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abstracts

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U.S. DEPARTMENT OF TRANSPORTATION
Urban Mass Transportation Administration
Office of Transportation Management
and Demonstrations
Washington , D.C. 20590





DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION
WASHINGTON, D.C. 20590

THE ADMINISTRATOR

I am happy to present you with the fourth volume of the URBAN MASS TRANSPORTATION ABSTRACTS, a document prepared by the U. S. Department of Transportation's Urban Mass Transportation Administration (UMTA).

This general reference document is intended to serve as an index of reports generated under contract to UMTA. The 313 reports abstracted can be obtained through the National Technical Information Service.

I hope that this document will guide you to those reports which suit your specific information needs for mass transit-related research.

If you have questions regarding this publication or the reports cited in it, please contact UMTA's Transit Research Information Center, 2100 Second Street, SW., Washington, D. C. 20590.

Richard S. Page
Richard S. Page

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16. Abstract <p>This volume is a reference document prepared by the Urban Mass Transportation Administration (UMTA) and serves as a guide to 313 reports generated under contract to UMTA. This document reflects UMTA's continuing commitment to the dissemination of technical report information to government, state, and local transportation planning bodies, private industry, and the general public.</p> <p>The types of documents abstracted in this volume are, by section: I) Research, Development, and Demonstration Project Reports; II) Technical Studies; and III) University Research and Training Reports. Section IV contains complete indexes to the volume by report title, personal author, corporate author, geographic location, and keywords.</p> <p>All reports in this document are available for sale at the National Technical Information Service (NTIS), Springfield, Virginia. Each abstract contains an NTIS order number and price for paper copy. Most documents are also available in microfiche. Volumes I, II, and III of the URBAN MASS TRANSPORTATION ABSTRACTS are also available at NTIS. The order number for Volume I (October 1972) is PB 213-212; the order number for Volume II (September 1973) is PB 225-368; and the order number for Volume III (July 1976) is PB 264-905.</p>					
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FOREWORD

This reference document was prepared by the Urban Mass Transportation Administration (UMTA) of the U. S. Department of Transportation as a guide to 313 reports generated under contract to UMTA. It is a reflection of UMTA's continuing commitment to the dissemination of technical report information to government, State and local transportation planning bodies, private industry, and the general public.

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National Technical Information Service (NTIS)
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Each abstract contains an NTIS order number and price for paper copy. Most documents are also available in microfiche for \$3.00 each. NTIS PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE. Therefore, it is advisable that you verify prices before ordering. All orders to NTIS must be prepaid and contain the report order number.

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Types of documents abstracted in this volume are, by section: I) Research, Development, and Demonstration project reports; II) Technical Studies; and III) University Research and Training reports. Section IV contains complete indexes to the volume by report title, personal author, corporate author, geographic location, and keywords.

For additional information about any of the reports in this volume, contact the Transit Research Information Center of the Urban Mass Transportation Administration, 2100 Second Street, S.W., Washington, D.C. 20590.

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TITLE: CITY OF ANCHORAGE
Demonstration Transportation Grant

AUTHOR: City of Anchorage

DATE: July 1974

PROJECT NO.: AK-06-0001

KEYWORDS:

1. Transportation Disadvantaged
 2. Elderly
 3. Handicapped
 4. Youth
 5. Surveys
-

The objective of this demonstration project was to develop a fixed-route transportation system in an area of limited mass transportation services - the City of Anchorage, Alaska. Groups served by this project included the elderly, handicapped, Indians, Native Eskimos, poor, unemployed, and the youth.

The project provided: 1) inner-city circulation which enabled transit users to travel between different areas of the city. Routes established provided residents with access to health, employment, business and social service facilities; 2) home-to-work and work-to-home services within the area served by the project.

A take-home survey was conducted to determine passenger attitudes, and trip origins and destinations. Other elements of the demonstration included: a monthly bus pass at a reduced fare, and a shuttle service from a fringe parking lot to the downtown core area.

The effectiveness of these operations was measured and evaluated. A preliminary financial report is also presented.

NTIS ORDER NO.: PB 245-160/AS

PRICE: \$5.25

TITLE: DEMAND RESPONSIVE TRANSPORTATION SYSTEM FOR THE EAST/NORTHEAST AND
WATTS MODEL CITIES NEIGHBORHOODS
Final Technical Report

AUTHOR: Wilbur Smith and Associates
(prepared for the Los Angeles City Demonstration Agency)

DATE: June 1974

PROJECT NO.: CA-06-0017

KEYWORDS:

1. Demand Responsive Systems
 2. Transportation Disadvantaged
 3. Elderly
 4. Subscription Services
 5. Youth
-

This final technical report documents the activities and operations of a Demand-Responsive Transportation Project in the East/Northeast and Greater Watts Model Neighborhoods of Los Angeles for the period of May 1, 1973 to April 30, 1974. Included are a chronology of events, a summary of operations, cost and performance data as well as an evaluation of the system performance.

This project was undertaken to determine if demand-responsive public transportation, utilizing subscription techniques, could be a successful and important service in supplementing existing fixed bus route operations within an inner city area. The study was to identify socio-economic, urban planning and transportation criteria, which, if successful, could be used in adopting similar dial-a-bus programs on a city or nation-wide basis. The following were the program priorities in terms of provision of service: 1) persons requiring access to health and related facilities within the service areas; 2) elderly persons requiring transportation within the area; 3) persons without autos to shopping facilities; 4) youth to facilities and services available under Model programs; and 5) other priorities defined on the basis of project experience.

NTIS ORDER NO.: PB 253-181/AS

PRICE: \$5.00

TITLE: ADVANCED MECHANICAL TRAINING PROGRAM Final Report
Air Conditioning Final Report Electrical Systems Final Report
Welding Final Report

AUTHOR: Southern California Rapid Transit District

DATE: September 1975

PROJECT NO.: CA-06-0065

KEYWORDS:

1. Maintenance, Personnel
2. Management, Training Techniques
3. Manpower and Personnel

The objective of the Advanced Mechanical Training Program (AMTP) was to demonstrate the value of blue-collar training received by mechanics in automotive welding techniques, coach electrical systems and coach air-conditioning. A related objective was to develop a series of tests which could be used to evaluate the success of the training program as well as identify other areas of mechanical knowledge in which the average mechanic could benefit from training. By improving the mechanic's skill, it was also felt that maintenance efficiency and productivity would increase, resulting in more reliable service to the public.

The AMTP was a joint effort of the Southern California Rapid Transit District's Personnel Department and Maintenance and Equipment Department. Administrative aspects of the program, including scheduling of classes, candidate selection, overall coordination and program evaluation, were the responsibility of the Personnel Department. The Maintenance and Equipment Department assumed technical responsibility for instructor selection, subject matter selection, selection of textbooks and training materials, etc.

The reports from the project contain descriptions of the objectives of the training, program development, results achieved, and conclusions. These reports are the Final Report (PB 256-781, \$9.25), Air Conditioning (PB 256-778, \$5.00), Electrical Systems (PB 256-779, \$5.50), and Welding (PB 256-780, \$5.00).

The order number for the set of PB 256-778 through PB 256-781 is PB 256-777-SET.

NTIS ORDER NO.: PB 256-777/AS

PRICE: \$13.50

TITLE: PERSONAL RAPID TRANSIT RESEARCH CONDUCTED
AT THE AEROSPACE CORPORATION

AUTHOR: The Aerospace Corporation
(C.L. Olson and H. Bernstein)

DATE: March 1976

PROJECT NO.: CA-06-0071

KEYWORDS:

1. Personal Rapid Transit
 2. Models and Modeling
 3. Testing Facilities
-

This report summarizes company-sponsored research which the Aerospace Corporation conducted on the conceptual and experimental development of Personal Rapid Transit (PRT) during the period from 1968 to 1975.

The work considered not only the technical and operational aspects of the PRT concept, but also included estimates of PRT capital and operating costs, analyses of system safety and reliability, analyses of urban applications and associated economics, evaluation of PRT energy utilization, development of PRT planning methodologies, and assessments of PRT deployment impacts.

Technology shortfalls associated with the possible future implementation of the specific PRT concept studied at Aerospace are identified, and R&D activities to overcome these shortfalls are recommended. Also described in this summary is an experimental 1/10 scale model PRT system developed at Aerospace which successfully demonstrated the feasibility of a particular integrated concept of longitudinal control, propulsion, braking, and switching.

NTIS ORDER NO.: PB 256-846/AS

PRICE: \$9.25

TITLE: FEASIBILITY STUDY OF THE EMPLOYMENT CENTER
BUS SERVICE CONCEPT

AUTHOR: The Aerospace Corporation
(Arthur Schnitt and Leon R. Bush)

DATE: August 1976

PROJECT NO.: CA-06-0084

KEYWORDS:

1. Subscription Services
 2. Bus, Commuter
 3. Carpools/Buspools
 4. Schedules and Scheduling
-

A new approach to commuter-oriented bus operations is studied. Advantage is taken of the spread in working hours in an employment center by having each bus make multiple trips during peak periods. Buses serve the first shift and then return with additional passengers to serve subsequent shifts. Groups of buses are assigned to make trips of various lengths. The service resembles subscription bus service; however, the increased productivity results in break-even fares which should attract a large segment of nontransit dependent travelers almost irrespective of commuting distance. The service could be operated even more efficiently as an area-wide system.

Procedures for developing and applying the service are provided, particularly using trip combinations of various lengths which can serve two to four staggered shifts. The service is also compared with paratransit modes and scheduled bus services and found to be generally superior from the standpoints of fare/cost, energy consumption, and emissions.

As a concluding test of feasibility, the service is applied to an actual employment center in El Segundo, California. Methods of data analysis, patronage forecasting, route development and scheduling are illustrated. A demonstration program is designed using the existing stagger in shifts in which fifteen routes are served by seven buses.

NTIS ORDER NO.: PB 259-941/AS

PRICE: \$6.75

TITLE: AUTOMATIC MIXED TRAFFIC VEHICLE CONTROL
AND SCHEDULING STUDY

AUTHOR: California Institute of Technology
Jet Propulsion Laboratory
(Ted K.C. Peng and Kilman Chon)

DATE: December 1976

PROJECT NO.: CA-06-0088

KEYWORDS:

1. Automated Guideway Transit
 2. Algorithms
 3. Guideways
 4. Research Activities
 5. Schedules and Scheduling
-

Automated Mixed Traffic Vehicle (AMTV) is a driverless vehicle which follows a fixed-route by means of a buried electrical guidewire and shares its guideway with pedestrians and/or other vehicles. Possible urban applications include transit services within public malls, large commercial/industrial/educational/and governmental facilities, business districts, and residential zones. Currently a low-speed (7 mph) AMTV is undergoing experimental operation at the Jet Propulsion Laboratory (JPL).

The intent in this study is to establish a basic understanding of the predicted behavior of an AMTV transit system and to identify desirable control and management strategies. The results of this study should help to form a basis on which system designs for specific urban applications can be readily developed in the future. The scope of this study includes an analysis of an AMTV system of multiple vehicles in low-speed operation along single-loop or multiple-loop guideways, as well as an initial effort to develop algorithms for vehicle scheduling, routing and guideway layout, and headway control. The study approach has been conducted on both the vehicle and system levels.

This report analyzes the operation and evaluates the expected performance of a proposed automatic guideway transit system which uses low-speed AMTVs. Vehicle scheduling and headway control policies are evaluated with a transit system simulation model. The effect of mixed-traffic interference on the average vehicle speed is examined with a vehicle-pedestrian interface model. Control parameters regulating vehicle speed are evaluated for safe stopping and passenger comfort.

The Appendices contain references and support materials. Areas are cited for follow-on studies.

NTIS ORDER NO.: PB 264-527/AS

PRICE: \$5.00

TITLE: LIFE CYCLE COST MODEL FOR COMPARING AGT AND
CONVENTIONAL TRANSIT ALTERNATIVES

AUTHOR: General Research Corporation
(C.A. Graver and J.F. Jenkins-Stark)

DATE: February 1976

PROJECT NO.: CA-06-0090

KEYWORDS:

1. Automated Guideway Transit
 2. Life Cycle Costing
 3. Models and Modeling
 4. Computer Applications
-

Some recent cost comparisons of conventional and Automated Guideway Transit (AGT) have directly used data from experimental AGT systems. These results are biased in that comparisons are made between an immature AGT system and mature forms of conventional transit. In effect, the analysis has not captured the long-term advantage of AGT, which results from the substitution of technology for labor.

In this report, an operational computer model is described which makes appropriate cost comparisons. It is a life-cycle cost model that time-phases costs, accounts for the time value of money, incorporates time-phased efficiency gains and provides for the impact of relative and general inflation.

The model has been tested with AIRTRANS data from the AIRTRANS Assessment Project. Results are illustrative only. Conclusions concerning AIRTRANS operation are not possible as the data used was preliminary and is already out of date with more recent data showing significant O&M cost reductions.

A number of conclusions concerning model sensitivity are drawn. Most unique was the impact of inflation on future investments. An economically inferior AGT system, if purchased in 1975, was economically superior if purchased in 1985. Thus, AGT systems should be evaluated not only as to where they are economically superior, but also when they will become superior.

NTIS ORDER NO.: PB 259-529/AS

PRICE: \$5.00

TITLE: TRANSPORTATION PROBLEMS OF THE TRANSPORTATION HANDICAPPED
Volume I: The Transportation Handicapped Population
Definition and Counts

AUTHOR: Crain and Associates (based on original work by ABT Associates, Inc.;
Peat, Marwick, Mitchell & Co.; and Grey Advertising, Inc.)

DATE: August 1976

PROJECT NO.: CA-06-0092

KEYWORDS:

1. Transportation Disadvantaged
2. Elderly
3. Handicapped
4. Socio-Economic Analyses
5. Demography
6. Modal Choice

Despite an abundance of planning and research literature concerning transportation services for elderly and handicapped individuals, at present no single operational definition of this target group, the transportation handicapped (TH), exists. This report provides a definition of a TH person and attempts to describe the TH population. A review of existing estimates of the urban TH population is presented based on an analysis of four studies. The estimates range from approximately six to nine million persons. A recommended estimation procedure considers three basic categories of the TH population: chronic conditions, acutely disabled, and institutionalized. Within these basic categories, data are provided for some of the nonmedical characteristics of the TH, such as age, income, employment status, and place of residence.

The travel behavior of the TH population is examined including trip purpose, frequency, residence (population density area), choice of mode, and latent demand. An analysis of specific conventional modes as sequences of functional requirements is presented, illustrated by modified flow charts that display the function sequence.

The other three volumes of this study are the following: Volume II: The Roles of Government and the Private Sector in the Provision of Mobility Systems for the Transportation Handicapped (PB 258-580); Volume III: Alternative Planning Methodologies (PB 258-581); and Volume IV: Transportation Solutions for the Handicapped (PB 258-582). The NTIS order number for the entire set of four volumes is PB 258-578-SET.

NTIS ORDER NO.: PB 258-579/AS

PRICE: \$5.50

TITLE: TRANSPORTATION PROBLEMS OF THE TRANSPORTATION HANDICAPPED
Volume II: The Roles of Government and the Private Sector in the
Provision of Mobility Systems for the Transportation Handicapped

AUTHOR: Crain and Associates (based on original work by ABT Associates, Inc.;
Peat, Marwick, Mitchell & Co.; and Grey Advertising, Inc.)

DATE: August 1976

PROJECT NO.: CA-06-0092

KEYWORDS:

1. Transportation Disadvantaged
 2. Elderly
 3. Handicapped
 4. Government, Federal
 5. Government, State
 6. Government, Local
-

This report examines the conflicting perspectives and attitudes of nine participants involved in improving mobility for the transportation handicapped (TH). These are the handicapped and their advocates who are committed to total accessibility on all transit systems, the transit industry which must reconcile the demands of the handicapped with the economic realities of transit operations, the Congress and Federal agencies, state and local governments, the public at large, private providers (taxis, paratransit services), and equipment manufacturers.

Issues which emerge from these conflicting perspectives are discussed, including: the need for coordination of services and funding sources for the handicapped; the role of the courts; provision of services by public or private means; and problems with labor standards, insurance, safety, and administration of services. Federal and state legislation and regulations dealing with transportation for the handicapped are discussed in detail. A section of the policy-making process examines the role of user groups and federal, state, and local governments in policy determination, administration, planning, implementation, operation, financing and evaluation. Finally, specific changes and actions needed in the roles of the relevant actors are presented.

The other three volumes of this study are the following: Volume I: The Transportation Handicapped Population, Definition and Counts (PB 258-579); Volume III: Alternative Planning Methodologies (PB 258-581); and Volume IV: Transportation Solutions for the Handicapped (PB 258-582). The NTIS order number for the entire set of four volumes is PB 258-579-SET.

NTIS ORDER NO.: PB 258-580/AS

PRICE: \$5.00

TITLE: TRANSPORTATION PROBLEMS OF THE TRANSPORTATION HANDICAPPED
Volume III: Alternative Planning Methodologies

AUTHOR: Crain and Associates (based on original work by ABT Associates, Inc.;
Peat, Marwick, Mitchell & Co.; and Grey Advertising, Inc.)

DATE: August 1976

PROJECT NO.: CA-06-0092

KEYWORDS:

1. Transportation Disadvantaged
 2. Planning, Tools
 3. Elderly
 4. Handicapped
 5. Surveys
-

This report proposes a general structure for the planning process for dealing with the problems of the transportation handicapped (TH). Flexibility of procedures and the avoidance of unnecessary standardization are emphasized. Planning for the needs of the TH may be incorporated into conventional transit planning or emerge as an independent process. Effective participation by the transportation handicapped and those who serve them (transit and taxi operators, union representatives, and local health and social service agencies) is discussed in detail.

Use of census data, the National Health Survey and general population surveys to assess the transportation needs of the TH population is presented. The necessity to establish a procedure for using certain information items before they are collected is emphasized. Procedures for the assessment of current resources and existing constraints that affect the options for serving the needs of the TH are reviewed. In addition to the transportation resources inventory, this section also covers jurisdictional problems, and labor issues that must be identified as part of the planning process. A section on development of the implementation plan outlines organizational structure, developing funding mechanisms and four consolidation scenarios. Time phasing, plan revision, and system monitoring are also discussed.

