms and transportation networks. Finally, the improved package will be used to test the impact of several policy options: Several low capital options in urban transportation will be tested such as gasoline taxes or quotas, parking taxes, parking space restrictions, and commuter taxes. The difference in the land use impacts of rail transit lines and busways will also be tested.

PERFORMING AGENCY: Pennsylvania University, Philadelphia, Department of City and Regional Planning  
 INVESTIGATOR: Putman, SH  
 SPONSORING AGENCY: National Science Foundation, Division of Advanced Product Research and Technology, APR73-07840 A02

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: June 1975 COMPLETION DATE: Nov. 1977 TOTAL FUNDS: \$193,900

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (GSQ 1344)

## 25 136065

**TECHNIQUES FOR EVALUATING OPTIONS IN STATEWIDE TRANSPORTATION PLANNING/PROGRAMMING**

To develop transportation planning methodologies that will be policy sensitive, allowing the testing and evaluation of options in a fashion that will produce timely results for decision-making. The research will focus on reasonable cost, sketch-planning type techniques having an application to issues of statewide transportation planning as part of the programming process. Phase I of the study will identify and classify major transportation issues, data and methodologies. Study design will be developed to test high priority methodologies. Phase II includes the development of the procedural manuals for application of techniques and the testing of techniques in states in the approved study design.

PERFORMING AGENCY: Voorhees (Alan M) and Associates, Incorporated; System Design Concepts, Incorporated  
 INVESTIGATOR: Bellomo, SJ Tel (703) 893-4310 Stowers, JR Tel (202) 393-5911  
 SPONSORING AGENCY: American Assn of State Hwy and Transp Officials; Federal Highway Administration  
 RESPONSIBLE INDIVIDUAL: Spicher, RE Tel (202) 389-6741

## NCHRP 8-18

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Sept. 1975 COMPLETION DATE: Feb. 1978 TOTAL FUNDS: \$300,000

ACKNOWLEDGMENT: Voorhees (Alan M) and Associates, Incorporated, National Cooperative Highway Research Program

## 25 136128

**DEPARTMENT OF COMMERCE REGIONAL TRANSPORTATION PLANNING**

Progress: Updated freight tariff functions to common base use by Bureau of Economic Analysis, DOC in interregional Economic Studies and I/O models. Relate and interface the impact of existing and proposed transport capabilities to the national economy. Objective: Update regional freight transportation impedances to a specified base year. Prepare national networks model for use in evaluating alternative policy and investments. Motivation: Determine the impact of freight transportation characteristics on regional economic flows. Will the rising cost of fuel likely result in a shift in shipment mode? If so, will subject mode(s) have sufficient capacity to carry additional demand? Approach: Examine existing data base and update as required. Examine coding of modes of major importance for correctness. Exercise modeling system to verify operation. Test specified alternative policy options.

PERFORMING AGENCY: National Bureau of Standards, Department of Commerce

INVESTIGATOR: Schofer, RE

SPONSORING AGENCY: National Bureau of Standards, Department of Commerce, 4314558

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1974 TOTAL FUNDS: \$60,000

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZBA 6325)

## 25 144359

**THE IMPACT OF REGULATION UPON TECHNICAL CHANGE IN THE RAILROAD INDUSTRY**

By examining the profitability of specific investments and innovations in Canada and the United States, the proposed research analyzes the role of the following factors upon technical change and innovation in the railroad industry: regulation, market structure, union work rules, competition, and the dispersion of economic activity. By choosing innovations in which all but one (or possibly two) of these factors are the same, and comparing the cost and demand structures associated with these innovations, it should be possible to isolate the impact of each of these factors upon technical change in the railroad industry. Innovations and investments that appear to meet these criteria include containerization, unit train, automatic coupling and braking systems, railroad operating and car management systems, centralized traffic control, automated humpyards, and investment in equipment and roadbed.