The other three volumes of this study are the following: Volume I: The Transportation Handicapped Population, Definition and Counts (PB 258-579); Volume II: The Roles of Government and the Private Sector in the Provision of Mobility Systems for the Transportation Handicapped (PB 258-580); and Volume IV: Transportation Solutions for the Handicapped (PB 258-582). The NTIS order number for the entire set of four volumes is PB 258-579-SET.

NTIS ORDER NO.: PB 258-581/AS

PRICE: \$4.50

TITLE: TRANSPORTATION PROBLEMS OF THE TRANSPORTATION HANDICAPPED
Volume IV: Transportation Solutions for the Handicapped

AUTHOR: Crain and Associates (based on original work by ABT Associates, Inc.;
Peat, Marwick, Mitchell & Co.; and Grey Advertising, Inc.)

DATE: August 1976

PROJECT NO.: CA-06-0092

KEYWORDS:

1. Transportation Disadvantaged
 2. Elderly
 3. Handicapped
 4. Transportation Systems Management
-

This report examines transportation solutions for the transportation handicapped (TH) through three broad strategies--public transit, alternative special services, and private transportation.

The first section present 51 physical and operational solutions for existing systems. To aid the TH it is necessary to construct groups of solutions. These are then presented as minimum, medium, and maximum accessibility combinations for terminals, urban bus or trolley, rail rapid transit, and intra-urban bus, railroad and air modes. The use of a personal vehicle for the disabled who can learn to drive is described in section two. Four problems with which the disabled driver must contend are presented along with summary data on automotive adaptive controls and their cost. The third section describes six aspects of specialized transportation services: service characteristics (door-to-ddor, personalized assistance, request time, etc.), the four principal vehicle types used, provider characteristics, eligibility restrictions, and operational issues and cost. Twelve possible systems based on different combinations of service characteristics and provider type are described in detail. Finally a detailed section is given of two comprehensive systems, both currently in operation--one in Sweden, the other in Delaware.

The other three volumes of this study are the following: Volume I: The Transportation Handicapped Population, Definition and Counts (PB 258-579); Volume II: The Roles of Government and the Private Sector in the Provision of Mobility Systems for the Transportation Handicapped (PB 258-580); and Volume III: Alternative Planning Methodologies (PB 258-581). The NTIS order number for the entire set of four volumes is PB 258-579-SET.

NTIS ORDER NO.: PB 258-582/AS

PRICE: \$6.75

TITLE: VALLEY TRANSIT DISTRICT: OPERATIONS, FARE SYSTEM
AND VEHICLE DESIGN

AUTHOR: RRC International, Inc.
(Prepared for Valley Transit District, Derby, CT)

DATE: September 1975

PROJECT NO.: CT-06-0003

KEYWORDS:

- | | |
|------------------------------|---|
| 1. Demand Responsive Systems | 5. Vehicle, Design |
| 2. Handicapped | 6. Management, Operations
and Techniques |
| 3. Bus, Intercity | |
| 4. Fare, Collection | |
-

The Valley Transit District (VTD) demonstration project is located in an area in southwestern Connecticut which consists of the four towns of Ansonia, Derby, Seymour, and Shelton. This report is an evaluation of the project from its inception in January 1973 until June 30, 1974.

Among the accomplishments of the VTD project are: incorporation of new features for the handicapped into the vehicles; demand bus operation over a 56 square mile area; investigation of dispatching for wide area demand systems; testing of attractiveness of small vehicles with luxury interior; provision of a unified transport system for regional health and social service agencies; establishment of a new transit district law in Connecticut; and a flexible multi-service operational system. Another feature is the demonstration of a computer-processed, credit card fare system called FAIRTRAN which has: deferred billing; precision for any complexity of fare structure; a cost-accountable, selective, user subsidy feature called FARESHARE; and comprehensive ride and demographic data collection capabilities.

Chapters specifically address: 1) system operations, which includes sections on marketing, energy, financial analysis, handicapped demand, dispatching system, and onboard survey; 2) the fare system; and 3) vehicle design.

NTIS ORDER NO.: PB 252-668/AS

PRICE: \$9.25

TITLE: THE AERODYNAMICS AND THERMODYNAMICS OF SUBWAY
DESIGN CONCEPTS

AUTHOR: Transit Development Corporation, Inc.
(prepared by Parsons, Brinckerhoff, Quade & Douglas, Inc.)

DATE: March 1974

PROJECT NO.: DC-06-0010

KEYWORDS:

- | | |
|---|--------------------------|
| 1. Underground Structures | 5. Computer Applications |
| 2. Environment and
Environmental Control | 6. Subways |
| 3. Aerodynamics | |
| 4. Thermodynamics | |
-

This report has been prepared as a part of the project, "Ventilation and Environmental Control in Subway Rapid Transit Systems," and is one of many such reports leading to the final product--"Subway Environmental Design Handbook."

The findings of Subway Environment Simulation (SES) computer program applications to a variety of hypothetical double-track subway rapid transit systems with bidirectional train operations are presented and discussed. The study encompasses the effects of subway geometrical features, such as ventilation shaft configuration and location, mechanical systems, such as fans and cooling equipment, and train operations. Results are presented in terms of both instantaneous and average subway air flows and temperatures.

NTIS ORDER NO.: PB 251-748/AS

PRICE: \$6.75

TITLE: COMPARISONS BETWEEN COMPUTER SIMULATIONS AND SCALE MODEL TESTS
OF SUBWAY TUNNEL AIR FLOW

AUTHOR: Transit Development Corporation, Inc.
(Prepared by Parsons, Brinckerhoff, Quade & Douglas, Inc.)

DATE: February 1974

PROJECT NO.: DC-06-0010

KEYWORDS: 1. Computer Applications
2. Models and Modeling
3. Tunnels and Tunneling
4. Environment and Environmental Control
5. Underground Structures
6. Subways
7. Aerodynamics

This report, prepared under the project "Ventilation and Environmental Control in Subway Rapid Transit Systems," is one of many reports leading to the final product--"Subway Environmental Design Handbook."

The purpose of this report is to describe the validation of the aerodynamic theory in the Subway Environment Simulation (SES) computer program, using data from the Subway Aerodynamic and Thermodynamic Test (SAT) scale-model facility. Direct comparisons of measured and theoretical vehicle aerodynamic drag and piston-action air flows are presented for both single train and bidirectional train operations, with and without tunnel venting.

Chapters discuss aerodynamic testing with scale models and aerodynamic SES validation; results are presented and conclusions reached. References are furnished.

Appendices are: Deviation of Corrected Distance, Velocity, and Acceleration Equations; Corrected Distance, Velocity, and Acceleration Computer Program Listing; and Computer Program Listing for Train Skin Friction Coefficients.

NTIS ORDER NO.: PB 244-567/AS

PRICE: \$4.50

TITLE: COMPARISONS OF COMPUTER MODEL PREDICTIONS AND FIELD MEASUREMENTS OF
SUBWAY ENVIRONMENT IN THE MONTREAL METRO

AUTHOR: Transit Development Corporation, Inc.
(Prepared by the Associated Engineers/A Joint Venture)

DATE: August 1975

PROJECT NO.: DC-06-0010

KEYWORDS: 1. Computer Applications
2. Models & Modeling
3. Underground Structures
4. Environment & Environmental Control
5. Subways

The purpose of the Montreal METRO full scale field validation tests was to directly validate the Subway Environment Simulation (SES) program for use as a design tool, and to validate by inference many of the related analytical techniques developed during the Subway Environmental Research Project. The Associated Engineers have established high standards for the analytical techniques developed as a part of the project, and a comparison of the SES program against these standards is provided in the body of this report.

Much of the discussion on the results obtained revolves around the causes of small discrepancies between the measurements and the SES predictions. Such meticulous checking of the SES is necessary in order to verify the mathematical modeling techniques and concepts used in the SES program, and to further develop and refine the SES mathematical models by identifying the sources of, and correcting, any discrepancies that arise between the measurements and the SES predictions. From a designer's standpoint, the magnitude of the discrepancies encountered and discussed in this report are for the most part virtually insignificant due to the fact that the discrepancies not caused by input related errors (e.g., a wrong vent shaft cross sectional area or train speed/time profile) are generally within the bounds of experimental uncertainty.

Within the limits of experimental precision, the SES has been shown to predict accurately the air flow, air temperature and humidity, train performance, fan performance, and vent shaft performance in an operating subway. In other words, the SES can be used as a design tool for predicting the environment within a given subway system with a high level of confidence.

Specific conclusions reached during the Montreal METRO full scale field validation tests are delineated. Chapters address near field aerodynamics, multijunction and tunnel flow aerodynamics, and system tests.

NTIS ORDER NO.: PB 249-119/AS

PRICE: \$7.75

TITLE: DEVELOPMENT AND TEST OF SIMPLIFIED METHODS TO PREDICT SUBWAY
AIR PRESSURE TRANSIENTS

AUTHOR: Transit Development Corporation, Inc.
(Prepared by DeLeuw, Cather & Company)

DATE: April 1974

PROJECT NO.: DC-06-0010

KEYWORDS: 1. Underground Structures 6. Models & Modeling
2. Tunnels & Tunneling 7. Subways
3. Environment & Environmental 8. Transit User Comfort
 Control
4. BART
5. Pressure & Pressure Measurement

This report, prepared under the project "Ventilation and Environmental Control in Subway Rapid Transit Systems," is one of many such reports leading to the final product-- "Subway Environmental Design Handbook."

It has been demonstrated that the piston action of trains causes an unsteady movement of air within a subway system which is further associated with changing air pressures in trains and at wayside. Under certain conditions, these pressure changes can be a source of passenger discomfort, and can be harmful to equipment and structures.

In order to minimize the discomfort of passengers, generation of pressure transients should be minimized. Therefore, attempts were made to concentrate on methods most likely to yield significant improvements by determining which factors influence the magnitude of the primary wave.

Air flow and pressure transient tests conducted at the BART Berkeley Hills Tunnel identified simplified methods whereby pressure transients onboard trains could be predicted reliably. Such simplified methods were thought to offer tools to subway design engineers, such that problems involving pressure transients could be detected early in the subway design process and alleviated without excessive analytical burden. Subsequently a plan was identified by which models could be developed and validated by full scale field tests.

This document reports on the development and testing of these design tools. The models introduced deal with pressure changes due to portal entry, post portal entry, vent passage, portal exit and passing trains. It was concluded by the authors that models were sufficient to identify pressure transient problem areas, as well as solutions in the early stages of subway system design.

NTIS ORDER NO.: PB 244-654/AS

PRICE: \$6.00

TITLE: DOUBLE TRACK POROSITY TESTING

AUTHOR: Transit Development Corporation, Inc.
(Prepared by Developmental Sciences, Inc., under subcontract
to the Associated Engineers/A Joint Venture)

DATE: November 1975

PROJECT NO.: DC-06-0010

KEYWORDS:

- | | |
|---------------------------|-----------------------|
| 1. Tracks and Trackage | 6. Thermodynamics |
| 2. Underground Structures | 7. Environment and |
| 3. Subways | Environmental Control |
| 4. Drag | |
| 5. Aerodynamics | |
-

This project was undertaken in order to provide the subway design engineer with a basic understanding of the effects of various design parameters on subway aerodynamics and thermodynamics (and hence on the subway environment). Such an understanding permits subway design with an eye toward efficient environmental control.

In this report, a test matrix designed to study the effects of center wall porosity (in a dual-track tunnel) on train drag and far-field air velocity was performed in the DSI SAT-DT (Developmental Sciences, Inc. Subway Aerodynamic and Thermodynamic Test Facility Double Track) facility. Tests were performed for three porosities: 0% (solid center wall), 15% porous, and 100% (no center wall). The first case duplicated precisely tests performed in a single-track rectangular tunnel (as was expected). The last case represented a double-width tunnel with a single (eccentric) train. The 15% porosity case, instead of falling somewhere between the two extremes, actually behaved essentially like an open (100% porosity) tunnel.

Additional testing in the SAT-DT facility was proposed (and conducted) in an attempt to discover the center wall porosity at which system performance nears that of a single tunnel (i.e., solid center wall). The purpose of this report is to describe the results of this additional testing, and to relate these results to those obtained during the original program.

NTIS ORDER NO.: PB 253-232/AS

PRICE: \$4.00

TITLE: SUBWAY ENVIRONMENTAL DESIGN HANDBOOK, VOLUME I
PRINCIPLES AND APPLICATIONS
Second Edition

AUTHOR: Transit Development Corporation, Inc.
(Prepared by Associated Engineers)

DATE: March 1976

PROJECT NO.: DC-06-0010

KEYWORDS:

- | | |
|---|----------------------------|
| 1. Underground Structures | 5. Guides and Guidance |
| 2. Rail | 6. Models and Modeling |
| 3. Environment and
Environmental Control | 7. Planning, Tools |
| 4. Subways | 8. Noise and Noise Control |
-

This Handbook is a guide and reference for the planning, design, construction and operation of environmental control systems for underground rapid transit. The Handbook follows the engineering sequence from criteria through load analysis, and from system conceptual design to selection of equipment. It covers a broad range of parameters, including temperature, humidity, air quality and rapid pressure change, and, to a limited extent, noise and vibration as related to environmental control equipment.

The content of the Handbook is divided into two volumes: Volume I (this volume), Principles and Applications, encompasses all of the above subject matter so that much of the environmental system design can be accomplished using the techniques, computations, and related graphic data contained herein; Volume II comprises both the User's and Programmer's Manuals for the Subway Environment Simulation (SES) computer program. As a design tool, this sophisticated program can be utilized readily by design engineers for detailed analysis of designs and for rapid evaluation of alternative environmental system concepts for extensive or complex configurations.

This Volume I report is also available through the Government Printing Office (Stock Number 050-014-00008-8, Price \$4.65).

Volume II, Part I: User's Manual (PB 254-789) and Part II: Programmer's Manual (PB 254-790), is available through the National Technical Information Service. To obtain all three reports, the order number is PB 254-787-SET.

NTIS ORDER NO.: PB 254-788/AS

PRICE: \$11.00

TITLE: SUBWAY ENVIRONMENTAL DESIGN HANDBOOK VOLUME II
SUBWAY ENVIRONMENT SIMULATION COMPUTER PROGRAM (SES)
Part I: User's Manual

AUTHOR: Transit Development Corporation, Inc.
(Parsons, Brinckerhoff, Quade & Douglas, Inc.)

DATE: October 1975

PROJECT NO.: DC-06-0010

KEYWORDS:

- | | |
|---|--------------------------------------|
| 1. Air Conditioning | 5. Planning, Tools |
| 2. Environment and
Environmental Control | 6. Rail, Systems and Planning Design |
| 3. Subways | 7. Underground Structures |
| 4. Models and Modeling | 8. Computer Applications |
| | 9. Guides and Guidance |
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This document forms part of the Subway Environmental Design Handbook. It contains the background information and instructions to enable an engineer to perform an analysis of a subway system by using the Subway Environment Simulation (SES) computer program. The SES program is a designer-oriented tool which provides estimates of the airflow, temperature, and humidity characteristics, as well as the air-conditioning requirements, for both operating and proposed multiple-track subway systems of any given design and operating characteristics. The SES program can be used to evaluate the impact on the subway environment of alternative subway system design parameters such as tunnel and station cross-sectional area and length, tunnel interconnections, location and size of ventilation shafts and passenger entrances, ventilation fans, train headway and operating speed, and other parameters. The SES program is a numerical simulation model which incorporates the results of theoretical research, scale-model tests and field tests, and has been verified through comparisons with measurements taken in operating subway systems.

Volume I of the Subway Environmental Design Handbook, "Principles and Applications," is available at the Government Printing Office, stock number 050-014-00008-8, \$4.65. Volume I is also available through NTIS (PB 254-788). Volume II, Part I: User's Manual and Part II: Programmer's Manual is available through NTIS. To obtain the set of three reports, the order number is PB 254-787-SET.

NTIS ORDER NO.: PB 254-789/AS

PRICE: \$50.75

TITLE: SUBWAY ENVIRONMENTAL DESIGN HANDBOOK VOLUME II
SUBWAY ENVIRONMENT SIMULATION COMPUTER PROGRAM (SES)
Part II: Programmer's Manual

AUTHOR: Transit Development Corporation, Inc.
(Associated Engineers, a Joint Venture of Parsons,
Brinckerhoff, Quade & Douglas, Inc.; DeLeuw, Cather & Company
and Kaiser Engineers)

DATE: October 1975 PROJECT NO.: DC-06-0010

KEYWORDS:

- | | |
|---|--------------------------------------|
| 1. Subways | 6. Computer Programming |
| 2. Environment and
Environmental Control | 7. Headways |
| 3. Models and Modeling | 8. Planning, Tools |
| 4. Air Conditioning | 9. Rail, Systems and Planning Design |
| 5. Computer Applications | 10. Underground Structures |
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This document forms part of the Subway Environmental Design Handbook. It contains the background information and instructions to enable an engineer to perform an analysis of a subway system by using the Subway Environment Simulation (SES) computer program. The SES program is a designer-oriented tool which provides estimates of the airflow, temperature, and humidity characteristics, as well as the air-conditioning requirements, for both operating and proposed multiple-track subway systems of any given design and operating characteristics. The SES program can be used to evaluate the impact on the subway environment of alternative subway system design parameters such as tunnel and station cross-sectional area and passenger entrances, ventilation fans, train headway and operating speed, and other parameters. The SES program is a numerical simulation model which incorporates the results of theoretical research, scale-model tests and field tests, and has been verified through comparisons with measurements taken in operating subway systems.

Volume I of the Subway Environmental Design Handbook, "Principles and Applications," is available at the Government Printing Office (Stock Number 050-014-00008-8, \$4.65). Volume I is also available through NTIS. Volume II, Part I: User's Manual and Part II: Programmer's Manual, is available through NTIS.

NTIS ORDER NO.: PB 254-790/AS

PRICE: \$37.25

TITLE: SUBWAY ENVIRONMENT SIMULATION (SES) HEAT CONDUCTION
MODEL VALIDATION

AUTHOR: Transit Development Corporation, Inc.
(Parsons, Brinckerhoff, Quade & Douglas, Inc.)

DATE: January 1974

PROJECT NO.: DC-06-0010

KEYWORDS:

1. Heating	6. Computer Applications
2. Underground Structures	7. Subways
3. Tunnels & Tunneling	8. Interfaces
4. Environment & Environmental Control	
5. Models & Modeling	

This report, prepared under the project "Ventilation and Environmental Control in Subway Rapid Transit Systems," is one of many such reports leading to the final product--"Subway Environmental Design Handbook."

The purpose of this particular report is to describe the validation of the heat conduction analytical model which comprises part of the Subway Environment Simulation (SES) computer program.

The conduction model is a closed-form transfer, cylindrical-coordinate frame solution which treats the case of unsteady heat transfer in two interfacing concentric materials.

The validation was accomplished through field tests conducted within the Toronto Transit Commission subway over several months. The field measurements, including temperature at the tunnel air-wall interface and temperature in the earth beyond the tunnel structure, were compared directly with analytical model predictions.

Besides describing the validation of the heat conduction model, the report includes a brief discussion of the mathematical groundwork and assumptions upon which the model is based, a description of the field testing and presentation of the resulting data, the procedure followed to reduce the data into appropriate input for the model and the results of the validation effort.

References are furnished.

NTIS ORDER NO.: PB 244-510/AS

PRICE: \$4.00

TITLE: UNDERPLATFORM EXHAUST TESTS IN THE TORONTO SUBWAY

AUTHOR: Transit Development Corporation
(Prepared by Associated Engineers/A Joint Venture)

DATE: December 1975 PROJECT NO.: DC-06-0010

KEYWORDS: 1. Underground Structures
2. Environment and Environmental Control
3. Subways
4. Heating
5. Stations and Terminals

This report has been prepared as a part of the project "Ventilation and Environmental Control in Subway Rapid Transit Systems."

The underplatform exhaust system is a subway environmental control feature designed to remove train generated heat within the confines of stations and thereby improve environmental conditions. To evaluate the performance of this system, a full-scale test facility was constructed in a station of the Toronto subway.

This report describes the facility design and the experimental program. A presentation of test results and interpretations is included, leading to the development of a quantitative design versus performance relationship for use by subway environmental engineers.

NTIS ORDER NO.: PB 251-728/AS

PRICE: \$7.75

TITLE: VENT AND STATION TEST (VST) FACILITY-
SPECIAL AND COMPLEX VENT SHAFT TESTING

AUTHOR: Transit Development Corporation, Inc.
Developmental Sciences, Inc.

DATE: December 1973

PROJECT NO.: DC-06-0010

KEYWORDS:

1. Environment and Environmental Control
 2. Underground Structures
 3. Tunnels and Tunneling
 4. Subways
 5. Testing Facilities
-

This report has been prepared under the Transit Development Corporation project, "Ventilation and Environmental Control in Subway Rapid Transit System" and is one of many such reports leading to the final product, a "Subway Environmental Design Handbook."

Ventilation of subway tunnels and stations is essential to insure an acceptable environment within the system. In previously completed work, various vent shafts have been tested, and for those tested, semiempirical theoretical expressions have been derived. The broad class of vent shafts tested during previous work included types which had a single outlet and attached in a "T" configuration (i.e., at 90°) to the tunnel.

The purpose of this particular report is to present and describe the testing of special and more complex vent shafts. A generalized theory is formulated as an extension of this and previous VST work. In this report, testing has been expanded to deal with multijunction systems which attach at various angles to the tunnel and may include fans or pumps. The types of vent shafts tested are enumerated and drawings and photographs of them are included.

Experimental methods for each general type of vent shaft or junction is described. Photographs of test sections and instrumentation are included.

Section 5 develops equations for each of the systems tested and discusses the agreement between theory and experiment for each general type of junction tested. Equations for flow conditions which were not tested are derivable from the equations developed herein.

Empirical results and final equations on junction pressure differentials to volumetric flow rates in adjoining tunnels are presented in Section 6. Equations for all flow conditions as detailed in Appendix B are presented.

NTIS ORDER NO.: PB 249-048/AS

PRICE: \$8.00

TITLE: FINAL REPORT FOR THE I-35W URBAN CORRIDOR DEMONSTRATION PROJECT

AUTHOR: Bather-Ringrose-Wolsfeld, Inc. for the Metropolitan Council
(St. Paul, MN)

DATE: August 1975

PROJECT NO.: DC-06-0062

KEYWORDS:

- | | |
|--------------------------------------|---------------------------------|
| 1. Corridors | 6. Meters and Metering |
| 2. Bus, Express | 7. Parking, Park-and-Ride |
| 3. Bus, Priorities | 8. Bus, Stations and Shelters |
| 4. Traffic Analysis, Congestion | 9. Traffic Analysis, Flow |
| 5. Transportation Systems Management | 10. Traffic Analysis, Peak-Hour |
-

The purpose of the I-35W Urban Corridor Demonstration Project is to implement and evaluate the Bus-on-Metered Freeway System. The system includes the following elements: metering of an urban radial freeway; a real-time surveillance, command and control system; extensive express bus service in the corridor; priority access to the freeway via express bus ramps; and provision of transit passenger amenities, i.e., bus shelters, signs, and park-and-ride facilities in the corridor. The complete system, located in the Minneapolis-St. Paul area, became operational on April 9, 1974.

Goals of the Urban Corridor Demonstration Program include: demonstrating the impact of a coordinated use of Federal Highway Administration (FHWA) and UMTA programs in alleviating peak-hour congestion in heavily used traffic corridors; improving the efficiency of existing transportation facilities in terms of people moving capability; encouragement of urban areas to coordinate planning of highway and transit improvements to obtain maximum impact; and improvement of peak-hour traffic flow in the project cities and documentation of results for national application.

The seven objectives of the I-35W project were: (1) improve the I-35W corridor level of service through metering the traffic entering an urban radial freeway without adverse impact of traffic operations on adjacent major arterials and CBD streets; (2) increase the transit modal split in the corridor through the shift of auto drivers and passengers to the express bus service; (3) improve the reliability of the freeway operation through the provision of consistent operations, the reduction of accidents, and the maintenance of an efficient traffic management system; (4) improve the transit system performance through decreased travel times, improved schedule adherence, reduced unit costs, and favorable cost/revenue position; (5) obtain user acceptance of the bus-on-metered freeway system through a marketing/advertising program; (6) obtain a positive environmental impact for the project through reduced energy consumption, reduced noise levels, and reduced exhaust emissions; and (7) implement the bus-on-metered freeway system in a cost-effective manner.

Each objective is evaluated and an executive summary and project overview are presented.

NTIS ORDER NO.: PB 247-663/AS

PRICE: \$11.75

TITLE: IMPLEMENTING SHARED TAXICAB SERVICES: A CASE STUDY IN
ARLINGTON, VIRGINIA

AUTHOR: The Urban Institute
(Ronald F. Kirby)

DATE: February 1975

PROJECT NO.: DC-06-0093

KEYWORDS:

1. Para-Transit
 2. Taxis
 3. Fare, Cost Determination
 4. Measuring and Measurements
-

Recent research has suggested that improvements in urban mobility may be achieved by allowing taxicabs to offer a variety of shared-ride services, for which passengers with different trip origins or destinations can share the same taxicab. Local regulations in most urban areas in the U.S., however, have historically discouraged or prohibited such services.

Arlington County, Virginia, recently decided to introduce shared taxicab services on an experimental basis, with a view to their eventual implementation as a permanent new form of public transportation for the County. This report discusses the motivation for this experiment, the issues and problems encountered in designing it, and the specific service provisions and fare structure adopted. The report also outlines measurement procedures developed to assist Arlington County in evaluating the experiment.

Transportation needs in the County, population and land use and existing transportation services and travel patterns are discussed. Chapters address formulating the services and promotion. In terms of monitoring, public response, fares and level of service, costs and productivity, impact on taxicab companies, operating procedures, community impacts and data collection procedures are considered.

References are furnished.

NTIS ORDER NO.: PB 245-645/AS

PRICE: \$4.00

TITLE: A PROCEDURE FOR ESTIMATING AUTOMOBILE FUEL CONSUMPTION ON
CONGESTED URBAN ROADS

AUTHOR: National Bureau of Standards
Department of Commerce
(David M. Levinsohn and James T. McQueen)

DATE: August 1974 PROJECT NO.: DC-06-0098

KEYWORDS:

1. Fuel, Consumption
 2. Private Transportation, Auto
 3. Traffic Analysis, Congestion
 4. Corridors
 5. Traffic Analysis, Peak-Hour
-

The ultimate requirement of this and other related research is to provide procedures for estimating automobile fuel consumption that may be used by transportation planners in evaluating alternative transportation strategies in congested urban corridors.

The purpose of this report is to summarize the existing literature and research in progress, to develop a statement of current knowledge of automobile fuel consumption, to identify inadequacies in existing techniques that lead to inaccurate estimations of consumption, and to recommend approaches for the elimination of inadequacies.

In this report, an estimated procedure is proposed that is designed to be particularly sensitive to automobile fuel consumption in congested, peak-hour traffic. This procedure is based upon vehicle attributes and roadway operating conditions which were determined through an extensive review of auto fuel consumption literature. Vehicle attributes include characteristics of the automobile that affect fuel consumption. Roadway operating conditions comprise the types of driving to which autos are subjected. Vehicles are classified by weight and model year. The proposed roadway classifications are expressway, arterial, and local street.

For each vehicle type category, base fuel consumption rates are determined. These base consumption rates are then modified by adjustment factors which reflect the roadway operating conditions. The rates are multiplied by the vehicle miles of each vehicle category and summed over all categories to compute the total fuel consumption on the road under analysis.

An example application of the procedure, including sensitivity analyses, is presented. The base fuel consumption rates can be obtained from EPA emissions test data. According to the authors, research is required to determine the adjustment factors, particularly under conditions of extreme roadway congestion.

References are furnished.

NTIS ORDER NO.: COM-75-10057

PRICE: \$3.25

TITLE: COORDINATING TRANSPORTATION FOR THE ELDERLY AND HANDICAPPED
A State of the Art Report

AUTHOR: The Institute of Public Administration

DATE: November 1976

PROJECT NO.: DC-06-0106

KEYWORDS: 1. Elderly
2. Handicapped
3. Para-Transit
4. Management, Operations and
Techniques
5. Surveys
6. Transportation Systems
Management

Since the publication of the Institute of Public Administration's State of the Art Report in 1975, there has been growing concern with the problems of providing coordinated transportation services. Having recognized the importance of coordination as a means for more effective use of transportation resources, UMTA initiated this survey interview study in order to understand the nature of the coordination problems being encountered, namely, at the local level, i.e., at the point of service delivery where coordination appears to be most important and most difficult. In this report, the concept of coordination reflects a degree of agreement and joint action in which there is some common sharing of funds, facilities or equipment by agencies, but in which agency transport identity is preserved.

This report consists of four major sections: 1) an overview of the nature of the problem and the results of an examination of 26 transportation projects, of which 20 have been developed as case studies; 2) preliminary findings and conclusions based on a telephone survey of the 20 projects; 3) preliminary recommendations for future effort and programs; and 4) an appendix containing the survey form and detailed case studies of the 20 special transportation service projects.

The goal of this study is to explore the present state of the art in terms of the scope and magnitude of coordination efforts in transportation projects serving the elderly and handicapped. Primary emphasis is on the identification and examination of on-going transportation projects in which coordination and/or consolidation of funds or services has been undertaken. Twenty on-going social service transportation projects have been selected for survey interviews. Detailed case studies and one-page summaries for the 20 projects surveyed are contained in Appendix B of this report. A survey form designed to assure that consistent and specific questions be used throughout this survey of the 20 projects on coordination methods is contained in Appendix A. Useful characteristics of the coordination experience of the 20 special projects have been identified and form the basis of this report.

NTIS ORDER NO. PB 265-079/AS

PRICE: \$6.00

TITLE: THE EVALUATION OF THE SHIRLEY HIGHWAY EXPRESS-BUS-ON-FREEWAY
DEMONSTRATION PROJECT
Final Report

AUTHOR: National Bureau of Standards
(J.T. McQueen, et al.)

DATE: August 1975

PROJECT NO.: DC-06-0110

KEYWORDS:

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|-----------------------------------|--------------------------------------|
| 1. Corridors | 5. Transportation Systems Management |
| 2. Traffic Analysis,
Peak-Hour | 6. Lane, Reserved |
| 3. Bus, Express | 7. Transportation Disadvantaged |
| 4. Carpools/Buspools | 8. Air Pollution |
| | 9. Fuel, Consumption |
-

The Shirley Highway Corridor, extending from Northern Virginia to downtown Washington, D.C., is a 150 square-mile area containing approximately 550,000 people. The Shirley Highway Express-Bus-on-Freeway Demonstration Project began in June 1971 and was completed in December 1974. The principal goal of the project was to demonstrate that express-bus-on-freeway operations can improve the quality of bus service and lead to an increase in the people moving capability of peak period transportation facilities. Other project goals were to demonstrate the effectiveness of this technology as a means of reducing auto pollutant emissions and gasoline consumption, improving the mobility of the transportation disadvantaged and the economic condition of the transit operator.

This report summarizes project performance with respect to the attainment of the above goals. An analysis of bus operations is presented which shows that the project effected an improvement in the quality of the Corridor bus service, evidenced by the reduction in travel times by bus, and the increase in both the reliability and the coverage of the bus system. Trends in peak period traffic volumes are presented which show that the subsequent increase in bus patronage and bus share of Corridor commuters led to an increase in the peak period people moving capacity of the Corridor. People moving capability also increased by project-stimulated growth in carpooling.

Data from surveys of Corridor commuters were used in identifying factors important in commuter's decision to use bus or to carpool. Bus users who formerly had commuted by auto reported that the most important factors in their decisions to switch were the expense and discomfort of auto commuting, and the expense features of project bus service. Factors reported as most important in decisions to carpool were reduction in commuting costs, special parking privileges for carpools, and availability of the express busway to carpools.

This report concludes with an analysis of project performance with respect to the secondary goals. Project costs and revenues are analyzed.

NTIS ORDER NO.: PB 247-637/AS

PRICE: \$6.75

TITLE: A SELECTED BIBLIOGRAPHY AND REFERENCE DOCUMENT
IN URBAN PUBLIC TRANSPORTATION

AUTHOR: JHK & Associates
(prepared for FHWA and UMTA)

DATE: July 1976

PROJECT NO.: DC-06-0114

KEYWORDS:

1. Bibliographies
 2. Information Aids
-

This document was prepared as part of an initial task in the development of a Federal Highway Administration/Urban Mass Transportation Administration-sponsored training course in Public Transportation. The materials included in this document have been selected for their use in association with the training course as such, and are not meant to be a comprehensive listing in any particular subject area.

The abstracts which make up this bibliography have their origins in four sources:

- 1) Fletcher, William S., and Sid Davis, Urban Transportation Information Handbook, Atlanta University, School of Business Administration, Atlanta, October 1975;
- 2) Oram, Richard L., Transportation System Management; Bibliography of Technical Reports, UMTA Office of Policy and Program Development, Washington, D.C., May 1976;
- 3) Author (s), editor (s), and compiler (s) of the individual documents utilized here (where written as abstracts); and
- 4) Richard Presby, of JHK & Associates, the compiler of this work.

This report also contains a public transit glossary. The glossary material was extracted from three sources: the San Francisco Municipal Transit Authority; the American Public Transit Association FACT BOOK '75 - '76 edition; and the URBAN MASS TRANSPORTATION TRAVEL SURVEYS OF 1972.

NTIS ORDER NO.: PB 266-252/AS

PRICE: \$5.00

TITLE: AN ANALYSIS OF COMMUTER VAN EXPERIENCE

AUTHOR: The Urban Institute
(Gerald K. Miller and Melinda A. Green)

DATE: February 1976

PROJECT NO.: DC-06-0120

KEYWORDS:

1. Paratransit
 2. Carpools/Buspools
-

This report analyzes the planning, organization, and operation of commuter van programs (often called van pools) in the U. S. and Canada. More than 30 existing operations have been examined and classified by considering the major organizational arrangements for providing service. The potential benefits van commuting generates for the users, employers, and community are discussed, and the report presents guidelines on the demand environment and indicates the service characteristics that are likely to be important in attracting riders.

Major legal issues including public regulation, competition with bus transit, liability and insurance, and implications of driver compensation are also reviewed. The potential for widespread van programs and the proposals for large-scale, areawide van service are also discussed.

A second report, "Guidelines for the Organization of Commuter Van Programs" (PB 252-305), presents detailed procedures on how to organize and administer an employer-based van program. The order number for the set of the two related reports is PB 252-303/set.

NTIS ORDER NO.: PB 252-304/AS

PRICE: \$4.00

TITLE: THE CONSEQUENCES OF TRANSIT FARE AND SERVICE POLICIES
A Classified Bibliography

AUTHOR: The Urban Institute
(Michael A. Kemp and Rebecca L. Rea)

DATE: April 1976

PROJECT NO.: DC-06-0120

KEYWORDS:

1. Bibliographies
 2. Fare, Cost Determination
 3. Ridership, Volume
-

This Bibliography is concerned with the consequences---most specifically the ridership and cost implications---of various policies regarding service and fare levels for urban public transit.

Cited publications are classified under separate headings for ease in reference. These are: the demand for transit service; fare and service elasticities of demand; transit operating costs; the economics of transit pricing; public subsidies for transit operations; low-fare and no-fare transit; transit fare structures; transit fares and the distribution of income; transit and the transportation disadvantaged; transit planning, operation and evaluation; marketing transit; and general related material

NTIS ORDER NO.: PB 253-101/AS

PRICE: \$4.00

TITLE: GUIDELINES FOR THE ORGANIZATION OF COMMUTER VAN PROGRAM

AUTHOR: The Urban Institute
(Gerald K. Miller and Melinda A. Green)

DATE: February 1976

PROJECT NO.: DC-06-0120

KEYWORDS:

1. Paratransit
 2. Carpools/Buspools
 3. Guides and Guidance
-

This document describes the major stages in the development of a company sponsored commuter van program including: the investigation of program feasibility, the promotion and organization of the service, and the operation and administration of an ongoing operation.