PERFORMING AGENCY: Massachusetts Institute of Technology, Center for Transportation Studies, 84329

INVESTIGATOR: Friedlaender, AF Tel (617) 253-3456

SPONSORING AGENCY: National Science Foundation, Office of Research & Development Assessment, Room P705, PRA76-17394

7617394-PRA

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Sept. 1976 COMPLETION DATE: Aug. 1978 TOTAL FUNDS: \$164,900

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (CD 351)

## 25 153574

**TRANSPORTATION SYSTEMS IN COLORADO: NEEDS ASSESSMENT AND ANALYSIS FOR COMPREHENSIVE STATE TRANSPORT**

To describe the components of the existing transportation sector in Colorado in a systematic framework. Identify goals for Colorado's transportation system and develop measures of performance on which to estimate the achievement of such goals. Identify areas of discrepancy between the existing system and the goals for the system. Develop a set of recommended actions to achieve congruence between the state goals and the transportation system.

PERFORMING AGENCY: Colorado State University, Fort Collins, Department of Economics, CSRS COL

INVESTIGATOR: Blood, D Wagner, W

SPONSORING AGENCY: Department of Agriculture, Cooperative State Re-

search Service, COLO0189

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: July 1976 COMPLETION DATE: June 1979

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070684)

#### 25 156620

##### **EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION, STORAGE AND DISTRIBUTION SYSTEMS**

This project will evaluate the economic effects of alternative federal, state and local government policies on shippers, carriers, receivers, and rural communities. The study will: develop an inventory of existing regulation in participating states and at the national level; Measure commodity flows into and out of case study areas in terms of commodity, origin, destination, mode, type of carriers, (regulated, exempt, and private) backhaul, service variables such as timeliness, reliability and damage incidence will be measured. Cost coefficients will be obtained and adapted to model carrier firms operating under simulated regulated and unregulated conditions as determined from survey findings. Comparison of costs and services under regulated vs. unregulated conditions will provide the basis for evaluating the merits of alternative regulatory policies. A model will be constructed which will describe rural transportation systems as they presently exist and as they would exist under alternative state and federal regulatory frameworks. The likely performance of the transportation systems will be estimated as a function of the inter-and intra-modal competitive environment.

PERFORMING AGENCY: Nebraska University, Lincoln, Department of Agricultural Economics, CSRS NEB

SPONSORING AGENCY: Department of Agriculture, NEB-10-071

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: Oct. 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070254)

#### 25 156676

##### **RAIL BRANCH LINE SUBSIDIES AND REHABILITATION**

A study of the need for rehabilitation of rail branch lines and methods of subsidizing service on lines operating in the red.

PERFORMING AGENCY: New York State Legislature, Select Senate Committee on Transportation

INVESTIGATOR: Mitchell, M Tel (578)472-3333 Zimmerman, JF

SPONSORING AGENCY: New York State Legislature, Select Senate Committee on Transportation

RESPONSIBLE INDIVIDUAL: Mitchell, M Tel (518)472-3333 Zimmerman, JF

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1973

ACKNOWLEDGMENT: New York State Legislature

#### 25 156707

##### **EVALUATION OF ALTERNATIVE RURAL FREIGHT TRANSPORTATION STORAGE AND DISTRIBUTION SYSTEMS**

The project will evaluate the economic effects of alternative federal, state, and local government policies on carriers, shippers, receivers, and rural communities. An inventory of existing transportation regulatory and policies will be developed. Commodity flows into and out of the state will be summarized from secondary sources. Data on origin, destination, mode, back haul, seasonality and rates will be based on surveys in case study areas. The relationship between service and the competitive structure of the transportation industry will be estimated through a survey of shippers and receivers. Service variables such as timeliness, reliability, and damage incidence will be measured. The likely performance of transportation systems will be estimated as a function of inter-and intra-modal competitive environment.