These guidelines are based on the experience of several successful programs and potential sponsors should find them useful for their particular situation. Seven detailed case studies which are representative of the major types of commuter van services are also presented in the Appendix. These are the 3M Company of St. Paul, Minnesota; Hoffman-LaRoche Pharmaceuticals, Nutley, New Jersey; Tennessee Valley Authority in Knoxville, Tennessee; Utah County Van Program, Provo, Utah; the Reston (Virginia) Mini-Bus Service; Polisar Commuter Cooperatives Sarnia, Ontario, Canada; and the Southern California Commuter Bus Service, in Los Angeles.

This is the second of two documents on commuter vans. The first report, entitled "An Analysis of Commuter Van Experience" (PB 252-304), examines the planning, organization, and operation of commuter van programs. Potential benefits, the demand environment, major legal issues and potential for the development of widespread and large-scale, area-wide van service are discussed in this report.

The order number of the pair of commuter van reports is PB 252-303 set.

NTIS ORDER NO.: PB 252-305/AS

PRICE: \$5.00

TITLE: ROSTER OF NORTH AMERICAN RAPID TRANSIT CARS 1945-1976

AUTHOR: American Public Transit Association

DATE: January 1977

PROJECT NO.: DC-06-0121

KEYWORDS:

1. Rail, Systems and Planning Design
 2. Rail, Rapid Transit
 3. Rail, Cost
 4. Lights and Lighting
-

This document is a compilation of data on rapid transit cars built between 1945 and 1976. It includes cars in the United States, Canada, and Mexico.

Data includes cost, performance, dimensions, weights, electrical equipment, lighting systems, and trucks and suspensions. It is broken down by authorities in alphabetical order, and has a further breakdown per transit authority in chronological order of transit car.

NTIS ORDER NO.: PB 266-620/AS

PRICE: \$9.00

TITLE: PROCEEDINGS OF THE URBAN MASS TRANSPORTATION ADMINISTRATION/AMERICAN
PUBLIC TRANSIT ASSOCIATION RESEARCH AND DEVELOPMENT
PRIORITIES CONFERENCE, 1976

AUTHOR: American Public Transit Association

DATE: May 1976

PROJECT NO.: DC-06-0136

KEYWORDS: 1. Research, Activities
2. Bus
3. Rail
4. Paratransit
5. Planning
6. Management

This is a compilation of the material that was presented at the Urban Mass Transportation Administration/American Public Transit Association Research and Development Priorities Conference. It contains a foreword, summary, and set of recommendations for each of the nine workshop sessions held during the conference. In addition, talks given at the general, luncheon and breakfast sessions are included.

The material specifically addresses the following aspects of urban transportation research and development: bus and paratransit technology; rail transit technology; new systems and automation; socioeconomic research and special projects; service and methods demonstrations; priorities and balance in UMTA research and development into service; transit management; and planning methodology.

Among the speakers whose remarks are included are American Public Transit Association Chairman Dr. William J. Ronan, Urban Mass Transportation Administration Administrator Robert E. Patricelli and Congressman Jack Edwards.

NTIS ORDER NO.: PB 255-898/AS

PRICE: \$6.00

TITLE: PROCEEDINGS OF THE SECOND URBAN MASS TRANSPORTATION ADMINISTRATION/
AMERICAN PUBLIC TRANSIT ASSOCIATION RESEARCH AND DEVELOPMENT
PRIORITIES CONFERENCE, 1976 Arlington, Virginia Nov. 30 - Dec. 1, 1976

AUTHOR: American Public Transit Association

DATE: March 1977

PROJECT NO.: DC-06-0157

KEYWORDS:

1. Bibliographies
 2. Information Aids
-

This report is a compilation of material that was presented at the Second Urban Mass Transportation Administration/ American Public Transit Association Research and Development Priorities Conference.

This report contains one or more resource papers, additional papers, a summary, and recommendations for each of five workshop sessions held during the conference. In addition, addresses at general, luncheon, and breakfast sessions are included.

The material specifically addresses the following aspects of urban transportation research and development: viewpoints on UMTA's R&D priorities from spokesmen for transit operators, State governments, and local governments; needs and priorities in policy-related research and development and deployment; implementation of nonhardware innovations; technology delivery systems; and information exchange. Among the speakers whose remarks are included are APTA Executive Director B.R. Stokes, Urban Mass Transportation Administrator Robert E. Patricelli, Senator Birch Bayh, and Jordan D. Lewis, Director of the Experimental Technology Incentives Program of the National Bureau of Standards. A listing of conference participants is also included.

NTIS ORDER NO.: PB 266-158/AS

PRICE: \$5.50

TITLE: TRAFFIC EQUILIBRIUM METHODS: STATE-OF-THE-ART PAPERS
Papers selected from those presented at the
International Symposium on Traffic Equilibrium Methods

AUTHOR: University of Montreal

DATE: January 1975

PROJECT NO.: FN-06-0001

KEYWORDS:

- | | |
|--------------------------|-------------------------|
| 1. Computer Applications | 5. Research, Operations |
| 2. Planning | 6. Bibliographies |
| 3. Models & Modeling | |
| 4. Traffic Analysis | |
-

These twelve papers, selected from those presented at the International Symposium on Traffic Equilibrium Methods held at the University of Montreal, November 21-23, 1974, summarize the current state of model research, computation and practice in this area.

The papers are as follows: "Equilibrium versus Optimum in Public Transportation Systems" by Martin J. Beckmann; "Integrated Equilibrium Flow Models for Transportation Planning" by Stella C. Dafermos; "Recent Experience with Equilibrium Methods for the Study of a Congested Urban Area" by Michael Florian and Sang Nguyen; "Area Traffic Control and Network Equilibrium" by Nathan Gartner; "A Note on the Interpretation of Delay Functions in Assignment Problems" by Marc Gaudry; "An Analysis and Comparison of Behavioral Assumptions in Traffic Assignment" by Larry J. Leblanc and Edward K. Morlok; "Supply Functions for Public Transport: Initial Concepts and Models" by Edward K. Morlok; "A Unified Approach to Equilibrium Methods for Traffic Assignment" by Sang Nguyen; "Evaluation of Freeway Corridor Assignment Equilibria" by Maxence P. Orthlied and Adolf D. May; "Network Equilibrium Capabilities for the UMTA Transportation Planning System" by Earl R. Ruiter; "The Choice of Assignment Techniques for Large Networks" by Dirck Van Vliet; and "Equilibrium Models in Use: Practical Problems and Proposals for Transport Planning" by M.R. Wigan.

NTIS ORDER NO.: PB 245-136/AS

PRICE: \$9.00

TITLE: AN ANALYSIS OF TAXICAB OPERATING CHARACTERISTICS

AUTHOR: International Taxicab Association

DATE: August 1975

PROJECT NO.: IL-06-0029

KEYWORDS:

1. Taxis
 2. Management, Operations and Techniques
 3. Surveys
 4. Fare, Cost Determination
-

The purpose of this report is to present the results of a survey of taxicab operating characteristics conducted during the Fall of 1974.

The reader should be cautioned that this survey presents the most extensive effort undertaken to date to gather statistics for the taxicab industry. Prior to this time the studies were made based upon small specialized samples. Therefore, there is no basis for comparison with previous studies, which according to the authors, probably tended to underestimate the total taxicab population in the United States.

A mail questionnaire was sent to 6,467 active operators. Of these, 696 (10.8%) responded. In spite of this rather low response rate, the sample provides broad geographic coverage and represents all sizes of operations (1 to over 2000 cabs); i.e., the sample appears to be representative of the industry although it falls short of being a true scientific (random) sample. It is believed that the sample statistics can be accepted as being reasonably close to their corresponding universe values and that projections based on these statistics will be useful as preliminary estimates.

The survey procedure, response rate and sample limitations are discussed in the introduction to the report. General industry characteristics are examined. The questionnaire was designed to determine the scope of services offered by taxicab operators. These include: regular demand services, special (contract) services, emergency services, private auto rental or leasing, and other (contract) services. Information was obtained on the various organizational schemes used in the taxicab business, and on the size distribution of taxicab operators as well as certain performance ratios. Taxicab fare structures were studied and information was obtained on mixture of vehicles used and degree to which two-way radios are used.

A related report is "Program Taxistats: A Computerized System for Processing and Analyzing Taxicab Company Statistics" PB 250-997/AS.

NTIS ORDER NO.: PB 251-147/AS

PRICE: \$4.00

TITLE: A COMPENDIUM OF PROVISIONS FOR A MODEL ORDINANCE FOR
THE REGULATION OF PUBLIC PARATRANSIT

AUTHOR: International Taxicab Association

DATE: February 1976

PROJECT NO.: IL-06-0029

KEYWORDS:

1. Paratransit
 2. Planning, Tools
-

This report comprises a complete set of provisions for the regulation of various types of public paratransit. Its preparation consisted of five stages: the collection and analysis of the statutes of every state, the ordinances of some 600 municipalities and several multistate compacts; the compilation, comparison and the organization and drafting of the sections; considerations of varying attitudes concerning several philosophies of regulation as revealed by the existing regulations; research into the needs which would appear from the implementation of new forms of public paratransit transportation; and the assembly of the Compendium.

The Compendium is a sort of supermarket of regulatory provisions which, in its entirety, is intended to provide an overview of potential areas of regulation from which each community would make a judgement with respect to the desirability of using or ignoring each such area. Each of the areas was broken out in great detail in order to permit greater ease in the selection of the desired depth of regulation. On the pages opposite the text are cross-references, comments of the authors, some legal warnings, and generalizations intended to assist the user in the selection process.

Sections of the Compendium are: Definitions; Ambiguities; Licensing Authority; Operating Licenses; Vehicle Licenses; Chauffeur's and Attendant's Licenses; Fees and Penalties; Financial Responsibility; Inspection of Vehicles; Books and Records; Reports; Service of Notice, etc.; Hearings; Affiliates; Taxicabs; Liveries and Limousines; Nontransit Buses; Jitneys; Ambulances and Cabulances; Criminal Offenses; Police Powers Not Infringed; Amendments; and Partial Invalidity.

Appendices include a list of sample cities used for the research in taxicab ordinances and a multijurisdictional agreement.

TITLE: PROGRAM TAXISTATS: A COMPUTERIZED SYSTEM FOR
PROCESSING AND ANALYZING TAXICAB COMPANY STATISTICS

AUTHOR: International Taxicab Association

DATE: June 1975

PROJECT NO.: IL-06-0029

KEYWORDS:

1. Taxis
 2. Computer Applications
 3. Computer Programming
-

This report represents the results of a study designed to develop software for reporting taxicab company statistics. It provides a general description of the data processing and report generation systems and discusses certain problems and issues associated with the sample design and implementation of the system.

Topics addressed in the chapter on system description are: data collection and preliminary file preparation; final file preparation; printing of final reports; schedule problems; and industrywide reports.

The section on system implementation discusses various problems and issues associated with the implementation and operation of the system as a continuous quarterly or annual reporting system.

Some of the issues to be considered in the sample design are available funds and processing cost per quarter, proportionate stratified sample, disproportionate stratified sampling, maximum error per class, and the importance of sampling objectives; some of the implementation issues are relations with participants, system management and control, and start-up procedures.

Appendices contain sample input forms for program taxistats, sample printouts of tables generated by the taxistats program, and examples of industrywide analysis.

A related report is "An Analysis of Taxicab Operating Characteristics" PB 251-147/AS.

NTIS ORDER NO.: PB 250-997/AS

PRICE: \$4.50

TITLE: URBAN GOODS MOVEMENT DEMONSTRATION PROJECT DESIGN PHASES I AND II
Executive Summary

AUTHOR: A. T. Kearney, Inc.

DATE: May 1976

PROJECT NO.: IL-06-0030

KEYWORDS: 1. Freight Movement 6. Logistics
2. Energy 7. Traffic Analysis, Congestion
3. Pollution 8. Qualitative Analysis
4. Noise and Noise Control 9. Quantitative Analysis
5. Center City

The specific tasks of the Urban Goods Movement Demonstration Project Design Study which are addressed in this report are: 1) to define quantitatively and qualitatively the impact of goods movement in urban areas on goods movement cost, traffic congestion, energy consumption, air pollution, noise pollution, and land use; 2) to identify problems associated with urban goods movement and their basic or fundamental causes; and 3) to generate plausible solutions to these problems. Other tasks of the study, not yet complete, are to analyze the potential solutions, to identify those which are particularly desirable and to propose and design demonstration projects to test and/or implement the proposed solutions.

This Executive Summary provides a brief overview of the entire study and represents a condensation of a 300-page final report. The final report and technical appendices are as follows:

Final Report on Phases I and II (A Primer on Urban Goods Movement) and Appendix A - Glossary of Terms (PB 249-319);

Appendix B - A Bibliography and Literature Abstracts (PB 249-320);

Appendix C - Distribution Logistics Analysis of Urban Goods Movement (PB 249-321);

Appendix D - Congestion Analysis, Appendix E - Energy Consumption Analysis, Appendix F - Air Pollution Analysis, Appendix G - Noise Pollution Analysis (PB 249-322); and

Appendix H - Potential Solutions to Urban Goods Movement Problems (PB 249-323).

The order number for the set of 5 full reports is PB 249-318 - Set.

TITLE: URBAN GOODS MOVEMENT DEMONSTRATION PROJECT DESIGN

AUTHOR: A.T. Kearney, Inc. and Alan M. Voorhees & Associates, Inc.

DATE: December 1975

PROJECT NO.: IL-06-0030

KEYWORDS: 1. Freight Movement
2. Bibliographies
3. Environment and Environmental Control
4. Traffic Analysis, Congestion
5. Noise and Noise Control
6. Logistics
7. Inner City

One goal of this study was to assemble all available data and combine it with practical experience in urban goods movement and urban transportation planning in order to develop a more complete understanding of the problems encountered in urban goods movement (UGM). A second objective was to identify solutions to UGM problems and develop a methodology for testing and implementing these solutions. A by-product of the understanding gained is the structuring of needs for further, in-depth research.

The report consists of seven sections. Section I presents a discussion of urban goods related transportation as compared to the nation's total transportation, plus a discussion of the physical distribution of goods as it sets the demand for goods related transportation in urban areas. Section II provides estimates of the characteristics and amounts of transportation currently used to move goods in the major cities. Section III presents estimates of the impact of this transportation on cities in terms of cost, congestion, energy consumption, air pollution, noise pollution, and land use. Section IV focuses on each of these impacts as viewed by several interest groups: commuters, consumers, goods haulers, shippers/receivers, and the community at large. The result is a list of focal points of attention. Section V isolates some fundamental causes of urban goods movement related problems, and Section VI discusses nearly 100 possible solutions to them. Section VII presents several recommendations for further action regarding the problems associated with the movement of goods in cities.

This study consists of 5 separate volumes:

- . Volume I: Final Report on Phases I and II and Appendix A
NTIS No. PB 249-319 Price: \$9.00
- . Volume II: Appendix B - Bibliography and Literature Abstracts
NTIS No. PB 249-320 Price: \$7.50
- . Volume III: Appendix C - Distribution Logistics Analysis and Findings
NTIS No. PB 249-321 Price: \$7.75
- . Volume IV: Appendix D - Congestion Analysis/Appendix E - Energy Analysis/
Appendix F - Air Pollution Analysis/Appendix G - Noise Analysis
NTIS No. PB 249-322 Price: \$7.75
- . Volume V: Appendix H - Potential Solutions to Urban Goods Movement
Problems
NTIS No. PB 249-323 Price: \$6.75.

NTIS ORDER NO.: PB 249-318-SET

PRICE: \$34.00

TITLE: THE OPERATION AND MANAGEMENT OF THE SHIRLEY HIGHWAY EXPRESS
BUS-ON-FREEWAY DEMONSTRATION PROJECT
Final Report

AUTHOR: The Northern Virginia Transportation Commission
(Smith and Locke Associates, Inc.)

DATE: September 1976

PROJECT NO.: IT-06-0024

KEYWORDS:

1. Express Bus Lanes
 2. Exclusive Bus Lanes
 3. Priority Bus Lanes
 4. Shirley Express
 5. Park and Ride
-

In September 1970, the Urban Mass Transportation Administration (UMTA) approved a demonstration grant to the Northern Virginia Transportation Commission (NVTC) to design and implement transit service on an 11 mile exclusive busway from suburban Virginia to downtown Washington, D.C. The grant also called for development of fringe parking lots to serve the exclusive lanes.

This document reports on the project from the viewpoint of the project sponsor. Thus, the report contains information which in all probability could not be obtained from other sources and which would not ordinarily be reported in any technical evaluation of the project. Also included in the report are some of the marketing and merchandising activities that contributed to the public awareness and acceptance of the express lane concept.

The success of the project both in terms of ridership and fare box revenues has been widely recognized in the transit industry.

NTIS ORDER NO.: PB 260-540/AS

PRICE: \$5.50

TITLE: THE SHIRLEY HIGHWAY EXPRESS BUS-ON-FREEWAY DEMONSTRATION PROJECT/
A STUDY OF PARK-AND-RIDE

AUTHOR: National Bureau of Standards
(James T. McQueen and Gerald Miller with C. Harrison)

DATE: March 1975

PROJECT NO.: IT-06-0024

KEYWORDS:

- | | |
|---------------------------|-----------------|
| 1. Lane, Reserved | 5. Bus, Express |
| 2. Bus, Priorities | 6. Demography |
| 3. Parking, Park-and-Ride | |
| 4. Modal Choice | |

The market for fixed-route transit operations is not limited to travelers within walking distance of transit stops. This was demonstrated by the Shirley Highway Express-Bus-on-Freeway Project as project promoted park-and-ride operations led to sizable increases in bus patronage; park-and-riders, commuters who traveled by auto to a bus stop and then by bus to work, greatly expanded the market for the fixed-route bus service in the Shirley Highway Corridor.

This report presents the results of a study of the successful park-and-ride operation within the Shirley Highway Corridor area, suburban fringe parking lots coupled with the high-speed buses of the project. Demographic characteristics of the park-and-riders as well as characteristics of their present park-and-ride and previous commuter trips are examined. Factors important in the commuters' decisions to park-and-ride are identified. The report also describes the survey procedure used in this study.