PERFORMING AGENCY: North Dakota State University, Department of Agricultural Economics, CSRS ND

INVESTIGATOR: Cobia, DW

SPONSORING AGENCY: Department of Agriculture, Cooperative State Research Service, ND01360

STATUS: Active NOTICE DATE: Apr. 1977 START DATE: July 1976 COMPLETION DATE: Sept. 1981

ACKNOWLEDGMENT: Current Research Information Service (CRIS-0070865)

#### 25 157601

##### **DEVELOPMENT OF A POLICY SENSITIVE MODEL FOR FORECASTING FREIGHT DEMAND**

To investigate and evaluate the application of disaggregate freight demand models in examining transportation policy alternatives. Using a mathematical model previously specified at Massachusetts Institute of Technology to investigate the adequacy of existing freight shipment data as the basis for model calibration. To calibrate and test such a model on alternative Federal intercity freight policy alternatives and the effects on modal shares, revenues, level of service and other factors.

##### REFERENCES:

Phase I Report (Draft). Development of a Policy Sensitive Model for Forecasting Freight Demand, Roberts, P; Terziev, M, July 1977

PERFORMING AGENCY: Massachusetts Institute of Technology, DOT-OS-70006

INVESTIGATOR: Roberts, PO Tel (617)253-1000

SPONSORING AGENCY: Department of Transportation, Office of Systems Analysis and Information

RESPONSIBLE INDIVIDUAL: Swerdloff, CN Office of the Secretary of Transportation Tel (202)426-4163

Contract DOT-OS-70006

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1977 COMPLETION DATE: July 1978 TOTAL FUNDS: \$290,000

ACKNOWLEDGMENT: OST

#### 25 159649

##### **RAILROAD RATEMAKING STUDY**

Under Section 202 (G) of the Railroad Revitalization and Regulatory Reform Act of 1976 the following studies are required: (1) Analysis of the effects of the regulatory reform provisions of the 4R Act on shippers and carriers in all modes; (2) Proposals for further regulatory reform.

PERFORMING AGENCY: Federal Railroad Administration

SPONSORING AGENCY: Federal Railroad Administration

STATUS: Active NOTICE DATE: Aug. 1977 COMPLETION DATE: Oct. 1977

#### 25 160045

##### **FEDERAL POLICY IMPLICATIONS (FPI) PROJECT**

The purpose of the Federal Policy Implications (FPI) Project is to respond to the interests of the Federal Government by bringing together the BART Impact Program (BIP) impact findings and their supporting data. BIP is a five-year study of the impacts of the BART system on travel conditions, economic activity, land use, public policies, and other aspects of life in the San Francisco Bay Area.

PERFORMING AGENCY: Voorhees (Alan M) and Associates, Incorporated

SPONSORING AGENCY: Office of Policy, Plans and International Affairs

RESPONSIBLE INDIVIDUAL: Grainger, GR Tel (202) 426-4168

Contract DOT-OS-70034 (CPFF)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Apr. 1977 TOTAL FUNDS: \$78,650

ACKNOWLEDGMENT: TRAIS

#### 25 160468

##### **PUBLIC POLICY PROJECT OF THE BART IMPACT PROGRAM**

Direct measures of public policy formulation and implementation in the local governmental process permit an understanding of the significance of BART's impact, and are the basis for study of the contributing behavioral responses within the community and the governmental sectors. The project's concern with perception and response to these changes and the broad implications for local policymaking addresses the crucial issue of how the lives of people are affected by those identified BART impacts.

PERFORMING AGENCY: Metropolitan Transportation Commission

SPONSORING AGENCY: Office of the Secretary of Transportation

Contract DOT-OS-30176/208 (CC)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Jan. 1977 COMPLETION DATE: May 1978 TOTAL FUNDS: \$115,000

ACKNOWLEDGMENT: TRAIS



26 058329

**RAILROAD RESEARCH INFORMATION SERVICE (RRIS)**

Aquisition, selection, storage, retrieval and dissemination of research information that is generated by and/or that is useful to administrators, researchers, and other specialists in the railroad and related fields of transportation research. To provide a central point for industry, academia, government and others to disseminate technical information to the interested railroad related community-at-large or research results as well as on-going research efforts in the interest of obtaining technology utilization in an efficient manner. To provide a service to the research community in maintaining a current awareness of technological and economic research findings and developments.