NTIS ORDER NO.: PB 253-123/AS

PRICE: \$4.50

TITLE: THE SHIRLEY HIGHWAY EXPRESS-BUS-ON FREEWAY DEMONSTRATION PROJECT/
A STUDY OF REVERSE COMMUTE SERVICE

AUTHOR: National Bureau of Standards
(Robert Waksman)

DATE: December 1974

PROJECT NO.: IT-06-0024

KEYWORDS:

- | | |
|-------------------|--------------------------------|
| 1. Bus, Commuter | 5. Traffic Analysis, Peak-Hour |
| 2. Lane, Reserved | 6. Surveys |
| 3. Corridors | 7. Benefit-Cost Analysis |
| 4. Employment | |
-

The Shirley Highway Corridor (I-95) peak period bus service has been overwhelmingly oriented toward trips made in the direction of the primary flow of peak period traffic. However, in early 1973, peak period reverse commute service was established on three of the demonstration project routes. Reverse commute service is an operation which provides peak period transit service in the direction opposite the primary flow of traffic. This report is based upon an analysis of these reverse commute routes.

The purpose of this report is to: 1) describe the Shirley Highway peak period reverse commute routes; 2) analyze and evaluate their operation; 3) determine the factors conducive to the success of the service; and 4) identify employment areas within the Shirley Highway Corridor which have high potential as markets for reverse commute service.

In early 1973, two major reverse commute routes began service to a newly opened high-rise office building in Northern Virginia. After eleven months, patronage was measured. Response to an on-board survey revealed that at least 4 percent of the riders had no other means for getting to work other than bus. The service has enabled many of these riders to accept jobs they might otherwise have had to forego.

The service was also found to be slightly profitable to bus operators on an incremental cost basis. Cost and revenue estimates showed that the bus operators margin of income over costs was positive.

NTIS ORDER NO.: COM-75-10412

PRICE: \$3.75

TITLE: ENERGY ABSORBING BUMPERS FOR TRANSIT BUSES
Transbus Program

AUTHOR: Booz-Allen Applied Research

DATE: May 1976

PROJECT NO.: IT-06-0025

KEYWORDS:

- | | |
|-----------------------|-----------------------|
| 1. Bus, Design | 6. Testing Facilities |
| 2. Bus, Transbus | 7. Safety |
| 3. Crashworthiness | |
| 4. Life Cycle Costing | |
| 5. Pneumatics | |
-

This report discusses the results of a program to test and evaluate the potential benefits of energy absorbing bumpers for transit buses and the life-cycle cost evaluations related to accident claims and bus repair costs.

The objective of this program is to determine, through controlled tests, the capabilities/limitations of six new design energy absorbing bumper systems (AMD Transbus Bumper, GMC Transbus Bumper, Rohr Transbus Bumper, GMC Production Bumper, EAS Water Bumper, EAS Transafe Bumper). Principal emphasis is placed upon the bumper system performance under simulated inservice tests with respect to its effectiveness in protecting the bus from minor accident hazards encountered during revenue service. The findings of this report are based, in part, on detailed controlled tests conducted at the Ultrasystems test facility, Phoenix, Arizona, and at CALSPAN Corporation, Buffalo, New York.

The economic benefits of energy absorbing bumpers are discussed with respect to life-cycle accident costs. The test facilities, each type of bumper system tested, and the test procedures are described in detail in terms of the objectives of the tests, equipment and methodology used for testing, and functional descriptions of each bumper system. The detailed test results for each bumper system are presented in table format, indicating energy absorbing performance at various impact velocities, maximum impact capability, and other characteristics.

Conclusions concerning the results of the tests including projected benefits of energy absorbing bumpers are delineated. Recommendations for the physical and performance properties of an energy absorbing system for transit are stated as well as product improvements of bumper systems.

NTIS ORDER NO.: PB 259-405/AS

PRICE: \$4.00

TITLE: THE GENERAL MOTORS TRANSBUS
Final Report

AUTHOR: General Motors Corporation/Truck and Coach Division
(prepared for Booz-Allen Applied Research)

DATE: May 1975

PROJECT NO.: IT-06-0025

KEYWORDS:

- | | |
|---|-------------------------|
| 1. Vehicle, Design | 4. Bus, Design |
| 2. Environment and
Environmental Control | 5. Transit User Comfort |
| 3. Bus, Transbus | 6. Suspension |
-

The "TRANSBUS" era began when General Motors received a contract from Booz-Allen on July 28, 1972, to manufacture three coaches to the specifications of the Department of Transportation which were essentially modeled after the 1956 National Academy of Arts and Sciences.

The GM, TRANSBUS, designed and built as part of a program of the Urban Mass Transportation Administration, features a number of design departures from present production coaches including a significantly lower floor; independent front suspension for superior ride and handling; a special kneeling feature that further lowers the front steps to curb distance; U-shaped lounge in the rear of the coach; and improved air conditioning, heating, and exhaust systems to provide a year-round, fume-free, temperature-controlled internal environment. This GM TRANSBUS is powered by a Detroit Diesel Allison gas turbine.

This final report is a summary of the final vehicle design (Vol. 1) and the program effort (Vol. 2) that went into the building of the GM TRANSBUS. A low-floor coach has been designed to conform to the requirements of the Department of Transportation. The purpose of this design is to provide a more attractive and useful coach that can be manufactured using existing technology. Three prototypes have been built to test and evaluate this design.

The final report consists of three separate volumes. All three volumes contain numerous charts illustrating vehicle design, tests, and analysis. Volume 3 is the Appendix.

- . Volume 1: PB 262-638/AS, \$4.50
- . Volume 2: PB 262-639/AS, \$5.50
- . Volume 3: PB 262-640/AS, \$9.75
- . Set of 3 volumes: PB 262-637-SET, \$17.50

NTIS ORDER NO.: PB 262-637/AS-SET

PRICE: \$17.50

TITLE: HUMAN FACTORS EVALUATION OF TRANSBUS BY THE ELDERLY
Final Report

AUTHOR: Booz-Allen Applied Research

DATE: May 1976

PROJECT NO.: IT-06-0025

KEYWORDS:

1. Bus, Design
 2. Bus, Transbus
 3. Elderly
 4. Handicapped
 5. Transportation Disadvantaged
 6. Safety
-

The Transbus Program is a research and development effort to develop advanced transit bus designs. One of the key design goals of the Transbus Program is to provide transportation for the elderly and the handicapped. This report describes the series of tests/analyses conducted to assess provisions for the elderly in the design of the prototype Transbus. The primary objectives of this testing/analysis effort are 1) to evaluate the features of three Transbus prototype buses (Prototype Bus No. 2) as they related to use by the elderly; 2) to gather information regarding the needs of the elderly as inputs to the development of specifications for the production version Transbus (Prototype No. 3); and 3) to identify problems to be corrected in the production Transbus before it is used in public demonstrations.

The human factors test program discussed in this report consisted of 1) test subjects (33 elderly volunteers) obtained and selected by Mr. Glenn Pearson, President of the Phoenix Chapter of the American Association of Retired Persons; 2) three prototype Transbuses (General Motors, AM General and Rohr Industries); and 3) a General Motors "New Look," Chicago-version Transbus, that served as a human factors baseline for comparison with the three prototype Transbuses. The test results indicated that mobility (getting on and off a bus) remained the highest preference score for the elderly. The elderly gave a high rating to the GM prototype for passenger assists, and low ratings to AM General and Rohr because both buses lacked vertical assists in the front of the bus and in the lounge area.

The test series consisted of Evaluation Questionnaires, Vehicle Capacity Tests, Boarding/Alighting Tests, Visibility, and Door Closing Forces Tests. Also presented in this report are the following: 1) A history of the Transbus Program with emphasis on the elderly and the handicapped; 2) A detailed description of the physical characteristics of the test subjects; and 3) A Bibliography related to the elderly and handicapped in mass transit.

NTIS ORDER NO.: PB 264-757/AS

PRICE: \$5.50

TITLE: ROHR INDUSTRIES TRANSBUS
Final Report

AUTHOR: Rohr Industries, Inc.
(under contract to Booz-Allen Applied Research, Inc.)

DATE: June 1975

PROJECT NO.: IT-06-0025

KEYWORDS:

1. Bus, Design
 2. Bus, Transbus
 3. Management, Operations and Techniques
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This document is the Final Report for the Rohr Industries' participation in the DOT/UMTA-sponsored Transbus Program that has been submitted to Booz-Allen Applied Research, Inc., the prime contractor of this program. This report culminates the Rohr program activity from the time of the contract award in June 1972. The major thrust of the Rohr effort has been in the design goals and manufacturing concepts of the Transbus Program.

Under the Transbus Program three manufacturers each designed and fabricated bus prototypes with design goals that included low floors, wide doors, and other features to improve accessibility and to speed loading and unloading. Rohr built three coaches with a seventeen-inch floor height. This report describes and analyzes the bus design and program effort involved in developing these prototypes.

This document consists of three parts: Part 1 is a brief description of the Rohr Transbus that includes summary description of vehicle characteristics and functional elements. Part 2 is a program summary that includes an accounting of design reviews and interim reports shown with an historical milestone chart. Models and mock-ups used as engineering aids are described. The analysis and special studies leading to development of the Transbus design specification packages are also discussed. Prototype fabrication is summarized including discussions of quality assurance, the test program, and technical problems encountered. Part 2 is the longest section of this report. Part 3 is a listing of the specifications, analysis reports, trade studies, and test results which are submitted as an appendix with this report. This Appendix is transmitted as a separate package and is not included in NTIS distribution.

NTIS ORDER NO.: PB 264-612/AS

PRICE: \$6.75

TITLE: TRANSBUS PUBLIC TESTING AND EVALUATION PROGRAM
Final Report

AUTHOR: Simpson and Curtin (in association with National Analysts
for Booz, Allen Applied Research, Inc.)

DATE: January 1976

PROJECT NO.: IT-06-0025

KEYWORDS: 1. Bus, Transbus
2. Vehicle, Design
3. Surveys
4. Handicapped

The Transbus Program encompassed the design, manufacture, and testing of 40-foot bus prototypes. Booz, Allen Applied Research was the prime contractor to UMTA for the development of Transbus. Under subcontracts, three bus manufacturers, AMGeneral, GMC Truck and Coach Division, and Rohr Industries, designed and fabricated three prototype Transbus vehicles each (a total of nine vehicles). These vehicles have been subjected to extensive testing, demonstrations, and evaluations including development tests, proving ground tests, incity operating tests and public demonstration.

Following acceptance tests on vehicle No. 3 from each manufacturer, these three Transbuses became available for public demonstration and in-city testing--the subject of this report. Simpson & Curtin was responsible for the original performance specification of the Transbuses and for planning the incity and Public Testing and Evaluation to obtain public reaction to the features required by the specifications.

The transit authorities in each of four cities were responsible for the conduct of the incity tests and public demonstration as follows:

- . Metropolitan Dade County Transit Agency (Miami, Florida)
- . New York City Transit Authority
- . Kansas City Area Transportation Authority (Missouri)
- . Municipality of Metropolitan Seattle (Washington).

The in-city and public testing program described in this report was designed to obtain data in the operating environment. Various types of data were obtained in the Program--attitudinal data were obtained through surveys of the general public, both users and non-users; operator and maintenance information was obtained through interviews and observations by transit company personnel, while special tests were conducted to obtain the views of the handicapped to the various special devices on the buses. Operational data were obtained by examination and physical measurement. The results and conclusions from these Tests as described in this report will be used as a component in the overall evaluation of the three Transbus prototype designs.

NTIS ORDER NO.: PB 251-882/AS

PRICE: \$8.00

TITLE: SOAC STATE-OF-THE-ART CAR DEVELOPMENT PROGRAM
Volume 2: Repair, Re-test and Operational Evaluation

AUTHOR: Boeing Vertol Company
(W.H. Dunton)

DATE: September 1975

PROJECT NO.: IT-06-0026

KEYWORDS:

1. Rail
2. SOAC
3. Rail, Commuter
4. Vehicle, Design

As systems manager for the Urban Mass Transportation Administration's Urban Rapid Rail Vehicle and Systems Program, the Boeing Vertol Company supervised the design, fabrication and test of two new State-of-the-Art Cars (SOAC) whose objective was to demonstrate the best available (1971-72) rail rapid transit vehicle technology.

Passenger convenience and operating efficiency were primary goals for the cars, which were designed to be operated on at least one line of the rapid transit systems in New York, Boston, Cleveland, Chicago, and Philadelphia. Built by the St. Louis Car Division of General Steel Industries, the SOAC features a DC-DC chopper in the propulsion system, separately excited DC traction motors, all-steel construction (with molded fiberglass ends), and vandal-resistant and fire-retardant materials in the interior.

Volume 1 of this report, PB 235-703, covered the development program through engineering testing, including data on design and performance, propulsion and braking, subsystems, test program, mockup and demonstration programs, and economic analysis.

This volume, Volume 2, of a two-volume report covers the repair of the damage sustained by the No. 2 car in an accident at the Transportation Test Center (TTC) in August 1973, the post-repair testing at the TTC, and the operational evaluation of the SOAC in revenue service in New York, Boston, Cleveland, Chicago, and Philadelphia.

NTIS ORDER NO.: PB 254-770/AS

PRICE: \$8.00

TITLE: STATE-OF-THE-ART CAR DEVELOPMENT PROGRAM FINAL TEST REPORT
Volume 1: Component Testing

AUTHOR: Boeing Vertol Company (Philadelphia, Pennsylvania)

DATE: August 1974

PROJECT NO.: IT-06-0026

KEYWORDS:

- | | |
|--------------------------------------|-----------------------|
| 1. Rail, Rolling Stock | 6. Testing Facilities |
| 2. Rail, Systems and Planning Design | 7. Safety |
| 3. Rail, Commuter | 8. SOAC |
| 4. Rail, Materials | |
| 5. Vehicle, Design | |
-

The Urban Rapid Rail Vehicle and Systems Program is an integrated development program directed toward improving high-speed, frequent-stop urban rail systems. The overall objective is to enhance the attractiveness of rail transportation to the urban traveler by providing service that is as comfortable, reliable, safe and economical as possible.

The objective of the State-of-the-Art Car (SOAC) is to demonstrate the best state-of-the-art in rapid rail car design with two new improved cars using existing proven technology. Primary goals for the cars are passenger convenience and operating efficiency.

This document, Volume 1 of the SOAC Final Test Report, presents the test results of the component testing of the State-of-the-Art car. The purpose of these tests was to show compliance with the SOAC Detail Specification (PB 222-147/AS). All component tests were conducted by the supplier of the applicable subsystems.

An introduction, test procedures and results, and conclusions are presented. Appendices are titled: Propulsion, Dynamic Braking and Auxiliary Power Equipment; Truck Frame; Truck Bolster; Windshield; Seat Strength; and Materials - Fire Resistance.

Other volumes of the State-of-the-Art Car Development Program Final Test Report are: Volume 2: Subsystem Functional Testing (PB 244-049); Volume 3: Acceptance Testing (PB 244-050); Volume 4: Simulated Demonstration Test (PB 244-051); and Volume 5: Postrepair Testing (PB 244-052).

The order number and price for the entire set of five volumes is: PB 244-047-SET/AS, \$26.00.

NTIS ORDER NO.: PB 244-048/AS

PRICE: \$8.75

TITLE: STATE-OF-THE-ART CAR DEVELOPMENT PROGRAM FINAL TEST REPORT
Volume 2: Subsystem Functional Testing

AUTHOR: Boeing Vertol Company
(Philadelphia, Pennsylvania)

DATE: November 1974

PROJECT NO.: IT-06-0026

KEYWORDS:

- | | |
|---|-----------------------|
| 1. Rail, Rolling Stock | 5. Vehicle, Design |
| 2. Rail, Systems and Planning
Design | 6. Testing Facilities |
| 3. Rail, Commuter | 7. Safety |
| 4. Rail, Materials | 8. SOAC |
-

The Urban Rapid Rail Vehicle and Systems Program is an integrated development program directed toward improving high-speed, frequent-stop urban rail systems. The overall objective is to enhance the attractiveness of rail transportation to the urban traveller by providing service that is as comfortable, reliable, safe, and economical as possible.

The objective of the State-of-the-Art Car (SOAC) is to demonstrate the best state-of-the-art in rapid rail car design with two new improved cars using existing proven technology. Primary goals for the cars are passenger convenience and operating efficiency.

This document, Volume 2, presents the test results for the subsystem functional testing of two state-of-the-art transit cars. The purpose of these tests was to show compliance with the SOAC Detail Specification (PB 222-147). All tests were conducted by the car manufacturer, St. Louis Car Division, General Steel Industries, Inc. Tests were conducted at the manufacturer's St. Louis plant and at the DOT High Speed Ground Test Center, Pueblo, Colorado. After adjustments and changes, all systems met the requirements of the detail specification.

Chapters of the report present instrumentation, test procedures and results, and conclusions. Items discussed in the chapter on test procedures and results are car body, lighting, wiring, equipment, main propulsion control and motor rotation, braking, propulsion auxiliaries, car weight, pantograph, and air compressor.

Other volumes of this program are: Volume 1: Component Testing (PB 244-048); Volume 3: Acceptance Testing (PB 244-050); Volume 4: Simulated Demonstration Test (PB 244-051); and Volume 5: Postrepair Testing (PB 244-052). The order number and price for the entire set of five reports is PB 244-047-SET, \$26.00.

NTIS ORDER NO.: PB 244-049/AS

PRICE: \$5.75

TITLE: STATE-OF-THE-ART CAR DEVELOPMENT PROGRAM FINAL TEST REPORT
Volume 3: Acceptance Testing

AUTHOR: Boeing Vertol Company (Philadelphia, Pennsylvania)

DATE: April 1974

PROJECT NO.: IT-06-0026

KEYWORDS:

- | | |
|--------------------------------------|-----------------------|
| 1. Rail, Rolling Stock | 6. Testing Facilities |
| 2. Rail, Systems and Planning Design | 7. Safety |
| 3. Rail, Commuter | 8. SOAC |
| 4. Rail, Materials | |
| 5. Vehicle, Design | |
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The Urban Rapid Rail Vehicle and Systems Program is an integrated development program directed toward improving high-speed, frequent-stop urban rail systems. The overall objective is to enhance the attractiveness of rail transportation to the urban traveller by providing service that is as comfortable, reliable, safe and economical as possible.

The objective of the State-of-the-Art Car (SOAC) is to demonstrate the best state-of-the-art in rapid rail car design with two new improved cars using existing proven technology. Primary goals for the cars are passenger convenience and operating efficiency.

This document, Volume 3 of the SOAC Final Test Report, presents the test results for the vehicle acceptance testing of two state-of-the-art transit cars. All performance, ride quality, noise and electromagnetic interference (EMI) acceptance tests were conducted by Boeing Vertol Company, St Louis Car Division, and GSI Casting Division of General Steel Industries, Inc. at the DOT High Speed Ground Test Center at Pueblo, Colorado.

Chapters contain a summary of test results, configuration, test equipment and instrumentation, test procedures, test results, and conclusions. Appendices are: Test Run Log (Test Runs 001-092 and 130, 131, 133); Test Data Sheets - Performance, Ride Quality, Noise and EMI Tests; Ride Quality Test Report - D174-10025-1; and Electromagnetic Interference Test Report (WO 1152-T).

Other volumes of the SOAC Final Test Report are: Volume 1: Component Testing (PB 244-048/AS); Volume 2: Subsystem Functional Testing (PB 244-049/AS); Volume 4: Simulated Demonstration Test (PB 244-051/AS); and Volume 5: Postrepair Testing (PB 244-052). The order number and price for the entire set of five volumes is: PB 244-047-SET/AS, \$26.00.

NTIS ORDER NO.: PB 244-050/AS

PRICE: \$8.75

TITLE: STATE-OF-THE-ART CAR DEVELOPMENT PROGRAM FINAL TEST REPORT
Volume 4: Simulated Demonstration Test

AUTHOR: Boeing Vertol Company (Philadelphia, Pennsylvania)

DATE: October 1974

PROJECT NO.: IT-06-0026

KEYWORDS:

- | | |
|--------------------------------------|-----------------------|
| 1. Rail, Rolling Stock | 6. Testing Facilities |
| 2. Rail, Systems and Planning Design | 7. Safety |
| 3. Rail, Commuter | 8. SOAC |
| 4. Rail, Materials | |
| 5. Vehicle, Design | |
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The Urban Rapid Rail Vehicle and Systems Program is an integrated development program directed toward improving high-speed, frequent-stop urban rail systems. The overall objective is to enhance the attractiveness of rail transportation to the urban traveller by providing service that is as comfortable, reliable, safe and economical as possible.

The objective of the State-of-the-Art Car (SOAC) is to demonstrate the best state-of-the-art in rapid rail car design with two new improved cars using existing proven technology. Primary goals for the cars are passenger convenience and operating efficiency.

A Simulated Demonstration Test of the SOAC two-car train was conducted at the DOT High Speed Ground Test Center in Pueblo, Colorado. The purpose of this test was to enhance the probability of trouble-free operation of the SOAC in demonstrations to be held for the riding public in the cities of New York, Boston, Chicago, Cleveland, and Philadelphia.

The demonstration profile was set up as a composite of the five demonstration city routes. The objectives of the test were: 1) to seek out any remaining equipment problems; and 2) to validate maintenance plans and procedures to be used during operation of the SOAC in the demonstration cities. In accomplishing these objectives, a goal of 3,000 miles was set for each car, a total of 6,000 car miles in a two-week period.

Other volumes of the SOAC Final Test Report are: Volume 1: Component Testing (PB 244-048/AS); Volume 2: Subsystem Functional Testing (PB 244-049/AS); Volume 3: Acceptance Testing (PB 244-050/AS); and Volume 5: Postrepair Testing (PB 244-052/AS). The order number and price for the entire set of five reports is: PB 244-047-SET/AS, \$26.00.

NTIS ORDER NO.: PB 244-051/AS

PRICE: \$3.75

TITLE: STATE-OF-THE-ART CAR DEVELOPMENT PROGRAM FINAL TEST REPORT
Volume 5: Postrepair Testing

AUTHOR: Boeing Vertol Company (Philadelphia, Pennsylvania)

DATE: December 1974

PROJECT NO.: IT-06-0026

KEYWORDS:

- | | |
|--------------------------------------|-----------------------|
| 1. Rail, Rolling Stock | 6. Testing Facilities |
| 2. Rail, Systems and Planning Design | 7. Safety |
| 3. Rail, Commuter | 8. SOAC |
| 4. Rail, Materials | |
| 5. Vehicle, Design | |
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The Urban Rapid Rail Vehicle and Systems Program is an integrated development program directed toward improving high-speed, frequent-stop urban rail systems. The overall objective is to enhance the attractiveness of rail transportation to the urban traveller by providing service that is as comfortable, reliable, safe and economical as possible.

The objective of the State-of-the-Art Car (SOAC) is to demonstrate the best state-of-the-art in rapid rail car design with two new improved cars using existing proven technology. Primary goals for the cars are passenger convenience and operating efficiency.

This document presents the test results for postrepair testing of the SOAC. The purpose of these tests was to show compliance with the SOAC Detail Specification (PB 222-147/AS) following repairs to the Number 2 car damaged in an accident on August 11, 1973 at the DOT High Speed Ground Test Center, Pueblo, Colorado and to complete the simulated demonstration testing which had been interrupted by the accident.

Chapters present configuration, instrumentation, test procedures, test results and conclusions. References are furnished and the appendix contains Acceptance Tests and Subsystem Functional Test Data Sheets.

Other volumes of the SOAC Final Test Report are: Volume 1: Component Testing (PB 244-048/AS); Volume 2: Subsystem Functional Testing (PB 244-049/AS); Volume 3: Acceptance Testing (PB 244-050/AS); and Volume 4: Simulated Demonstration Test (PB 244-051/AS). The order number and price for the entire set of five reports is: PB 244-047-SET/AS, \$26.00

NTIS ORDER NO.: PB 244-052/AS

PRICE: \$4.25

TITLE: URBAN RAPID RAIL VEHICLE AND SYSTEMS PROGRAM
Annual Report, July 1974

AUTHOR: Boeing Vertol Company

DATE: July 1974

PROJECT NO.: IT-06-0026

KEYWORDS: 1. Rail, Automatic Control 6. SOAC
 2. BART 7. Transit User Comfort
 3. Rail, Systems & Planning 8. Safety
 Design 9. Economics
 4. Rail, Commuter
 5. Rail, Rapid Transit

This report reviews the third year's efforts of UMTA's Urban Rapid Rail Vehicle and Systems Program. The objective of the Program is to enhance the attractiveness of rail rapid transit to the urban traveler by providing transit vehicles that are as comfortable, reliable, safe, and economical as possible.

The eight separate tasks performed under the program are: Program Management; BART Review; State-of-the-Art Car (SOAC); Advance Concept Train R&D (ACT-1); Advanced Subsystem Development Program (ASDP-formerly ACT-2); Advanced Concept Train Operational Demonstration Planning (ACT-3); Economic Analysis; and, Human Factor Analysis.

Accomplishments for the year ending June 1974 included the following: completion of the review of BART data; completion of the SOAC test and simulated demonstrations programs at the High Speed Ground Test Center, Pueblo, Colorado; and completion of SOAC demonstration runs on the NYCTA lines. The ACT-1 program progressed to the award of a contract for the design and construction of ACT-1 train. A list of candidate subsystems has been proposed for test and development under the ASDP.

Related documents are the first Annual Report, July 1972 (PB 212-848), Annual Report, July 1973 (PB 222-141), and Annual Report, July 1974 (PB 245-310).

NTIS ORDER NO.: PB 245-310/AS

PRICE: \$5.50

TITLE: URBAN RAPID RAIL VEHICLE AND SYSTEMS PROGRAM
Annual Report, July 1975

AUTHOR: Boeing Vertol Company

DATE: July 1975

PROJECT NO.: IT-06-0026

KEYWORDS:

- | | |
|--------------------------------------|-------------------------|
| 1. SOAC | 6. Transit User Comfort |
| 2. Rail, Commuter | 7. Safety |
| 3. Rail, Rapid Transit | |
| 4. Vehicle, Design | |
| 5. Rail, Systems and Planning Design | |
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This report reviews the fourth year's efforts of the Urban Mass Transportation Administration's Urban Rapid Rail Vehicle and Systems Program. The objective of the Program is to enhance the attractiveness of rail rapid transit to the urban traveler by providing him with transit vehicles that are as comfortable, reliable, safe, and economical as possible.

Accomplishments for the year ending June 1975 included the following: completion of the five-city test and evaluation of the SOAC cars; ACT-1 program progress from the preliminary design phase through the award of major equipment subcontracts by AiResearch, to delivery of initial test hardware; completion of a plan for the implementation of the Advanced Subsystems Development Program consisting of the integration of a self-synchronous brake into the SOAC cars; and preparation of Subsystem specifications for the Transit Authority Participation portion of the Advanced Subsystem Development Program

Related documents are the Annual Report, July 1972 (PB 212-848), Annual Report, July 1973 (PB 222-141), Annual Report, July 1974 (PB 245-310).

NTIS ORDER NO.: PB 254-727/AS

PRICE: \$5.50

TITLE: URBAN RAPID RAIL VEHICLE AND SYSTEMS PROGRAM
Annual Report October 1976

AUTHOR: Boeing Vertol Company
Surface Transportation Systems Department

DATE: October 1976

PROJECT NO.: IT-06-0026

KEYWORDS:

- | | |
|---|--------------------------------------|
| 1. BART | 5. Transit User Comfort |
| 2. Rail, Rapid Transit | 6. Safety |
| 3. Rail, Systems and
Planning Design | 7. Ridership, Attraction |
| 4. SOAC | 8. Urban Development and
Planning |
-

This Annual Report reviews the fifth year's efforts of UMTA's Urban Rapid Rail Vehicle and Systems Program. Three major hardware tasks were active during this reporting period: State-of-the-Art Car (SOAC), Advanced Concept Train R&D (ACT-1), and Advanced Subsystem Development Program (ASDP). The objective of this program is to enhance the attractiveness of rail rapid transit to the urban traveler by providing transit vehicles that are as comfortable, reliable, safe, and economical as possible.

Accomplishments for the year ending September 1976 include the following: completed arrangements to further extend the operational demonstration of the SOAC vehicles to include nine months of revenue service on the Lindenwold High-Speed Line of PATCO; the design, development, testing, and fabrication portions of the ACT-1 program are in the final stages with delivery of the first vehicle to DOT Transportation Test Center, Pueblo, Colorado, scheduled for February 1977. The second vehicle delivery is scheduled for March 1977; the ASDP was initiated in October 1975 with a subcontract award to Delco Electronics for the design, fabrication and test of the truck, and WABCO was awarded a subcontract in February 1976 for the design, fabrication, and test of the Synchronous Brake System.

Related documents are the Annual Report, July 1972 (PB 212-848) Annual Report, July 1973 (PB 222-141), Annual Report, July 1974 (PB 245-310), and Annual Report, July 1975 (PB 254-727).

NTIS ORDER NO.: PB 266-096/AS

PRICE: \$6.00

TITLE: BUS INTERIOR DESIGN FOR IMPROVED SAFETY

AUTHOR: Booz, Allen Applied Research

DATE: April 1976

PROJECT NO.: IT-06-0029

KEYWORDS:

1. Safety
 2. Bus
 3. Bus, Transbus
 4. Bus, Design
-

This report describes the results of a thorough project of testing and analysis directed at finding solutions to the problem of on-board accidents on transit buses. It was conducted as part of the Transbus program and deals primarily with passenger falls on board buses.

Accident statistics are discussed with respect to the on-board accident problem, the on-board accident scenario, interior hazards and potential design changes, and the deceleration problem. A comparison of the risk of on-board accidents to other everyday human risks is presented.

An on-board accident test procedure was developed based upon knowledge gained from the accident data analysis. This human factors test procedure is described in detail, in terms of the following: test objectives, detailed test procedures, data analysis procedures.

The general test results, a comparison of the test results for the Transbus prototypes, and significant conclusions for urban transit bus safety are presented. This report does not deal with severe crashes of buses, the crash-worthiness of buses, the overall safety aspects involved in the interior and exterior design of transit buses, or the human factors and safety problems of the elderly and handicapped.

NTIS ORDER NO.: PB 252-253/AS

PRICE: \$4.50

TITLE: CHARACTERISTICS OF URBAN TRANSPORTATION SYSTEMS
A Handbook for Transportation Planners

AUTHOR: DeLeuw, Cather & Company
The Urban Institute

DATE: May 1975 PROJECT NO.: IT-06-0049

KEYWORDS:

1. Planning, Tools	6. People Movers
2. Rail	7. Pedestrians
3. Bus	8. Urban Development and Planning
4. Private Transportation, Auto	
5. Modal Split	

The objective of this handbook, specifically for use by transportation planners in the evaluation of alternative systems, is to provide a single simplified reference source which characterizes the most important (from the standpoint of evaluation) performance characteristics of the following contemporary urban transportation systems: (1) rail (commuter, rapid, and light); (2) local bus and bus rapid transit; (3) automobile-highway system (automobiles and other vehicles); (4) pedestrian assistance systems; and (5) activity center systems---people mover systems that have been installed at airports, zoos, amusement parks, etc.

The handbook assesses only the supply or performance aspect of urban transportation dealing with passenger demand implicitly in that demand itself sometimes dictates supply characteristics (e.g., operating cost). The seven supply parameters chosen and studied are: speed, capacity (service volume), operating cost (vehicle), energy consumption (vehicle or source), pollution, capital cost, and accident frequency.

The material presented is organized as a series of independent self-descriptive tables dealing with the conventional transport modes mentioned. Each of the transport modes is organized in its own chapter according to the supply parameters. Furthermore, each parameter is constructed to present three levels of detail specifically designed to assist the urban planner in characterizing a particular transport mode. These levels include: default value, range of values, and theoretical values.

References, a bibliography, and a list of key terms and their definitions are provided.

NTIS ORDER NO.: PB 245-809/AS

PRICE: \$7.50

TITLE: SOFTWARE SYSTEMS DEVELOPMENT PROGRAM/
UMODEL USER'S GUIDE WITH CASE STUDIES

AUTHOR: R.H. Pratt Associates, Inc.
(G.W. Schultz)

DATE: February 1976

PROJECT NO.: IT-06-0050

KEYWORDS:

1. Models and Modeling
 2. Computer Applications
 3. Planning, Tools
 4. Guides and Guidance
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This manual is written to serve as a guide for the transportation planning analyst in the use of the program UMODEL. The manual assumes a basic knowledge of transportation planning and assumes that program documentation is available which will serve as the primary reference for applying program UMODEL. Additional and more detailed explanation is necessary, however, for UMODEL's wide array of potential input data formats and reporting capabilities as well as several optional user coded subroutines which allow the user to manipulate input data. Explicit documentation for applying these capabilities and subroutines would be voluminous and difficult to use if incorporated in the program user documentation. In addition, UMODEL is written with a built-in travel demand model which can be applied without any need for user-coded subroutines. This feature also requires additional explanation for complete understanding of the model. Finally, the manual demonstrates methods for use which may aid the analyst to heuristically apply UMODEL for forecasting trips and evaluating transportation system alternatives.

The report is divided into two sections. The first section describes the default model and contains a general description of program UMODEL and discusses program formats and potential output files and reports. Six case studies illustrate its application. For the reader who wishes to know what the program is and what it can do, this first section should suffice. The second section describes methods of application and uses a comprehensive series of case studies to illustrate these methods. Each case study includes a description of the problem to be solved and a list of the input data, necessary subroutine(s) and a listing of the complete UMODEL run.

NTIS ORDER NO.: PB 258-320/AS

PRICE: \$10.00

TITLE: UMTA TRANSPORTATION PLANNING SYSTEM REFERENCE MANUAL

AUTHOR: Urban Mass Transportation Administration (UMTA)
Planning Methodology and Technical Support Division

DATE: June 1975

PROJECT NO.: IT-06-0050

KEYWORDS:

1. Computer Applications
 2. Computer Programming
 3. Codes & Coding
 4. Planning, Tools
 5. Urban Development and Planning
-

Developed by the Urban Mass Transportation Administration, the UMTA Transportation Planning System (UTPS) is a collection of IBM System/360-370 computer programs for use in planning multi-modal urban transportation systems. The objective of UTPS is to provide transportation planners with readily available, tested, and easy to use planning tools.

This document summarizes information on the function and use of the UTPS programs. It discusses general program operations and contains each individual program's operating instructions. This manual also describes all UTPS data sets and explains how UTPS is installed at a user's computing facility.

Sections include system control statements, subject program control statements, program writeup organization, software system description, data file formats, cataloged procedures, and program writeups.

NTIS ORDER NO.: PB 246-187/AS

PRICE: \$12.75

TITLE: OPERATIONS OF SMALL BUSES IN URBAN TRANSIT SERVICE IN THE UNITED STATES
Small Transit Bus Requirements Study

AUTHOR: RRC International, Inc.

DATE: July 1975

PROJECT NO.: IT-06-0074

KEYWORDS:

1. Bus, Small

The Small Bus Project is a six-phase program designed to insure that final vehicle specifications would evolve from a comprehensive analysis of all aspects of the operating environment and thus have a broad applicability. The Small Bus Project is presented in six separate reports.

This report, Operation of Small Buses in Urban Transit Service in the United States, investigates the operating environment of small buses in the U.S. and relates them to vehicle requirements.

PB 269-393/AS \$6.75

The remainder of the study is made up of the following reports:

Bus Characteristics Needed for Elderly and Handicapped in Urban Travel

PB 269-394/AS \$5.00

Operating Profiles and Small Bus Performance Requirements in Urban Transit Service

PB 269-395/AS \$4.00

Guidelines for the Design of Future Small Transit Buses and Bus Stops to Accommodate the Elderly and Handicapped

PB 269-396/AS \$4.50

General and Performance Specifications for a Small Urban Transit Bus

PB 269-397/AS \$6.00

Small Transit Bus Requirements Study

PB 269-398/AS \$5.50

NTIS ORDER NO.: PB 269-392/AS-SET OF SIX PRICE: \$25.00

TITLE: BUS CHARACTERISTICS NEEDED FOR ELDERLY AND HANDICAPPED
IN URBAN TRAVEL
Small Transit Bus Requirements Study

AUTHOR: RRC International, Inc.

DATE: March 1976

PROJECT NO.: IT-06-0074

KEYWORDS:

1. Bus, Small
 2. Bus, Design
 3. Elderly
 4. Handicapped
-

The Small Bus Project is a six-phase program designed to insure that final vehicle specifications would evolve from a comprehensive analysis of all aspects of the operating environment and thus have a broad applicability. It is presented in six separate reports.