PERFORMING AGENCY: Transportation Research Board

INVESTIGATOR: Houser, FN Tel 202-389-6611

SPONSORING AGENCY: Federal Railroad Administration, Office of Research and Development

RESPONSIBLE INDIVIDUAL: Ahmed, N Tel 202-4260955

Contract DOT-FR-74193 (CC)

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: Apr. 1977 COMPLETION DATE: Feb. 1980 TOTAL FUNDS: \$525,000

ACKNOWLEDGMENT: FRA

26 099429

**RAILROAD TANK CAR SAFETY RESEARCH AND TEST PROJECT, PHASE 4-LITERATURE REVIEW**

Background experience and literature in the various technical areas of interest under the Project are continually under review. A reference library has been established and maintained under this Phase.

See also RRIS 12A 081788.

PERFORMING AGENCY: Association of American Railroads Technical Center

SPONSORING AGENCY: Association of American Railroads; Railway Progress Institute

RESPONSIBLE INDIVIDUAL: Phillips, EA Tel 312-5673607

STATUS: Active NOTICE DATE: Feb. 1978 START DATE: 1970

ACKNOWLEDGMENT: AAR

26 135521

**SCIENTIFIC AND TECHNICAL INFORMATION CENTER FOR SOIL MECHANICS**

Purpose of study/investigation: To establish and operate a Soil Mechanics Information Analysis Center. Approach or plan: Center will acquire, analyze, evaluate, and condense the world's literature in the area of soil mechanics. Information is screened, filtered, and reduced to meet user requirements for management and for bench scientists and engineers throughout the DOD. Services include specific items of evaluated data, current summaries of technical trends, comprehensive state-of-the-art analyses, and specialized advisory services.

PERFORMING AGENCY: Waterways Experiment Station

INVESTIGATOR: Cunny, RW

SPONSORING AGENCY: Army Corps of Engineers, Department of the Army

STATUS: Active NOTICE DATE: Feb. 1977 START DATE: July 1973

ACKNOWLEDGMENT: Smithsonian Science Information Exchange (ZTK 144 1)

# Source Index

This index serves not only as the reference for the publications and the corporate affiliations of authors of documents appearing in this *Bulletin* but also as the source for addresses of organizations that do not appear on page v. In general, if no address is listed after the name of an organization, the entry involves an author affiliation rather than a publication. Consequently, there are multiple listings for

many organizations, and all the document numbers should be checked. Some organizations have more than one office, and again there will be more than one listing of document numbers of possible interest. Each summary of ongoing research is indicated not only by the *A* in the document number but also by the use of italics for the entire number.

## A

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10 167136

**ABT ASSOCIATES, INCORPORATED** 55 Wheeler Street; Cambridge, Massachusetts, 02138

00A 058470, 15 167108

**ACEC REVUE** Ateliers de Constructions Electriques de Charleroi; BP4; 6000 Charleroi, Belgium

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**ACUSTICA** Birkenwaldstrasse 44, Postfach 347; 7000 Stuttgart 1, West Germany

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21A 138372, 22A 083506, 22A 083511, 22A 099637, 22A 099638, 22A 099639, 22A 138400

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03A 148336, 21A 138372

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**AIT-REVUE** Asociacion de Investigacion del Transporte; Madrid, Spain

04 170084

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01 168003

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20 166691

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- APPLIED MATHEMATICS AND OPTIMIZATION** Springer Verlag; Heidelberg Platz 3; 1000 Berlin 33, West Germany  
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02163

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California, 94720

24A 170611

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California, 92664

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Laboratory, P.O. Box 808; Livermore, California, 94550

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11 151199

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