This report, Bus Characteristics Needed for Elderly and Handicapped in Urban Travel, outlines the constraints imposed on bus design by the elderly and handicapped with respect to the major bus features such as steps, handrails, wheelchair ramps/lifts, restraints, handholds, and seats.

PB 269-394/AS \$5.00

The remainder of the study is made up of the following reports:

Operations of Small Buses in Urban Transit Service in the United States

PB 269-394/AS \$5.00

Operating Profiles and Small Bus Performance Requirements in Urban Transit Service

PB 269-395/AS \$4.00

Guidelines for the Design of Future Small Transit Buses and Bus Stops to Accommodate the Elderly and Handicapped

PB 269-396/AS \$4.50

General and Performance Specifications for a Small Urban Transit Bus

PB 269-397/AS \$6.00

Small Transit Bus Requirements Study

PB 269-398/AS \$5.50

NTIS ORDER NO.: PB 269-392/AS-SET OF SIX

PRICE: \$25.00

TITLE: OPERATING PROFILES AND SMALL BUS PERFORMANCE REQUIREMENTS
IN URBAN TRANSIT SERVICE
Small Transit Bus Requirements Study

AUTHOR: RRC International, Inc.

DATE: December 1976

PROJECT NO.: IT-06-0074

KEYWORDS:

1. Bus, Small

The Small Bus Project is a six-phase program designed to insure that final vehicle specifications would evolve from a comprehensive analysis of all aspects of the operating environment and thus have a broad applicability. It is presented in six separate reports.

This report, Operating Profiles and Small Bus Performance Requirements in Urban Transit Service, builds upon the data base of the previous references to develop a set of operating profiles and service requirements as the basis for specifications for a new small urban transit bus to meet the identified operational needs.

PB 269-395/AS \$4.00

The remainder of the study is made up of the following reports:

Operations of Small Buses in Urban Transit Service in the United States

PB 269-393/AS \$6.75

Bus Characteristics Needed for Elderly and Handicapped in Urban Travel

PB 269-394/AS \$5.00

Guidelines for the Design of Future Small Transit Buses and Bus Stops to Accommodate the Elderly and Handicapped

PB 269-396/AS \$4.50

General and Performance Specifications for a Small Urban Transit Bus

PB 269-397/AS \$6.00

Small Transit Bus Requirements Study

PB 269-398/AS \$5.50

NTIS ORDER NO.: PB 269-392/AS-SET OF SIX

PRICE: \$25.00

TITLE: GUIDELINES FOR THE DESIGN OF FUTURE SMALL TRANSIT BUSES AND
BUS STOPS TO ACCOMMODATE THE ELDERLY AND HANDICAPPED
Small Transit Bus Requirements Study

AUTHOR: RRC International, Inc.

DATE: March 1977

PROJECT NO.: IT-06-0074

KEYWORDS:

1. Bus, Design
2. Bus, Small
3. Bus, Stations and Shelters
4. Elderly
5. Handicapped
6. Guides and Guidance

The Small Bus Project is a six-phase program designed to insure that final vehicle specifications would evolve from a comprehensive analysis of all aspects of the operating environment and thus have a broad applicability. It is presented in six separate reports.

This report, Guidelines for the Design of Future Small Transit Buses and Bus Stops to Accommodate the Elderly and Handicapped, presents scenarios for the future uses and markets of small urban buses, as well as the conceptual design for three vehicle configurations to assess the feasibility of meeting the design requirements. The result is a set of design guidelines for the vehicles.

PB 269-396/AS \$4.50

The remainder of the study is made up of the following reports:

Operations of Small Buses in Urban Transit Service in the United States

PB 269-393/AS \$6.75

Bus Characteristics Needed for Elderly and Handicapped in Urban Travel

PB 269-394/AS \$5.00

Operating Profiles and Small Bus Performance Requirements in Urban Transit Service

PB 269-395/AS \$4.00

General and Performance Specifications for a Small Urban Transit Bus

PB 269-397/AS \$6.00

Small Transit Bus Requirements Study

PB 269-398/AS \$5.50

NTIS ORDER NO.: PB 269-392/AS-SET OF SIX PRICE: \$25.00

TITLE: GENERAL AND PERFORMANCE SPECIFICATIONS FOR A SMALL
URBAN TRANSIT BUS
Small Transit Bus Requirements Study

AUTHOR: RRC International, Inc.

DATE: December 1976

PROJECT NO.: IT-06-0074

KEYWORDS:

1. Bus, Small
 2. Bus, Design
 3. Demand Responsive Systems
 4. Bus, Transbus
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The Small Bus Project is a six-phase program designed to insure that final vehicle specifications would evolve from a comprehensive analysis of all aspects of the operating environment and thus have a broad applicability. It is presented in six separate reports.

This report, General and Performance Specifications for a Small Urban Transit Bus, includes an Executive Summary which presents the major differences between Transbus and the Small Bus General and Performance Specifications. It also presents requirements for an advanced design coach which may be used for both demand-responsive service and general service on urban arterial streets.

PB 269-397/AS \$6.00

The remainder of the study is made up of the following reports:

Operations of Small Buses in Urban Transit Service in the United States

PB 269-393/AS \$6.75

Bus Characteristics Needed for Elderly and Handicapped in Urban Travel

PB 269-394/AS \$5.00

Operating Profiles and Small Bus Performance Requirements in Urban Transit Service

PB 269-395/AS \$4.00

Guidelines for the Design of Future Small Transit Buses and Bus Stops to Accommodate the Elderly and Handicapped

PB 269-396/AS \$4.50

Small Transit Bus Requirements

PB 269-398/AS \$5.50

NTIS ORDER NO.: PB 269-392/AS-SET OF SIX PRICE: \$25.00

TITLE: SMALL TRANSIT BUS REQUIREMENTS STUDY
Summary

AUTHOR: RRC International, Inc.

DATE: March 1977

PROJECT NO.: IT-06-0074

KEYWORDS:

- | | |
|-------------------------------|------------------------------|
| 1. Bus, Design | 5. Handicapped |
| 2. Bus, Small | 6. Demand Responsive Systems |
| 3. Bus, Stations and Shelters | |
| 4. Elderly | |

The Small Bus Project is a six-phase program designed to insure that final vehicle specifications would evolve from a comprehensive analysis of all aspects of the operating environment and thus have a broad applicability. It is presented in six separate reports.

This report, Small Transit Bus Requirements Study, Summary, summarizes the findings presented in five separate interim project reports. It also contains a list of guidelines for the performance specifications as well as an overview of the Small Bus Project.

PB 269-398/AS \$5.50

The remainder of the study is made up of the following reports:

Operations of Small Buses in Urban Transit Service in the United States

PB 269-393/AS \$6.75

Bus Characteristics Needed for Elderly and Handicapped in Urban Travel

PB 269-394/AS \$5.00

Operating Profiles and Small Bus Performance Requirements in Urban Transit Service

PB 269-395/AS \$4.00

Guidelines for the Design of Future Small Transit Buses and Bus Stops to Accommodate the Elderly and Handicapped

PB 269-396/AS \$4.50

General and Performance Specifications for a Small Urban Transit Bus

PB 269-397/AS \$6.00

NTIS ORDER NO.: PB 269-392/AS-SET OF SIX

PRICE: \$25.00

TITLE: A PROGRAM FOR IMPROVING TRANSIT INDUSTRY
MANAGEMENT INFORMATION SYSTEMS
Final Report

AUTHOR: Arthur Andersen & Company
(M.E. Simon, et al.)

DATE: September 1976

PROJECT NO.: IT-06-0094

KEYWORDS:

1. Reporting System
2. Information Aids
3. Management, Planning
and Analysis
4. Transportation Systems Management
5. Planning, Tools

Task V, of what is now known as the Section 15 Reporting System (formerly Project FARE), consists of: the development of the processes and procedures necessary to implement the Uniform System of Accounts and Records and Reporting System required by the UMTA Act of 1964, as amended (Subtask 2); and, the UMTA program designed to improve transit industry internal management systems (Subtask 1). Both subtasks are presented under a separate set of project reports.

This report (Subtask 1, Task 5-Section 15 Reporting System) presents an internal management systems improvement plan for the urban mass transit industry. It contains for both UMTA and individual transit properties the approaches, design concepts, work steps, and related reference materials needed to plan, develop, and implement the particular systems necessary to upgrade and modernize the industry's current management information systems. This final report is presented in the following 3 volumes:

Volume I: Information Systems Improvement Plan Summary consists of three sections. Section 1 provides an overview of the transit industry; Section 2 presents a proposed set of systems projects for UMTA sponsorship based on criteria herein; and Section 3 presents a methodology and process for individual transit properties to follow in their systems planning activities. PB 264-524/AS, \$5.00.

Volume II: Systems Development Work Programs contains work programs for UMTA and transit properties to use in their respective systems development and implementation efforts. PB 264-525/AS, \$7.50.

Volume III: Systems Design Reference Manual contains descriptions of various system components which together comprise an integrated transit management information system. This volume also contains a compendium of management responsibilities and associated information needs which can provide a starting point for individual properties systems planning efforts. PB 264-526/AS, \$7.75.

NTIS ORDER NO.: PB 264-523/AS-SET

PRICE: \$17.50

TITLE: A PROGRAM FOR IMPROVING TRANSIT INDUSTRY MANAGEMENT
INFORMATION SYSTEMS
Volume I: Information Systems Improvement Plan Summary

AUTHOR: Arthur Andersen & Company
(M.E. Simon, et al.)

DATE: September 1976

PROJECT NO.: IT-06-0094

KEYWORDS:

1. Reporting System
 2. Information Aids
 3. Management, Planning
and Analysis
 4. Planning, Tools
 5. Transportation Systems Management
-

This Task V of Project FARE (Financial Accounting and Reporting Elements) is a response to the internal needs of the transit industry, just as Task IV of Project FARE is a response to the external needs (Uniform reporting system) of the transit industry.

This report presents an internal management systems improvement plan for the urban mass transit industry. It is the final report of a series of three reports which develop a transit management information systems improvement program. This final report is presented in three volumes. This volume, Volume I, consists of three sections: Section 1 provides an overview of the transit industry; Section 2 presents a proposed set of systems projects for UMTA sponsorship based on criteria herein; and Section 3 presents a methodology and process for individual transit properties to follow in their systems planning activities.

The other volumes of this project are the following: Volume II: Systems Development Work Programs (PB 264-525); and Volume III: Systems Design Reference Manual (PB 264-526). The NTIS order number and price for this set of 3 volumes is PB 264-525/AS, \$17.50.

NTIS ORDER NO.: PB 264-524/AS

PRICE: \$5.00

TITLE: A PROGRAM FOR IMPROVING TRANSIT INDUSTRY MANAGEMENT
INFORMATION SYSTEMS
Volume II: Systems Development Work Programs

AUTHOR: Arthur Andersen & Company
(M.E. Simon, et al.)

DATE: September 1976

PROJECT NO.: IT-06-0094

KEYWORDS:

- | | |
|---|--------------------------------------|
| 1. Reporting System | 4. Transportation Systems Management |
| 2. Information Aids | 5. Planning, Tools |
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The other volumes of this project are the following: Volume I: Information Systems Improvement Plan Summary (PB 264-524); and Volume III: Systems Design Reference Manual (PB 264-526). The NTIS order number and price for this set of 3 volumes is PB 264-523, \$17.50.

NTIS ORDER NO.: PB 264-525/AS

PRICE: \$7.50

TITLE: A PROGRAM FOR IMPROVING TRANSIT INDUSTRY MANAGEMENT
INFORMATION SYSTEMS
Volume III: Systems Design Reference Manual —

AUTHOR: Arthur Andersen & Company
(M.E. Simon, et al.)

DATE: September 1976

PROJECT NO.: IT-06-0094

KEYWORDS:

- | | |
|---|--------------------------------------|
| 1. Reporting System | 4. Transportation Systems Management |
| 2. Information Aids | 5. Planning, Tools |
| 3. Management, Planning
and Analysis | |

This Task V of Project FARE (Financial Accounting and Reporting Elements) is a response to the internal needs of the transit industry, just as Task IV of Project FARE is a response to the external needs (Uniform reporting system) of the transit industry.

This report presents an internal management systems improvement plan for the urban mass transit industry. It is the final report of a series of three reports which develop a transit management information systems improvement program. This final report is presented in three volumes. This volume, Volume III, contains descriptions of various system components which together comprise an integrated transit management information system. This volume also contains a compendium of management responsibilities and associated information needs which can provide a starting point for individual properties systems planning efforts.

The other volumes of this project are the following: Volume I: Information Systems Improvement Plan Summary (PB 264-524); and Volume II: Systems Development Work Programs (PB 264-525). The NTIS order number and price for this set of 3 volumes is PB 264-523, \$17.50.

NTIS ORDER NO.: PB 264-526/AS

PRICE: \$7.75

TITLE: URBAN MASS TRANSPORTATION INDUSTRY UNIFORM SYSTEM OF ACCOUNTS
AND RECORDS AND REPORTING SYSTEM
Volume I: General Description

AUTHOR: Arthur Andersen & Company
(M. Simon, et al.)

DATE: January 1977

PROJECT NO.: IT-06-0094

KEYWORDS:

1. Accounts and Accounting
 2. Financing Mass Transportation,
Requirements
 3. Reporting System
-

The purpose of this report is to present and document the detailed features of the uniform system of accounts and records and reporting system required by Section 15 of the Urban Mass Transportation Act of 1964, as amended.

This report is presented in four volumes:

Volume I: GENERAL DESCRIPTION presents an overview of the systems, and an identification of the analytical potential provided by comparative data generated by the system.

Volume II: UNIFORM SYSTEM OF ACCOUNTS AND RECORDS contains the definitions for the uniform system of accounts and records. Modes of transit service subject to this Section 15 system are also defined in this volume.

Volume III: REPORTING SYSTEM FORMS AND INSTRUCTIONS-REQUIRED contains illustrative forms for each of the reports required to be submitted under Section 15 and instructions for completing these forms.

Volume IV: REPORTING SYSTEM FORMS AND INSTRUCTIONS-VOLUNTARY contains illustrative forms and instructions for optional revenue and expense reporting. The voluntary reports in Volume IV are more detailed than their counterparts in Volume III. Operators may elect one or more of the optional reports in Volume IV in place of counterpart reports in Volume III.

The NTIS order number and price for this set of 4 volumes is PB 264-876/AS, \$22.50.

NTIS ORDER NO.: PB 264-877/AS

PRICE: \$4.50

TITLE: URBAN MASS TRANSPORTATION INDUSTRY UNIFORM SYSTEM OF ACCOUNTS
AND RECORDS AND REPORTING SYSTEM
Volume II: Uniform System of Accounts and Records

AUTHOR: Arthur Andersen & Company
(M. Simon, et al.)

DATE: January 1977

PROJECT NO.: IT-06-0094

KEYWORDS:

1. Accounts and Accounting
 2. Financing Mass Transportation,
Requirements
 3. Reporting System
-

The purpose of this report is to present and document the detailed features of the uniform system of accounts and records and reporting system required by Section 15 of the Urban Mass Transportation Act of 1964, as amended.

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The NTIS order number and price for this set of 4 volumes is PB 264-876/AS, \$22.50.

NTIS ORDER NO.: PB 264-878/AS

PRICE: \$9.00

TITLE: URBAN MASS TRANSPORTATION INDUSTRY UNIFORM SYSTEM OF ACCOUNTS
AND RECORDS AND REPORTING SYSTEM
Volume IV: Reporting System Forms and Instruction-Voluntary

AUTHOR: Arthur Andersen & Company
(M. Simon, et al.)

DATE: January 1977

PROJECT NO.: IT-06-0094

KEYWORDS:

1. Accounts and Accounting
 2. Financing Mass Transportation,
Requirements
 3. Reporting System
-

The purpose of this report is to present and document the detailed features of the uniform system of accounts and records and reporting system required by Section 15 of the Urban Mass Transportation Act of 1964, as amended.

This report is presented in four volumes:

Volume I: GENERAL DESCRIPTION presents an overview of the systems, and an identification of the analytical potential provided by comparative data generated by the system.

Volume II: UNIFORM SYSTEM OF ACCOUNTS AND RECORDS contains the definitions for the uniform system of accounts and records. Modes of transit service subject to this Section 15 system are also defined in this volume.

Volume III: REPORTING SYSTEM FORMS AND INSTRUCTIONS-REQUIRED contains illustrative forms for each of the reports required to be submitted under Section 15 and instructions for completing these forms.

Volume IV: REPORTING SYSTEM FORMS AND INSTRUCTIONS-VOLUNTARY contains illustrative forms and instructions for optional revenue and expense reporting. The voluntary reports in Volume IV are more detailed than their counterparts in Volume III. Operators may elect one or more of the optional reports in Volume IV in place of counterpart reports in Volume III.

The NTIS order number and price for this set of 4 volumes is PB 264-876/AS, \$22.50.

NTIS ORDER NO.: PB 264-879/AS

PRICE: \$4.50

TITLE: URBAN MASS TRANSPORTATION INDUSTRY UNIFORM SYSTEM OF ACCOUNTS
AND RECORDS AND REPORTING SYSTEM
Volume IV: Reporting System Forms and Instruction-Voluntary

AUTHOR: Arthur Andersen & Company
(M. Simon, et al.)

DATE: January 1977

PROJECT NO.: IT-06-0094

KEYWORDS:

1. Accounts and Accounting
2. Financing Mass Transportation,
Requirements
3. Reporting System

The purpose of this report is to present and document the detailed features of the uniform system of accounts and records and reporting system required by Section 15 of the Urban Mass Transportation Act of 1964, as amended.

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Volume IV: REPORTING SYSTEM FORMS AND INSTRUCTIONS-VOLUNTARY contains illustrative forms and instructions for optional revenue and expense reporting. The voluntary reports in Volume IV are more detailed than their counterparts in Volume III. Operators may elect one or more of the optional reports in Volume IV in place of counterpart reports in Volume III.

The NTIS order number and price for this set of 4 volumes is PB 264-876/AS, \$22.50.

NTIS ORDER NO.: PB 264-880/AS

PRICE: \$5.00

TITLE: LIGHT RAIL TRANSIT: STATE OF THE ART REVIEW

AUTHOR: DeLeuw, Cather & Company
(E. S. Diamant, et al)

DATE: Spring 1976

PROJECT NO.: IT-06-0103

KEYWORDS:

1. Rail, Light
2. Planning
3. Rail, Cost
4. Rail, Stations and Terminals
5. Right-of-Way

A fundamental objective of this report is to establish a common level of understanding of Light Rail Transit (LRT) among transit planners, community leaders, and decision-makers at various levels of government. In this report contemporary planning concepts of LRT are reviewed, and an outline is provided of the types of guideway, hardware and methods of operation of light rail systems.

The basic approach of the report is to consolidate the available information on LRT from European and North American experience. Descriptions of a number of relevant systems are presented, and those experiences which may be applicable in the U.S. are identified. Major factors influencing evolution of LRT in Europe and the U.S. are examined, as is the spectrum of applications open to LRT.

Descriptions and comparisons of LRT vehicles, stations and rights-of-way are presented with emphasis on the advantages and limitations of the various options. A general comparison of LRT operating characteristics is presented, including speed, reliability, capacity, safety, selected environmental impacts, energy consumption, and compatibility with other transit modes. Operating and management techniques used to upgrade LRT and improve efficiency and quality of service are examined.

The costs of implementing LRT systems, both capital and operating, are identified. Particular attention is given to the capital cost consequences of alternative operating and right-of-way strategies, because they greatly affect the total cost per route mile. A comparison of LRT operating characteristics and costs with those of other modes is presented.

NTIS ORDER NO.: PB 256-821/AS

PRICE: \$9.75

TITLE: STUDY OF FUTURE PARATRANSIT REQUIREMENTS
EXECUTIVE SUMMARY

AUTHOR: Alan M. Voorhees and Associates, Inc.

DATE: February 1977

PROJECT NO.: IT-06-0104

KEYWORDS:

1. Demand Responsive Systems
 2. Paratransit
 3. Taxis
-

This study consists of three reports: Scenario Report, Final Report, and this Executive Summary Report. The overall objective of this study is to define the future dimensions and characteristics of paratransit and the requirements for testing innovative transportation services for the development of new vehicles, and for ways to overcome legal and institutional constraints. The analysis is based on urban scenarios projected into the 1980-1995 time frame and representative of a large number of locations.

This Executive Summary report examines a range of paratransit service concepts in context with a set of typical urban settings under three alternative 1995 futures. These alternative futures are described in terms of energy cost and degree of automobile disincentives. Integrated transit and paratransit systems are defined and match a combination of transit and paratransit services with forecasted transportation needs for each individual setting.

Two further issues which are of key importance in terms of future paratransit development are resource allocation problems and labor-management considerations. Responses to these issues, such as recommended institutional actions are highlighted on a mode-specific basis in this report.

Related documents are: "Study of Future Paratransit Requirements" Scenario Report, PB 262-629 and "Study of Future Paratransit Requirements" Final Report, PB 264-082.

NTIS ORDER NO.: PB 265-821/AS

PRICE: \$4.00

TITLE: STUDY OF FUTURE PARATRANSIT REQUIREMENTS
Final Report

AUTHOR: Alan M. Voorhees & Associates, Inc.

DATE: January 1977

PROJECT NO.: IT-06-0104

KEYWORDS:

1. Paratransit
2. Taxis
3. Trip Generation
4. Vehicle, Design

The overall objective of this study is to define the future dimensions and characteristics of paratransit and the requirements for testing innovative transportation services for the development of new vehicles, and for ways to overcome legal and institutional constraints. The analysis is based on urban scenarios projected into the 1980-1995 timeframe and representative of a large number of locations.

This final examines a range of paratransit service concepts in context with a set of typical urban settings under three alternative 1995 futures. These alternative futures are described in terms of energy cost and degree of automobile disincentives. Integrated transit and paratransit systems are defined and match a combination of transit and paratransit services with forecasted transportation needs for each individual setting. Using estimated representativeness factors for each setting, the setting results are expanded to provide order-of-magnitude nationwide estimates of potential future paratransit activity. These estimates are presented in terms of passenger demand, subsidy requirements, and vehicle requirements.

The implication of these long-term findings are related to three specific areas of immediate concern: paratransit demonstrations, vehicles and facilities, and policy issues. A tentative paratransit demonstration framework has been developed which organizes previous and ongoing demonstration experience with study findings to point the way toward promising demonstration activities. The vehicle and facility analysis focuses on requirements for paratransit vehicles with capacities from 2 to 14 passengers. A wide range of policy issues are discussed including existing resource allocation, the role of private enterprise in paratransit development, labor-management concerns, and regulatory barriers.

The appendices are included in this report. Appendix 1 consists of a Glossary of Terms, and Appendix 2 is a Bibliography.

NTIS ORDER NO.: PB 264-082/AS

PRICE: \$9.25

TITLE: STUDY OF FUTURE PARATRANSIT REQUIREMENTS
SCENARIO REPORT

AUTHOR: Alan M. Voorhees & Associates, Inc.

DATE: November 1976

PROJECT NO.: IT-06-0104

KEYWORDS:

- | | |
|----------------------------|---------------------------|
| 1. Paratransit | 5. Socioeconomic Analyses |
| 2. Trip Generation | 6. Quantitative Analysis |
| 3. Travel Demand | 7. Planning, Tools |
| 4. Intermodal, Integration | |

Task 2, Scenarios, is one of five contract tasks conducted for the Urban Mass Transportation Administration (UMTA) of the U.S. Department of Transportation. Task 2 is the interim point of this project and information from this report will be incorporated in Tasks 3, 4, and 5 as well as documented in the final project report.

Scenarios examines a wide range of future conditions in order to estimate the characteristics of paratransit services for the period 1980-1995. This scenario development process has been structured to be responsive to the key factors that Task 1 determined would affect the market penetration and the operational results of promising paratransit service concepts. The purpose of Task 2, Scenarios, is to develop an improved quantitative basis for estimates of the technical and institutional requirements for promising paratransit services in the 1980-1995 time frame. These requirements are to be set forth in a subsequent report. The main elements of Task 2 begin with identification of scenario factors and market opportunities for various forms of paratransit services and end with estimates and findings concerned with passenger potential, an initial view of vehicle needs, operating costs, and other paratransit service measures in a range of urban settings, together with an assessment of the national representativeness of these findings.

The overall objective of this study is to define the future dimensions and characteristics of paratransit and the requirements for testing innovative transportation services for the development of new vehicles and ways to overcome legal and institutional constraints. This Scenario Report describes how these scenarios were constructed and evaluated and how the findings were aggregated for the entire U.S.

This Scenario Report contains a Glossary, Figures, and Tables that depict the overall Paratransit Project as well as the role of each Task in this project.

NTIS ORDER NO.: PB 262-629/AS

PRICE: \$8.00

TITLE: DETERMINATION OF THE OPTIMAL APPROACH TO RAIL RAPID TRANSIT
CAR STANDARDIZATION

AUTHOR: International Research & Technology Corporation
(R. Morris, et al.)

DATE: August 1976

PROJECT NO.: IT-06-0131

KEYWORDS:

1. Rail, Rapid Transit
 2. Rail, Rolling Stock
 3. Rail, Cost
 4. Rail, Systems and Planning Design
 5. Vehicle, Design
-

This report documents the findings of Phase I of a two-part program on standardization of rail rapid transit cars.

The purpose of Phase I was to determine the optimal form of standardization which would: 1) stabilize the prices of new rail rapid transit cars; 2) reduce operating and maintenance costs; and 3) improve equipment reliability and maintainability.

APTA, the American Public Transit Association, and RPI, the Railway Progress Institute, established technical boards which provided transit industry technical analysis and review of the work plans, approaches, and findings of the technical contractor.

The first phase final report documents the analysis leading to a determination that rail rapid transit car standardization is feasible and should be implemented under a phased program to develop a qualified products list and products qualification procedure, a car prototype certification procedure, and a family of car performance specifications.

NTIS ORDER NO.: PB 259-363/AS

PRICE: \$6.00

TITLE: SPECIAL TRANSPORTATION SERVICES FOR THE ELDERLY AND
HANDICAPPED DEMONSTRATION PROJECT - BATON ROUGE, LOUISIANA

AUTHOR: CACI, Inc. - Federal
(Chester H. Mc Call, Jr., Mary I. Olson, and Harry I. Reed, III)

DATE: November 1976

PROJECT NO.: LA-06-0001

KEYWORDS:

1. Demand Responsive Systems
2. Elderly
3. Handicapped

In July 1972, UMTA, under its Service Development Program, awarded an 18-month grant to the City of Baton Rouge to demonstrate the feasibility of establishing a modern, cost-effective method of transporting the aged and disabled by means of a specially designed system, separate from conventional public transit, but coordinated with the community's existing public transportation resources. The special service offered by this system consisted of door-to-door, pre-scheduled pick-up and delivery functions, dispatched through a central control facility. This Special Transportation Services (STS) was managed as a division of a local public transportation firm, the Capitol Transportation Corporation. The STS was not, however, coordinated with existing public transit routes.

This final report details a chronology of what happened leading up to and during the conduct of the specialized services. In addition, programs encountered and steps taken to resolve these problems are presented. Statistics on system clients, trips, and costs are presented for the 12 months of STS system operation. Where appropriate, implications that might bear on the initiation of a similar service elsewhere are set forth. This report concludes that based upon sample information, more than 90 percent of the system users considered the service "good" or "excellent."

NTIS ORDER NO.: PB 263-904/AS

PRICE: \$5.00

TITLE: A PUBLIC TRANSPORTATION IMPROVEMENT PLAN FOR
THE AMHERST-FIVE COLLEGE AREA

AUTHOR: University of Massachusetts
(LeRoy B. Butler, Jr. and William P. Goss)

DATE: December 1975

PROJECT NO.: MA-06-0006

KEYWORDS:

- | | |
|-----------------------|--------------------------------------|
| 1. Universities | 6. Bus |
| 2. Rural Areas | 7. Ridership |
| 3. Suburbs | 8. Fare, Free |
| 4. Routes and Routing | 9. Transportation Systems Management |
| 5. Paratransit | |

This study presents a short-range public transportation improvement plan for the Amherst-Five College Area--12 suburban-rural communities (population: 105,000) in Hampshire and Franklin Counties, Massachusetts. By use of a generalized methodology, residential and commercial areas and distinct demographic segments of the Study Area population are identified for conventional fixed-route, scheduled bus transit and/or paratransit public transportation services. Patronage levels are estimated with ridership, "reach," and "penetration" data gathered during an UMTA fare-free bus service Research and Demonstration Project at the Amherst campus of the University of Massachusetts.

A total of 15 potential service areas are identified as deserving of fixed-route, scheduled bus transit service, where the frequency of bus service proposed for the potential service areas ranges from a high of six bus trips per hour to a low of seven bus trips per day. Paratransit public transportation services find justifiable application for many of the potential service groups identified in the Study Area, including the worker-commuter, the midday shopper, and the limited mobility potential service groups. It is concluded that the market applications of the many public transportation modes considered in this study are not mutually exclusive but rather intersecting sets.

A list of policy-oriented recommendations is included to facilitate the implementation of the Recommended Public Transportation Plan within the institutional, political, and economic environment of the Amherst-Five College Area. Recommended are: 1) the integration of the University of Massachusetts (UMass) and the Five Colleges, Inc., fare-free bus services under the auspices of the Pioneer Valley Transit Authority (PVTA); 2) the consummation of the capital equipment grant; 3) the extension of several UMass fare-free bus service routes into three potential service areas; and 4) the initiation of a more comprehensive paratransit study than the one contained herein. The Appendix presents a detailed analysis of the costs involved.

NTIS ORDER NO.: PB 258-146/AS

PRICE: \$6.00

TITLE: BOARDING RAMPS FOR TRANSIT BUSES
Final Report

AUTHOR: Booz, Allen & Hamilton, Inc.

DATE: May 1977

PROJECT NO.: MD-06-0024

KEYWORDS:

1. Access, Planning and Control
 2. Bus, Design
 3. Bus, Transbus
 4. Elderly
 5. Handicapped
6. Vehicle, Design

Basically, there are three methods for providing access to transit buses for people who cannot climb steps: 1) an on-board lift device; 2) an on-board ramp; and 3) a level entry platform on the bus which extends to a permanently raised curb/sidewalk section at each bus stop. In the program entitled "The Transbus Program: Booz, Allen Applied Research, Prime Contractor (1971-1976), DOT-UT-10008," the following manufacturers provided access devices for one prototype bus: AM GENERAL TRANSBUS--level entry platform; GENERAL MOTORS TRANSBUS--a lift device; and ROHR TRANSBUS--an on-board ramp.

The objectives of this report are: 1) to assemble current research and demonstration information related to on-board ramps; 2) to quantify basic human factors engineering requirements associated with the use of on-board ramps; and 3) to identify bus engineering design issues associated with the use of on-board ramps. This report describes the on-board ramp method of providing accessibility to transit buses for people who cannot climb steps. Certain basic features that make this ramp method more attractive than the other methods are discussed as well as bus engineering and human factors design issues such as bus floor height, ramp angle and length, door width and edge design, and a number of other issues. Information available to meet the objectives of this report is limited primarily to research and demonstration findings on recent UMTA and Federal Highway Administration programs. In general, information presented herein was extracted from raw data and program memoranda, and include information that is not generally available in the technical literature.

This report concludes that this on-board ramp is a feasible access concept for a low floor bus (22-inch nominal floor height) with a kneeling feature, but not for Advanced Design Buses (24-inch floor height in kneeled condition). This means that a Transbus with an on-board ramp appears to be the best combination of bus design and human factor technology available in the near future (5 to 10 years).

NTIS ORDER NO.: PB 269-290/AS

PRICE: \$4.00

TITLE: ASSESSMENT OF DISRUPTIVE EFFECTS ASSOCIATED WITH
URBAN TRANSPORTATION TUNNEL CONSTRUCTION

AUTHOR: ABT Associates, Inc.
(under contract to Transportation Systems Center)
(Peter C. Wolff and Peter H. Scholnick)

DATE: June 1976

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Socioeconomic Analyses
 2. Tunnels and Tunneling
 3. Environment and Environmental Control
 4. Social Benefits and Costs
-

Social, economic, and environmental impacts resulting from the construction of tunnels for mass transportation purposes in urban areas are identified. A matrix is constructed identifying the locus of costs to affected groups by four kinds of causal agents: traffic interference, property takings, environmental disturbances, and utility disruptions. A separate matrix must be constructed for social, economic, and environmental costs. The cells of the matrix must be further expanded in order to pinpoint actual costs. Variables must be identified for each affected group and each causal agent and measures for the variables determined. One row of the economic matrix and one row of the social matrix are expanded by way of example: economic costs to retail businesses and social costs to residents. The measurement and aggregation of impacts are then discussed. Four possible ways of lessening impacts are mentioned: good planning and institutional procedures, proper community relations, the use of advanced construction techniques, and the utilization of monetary compensation.

Two small case studies are included: the construction of the Waterfront station by WMATA in Washington, D.C., and the extension of the Picadilly Line in London to Heathrow Airport. Directions of possible future research are indicated.

NTIS ORDER NO.: PB 256-848/AS

PRICE: \$7.50

TITLE: AN ASSESSMENT OF THE CRASHWORTHINESS OF EXISTING URBAN RAIL VEHICLES
Analyses and Assessments of Vehicles
Volume I: Chapters 1 through 7
AUTHOR: Volume II: Chapters 8 through 12 and Appendices and References
Calspan Corporation (under contract to Transportation Systems Center)
(R.J. Cassidy and D.J. Romeo)
DATE: November 1975 PROJECT NO.: MA-06-0025

KEYWORDS:

1. Safety
 2. Crashworthiness
 3. Rail, Rolling Stock
 4. Vehicle, Design
-

The crashworthiness of existing urban rail vehicles (passenger cars) and the feasibility of improvements in this area were investigated in this report. Both rail-car structural configurations and impact absorption devices were studied. From this work, recommendations for engineering standards for urban rail vehicles will be developed.

This final report issued under the crashworthiness effort covers: 1) the development of analytical tools to predict passenger threat-environment during collision; 2) criteria for predicting passenger injury due to train collisions; 3) an application of injury criteria and analytical models to predict passenger injuries resulting from collisions of trains that represent existing construction types; 4) a preliminary investigation of applying impact absorption devices to transit vehicles; 5) a design study of car structural configurations for improved impact energy management; and 6) a review of engineering standards for Urban Rail Car Crashworthiness.

Chapters in Volume I (PB 249-142) are entitled: introduction and summary; major conclusions and recommendations; injury-prediction methodology for train crashes; integrated train/occupant crash modeling; characteristics of existing railcars; structural and interior inputs for collision model; and results of crash simulations.

Volume II (PB 249-143) chapters are: railcar override; priority areas for the development of cost effective improved car structures; preliminary design study of impact energy absorbing device; cost effectiveness of structural improvements; and development of uniform standards. Appendices contain a review of injury criteria defined in the literature and a report of inventions.

References are furnished.

NTIS ORDER NO.	Volume I	- PB 249-142	Price: \$7.50
	Volume II	- PB 249-143	Price: \$6.75

NTIS ORDER NO.: PB 249-141-SET

PRICE: \$13.00

TITLE: AN ASSESSMENT OF THE CRASHWORTHINESS OF EXISTING URBAN RAIL VEHICLES
Volume III: Train-Collision Model User's Manual

AUTHOR: Calspan Corporation
(Under contract to Transportation Systems Center)

DATE: November 1975

PROJECT NO.: MA-06-0025

KEYWORDS: 1. Crashworthiness
2. Safety
3. Vehicle Design
4. Rail, Rolling Stock
5. Models and Modeling

In this report, the crashworthiness of existing urban rail vehicles (passenger cars) and the feasibility of improvements in this area were investigated. Both rail-car structural configurations and impact absorption devices were studied. From this work, recommendations for engineering standards for urban rail vehicles will be developed.

This final report issued under the crashworthiness effort covers:

1. The development of analytical tools to predict passenger threat-environment during collision.
2. Criteria for predicting passenger injury due to train collisions.
3. An application of injury criteria and analytic models to predict passenger injuries resulting from collisions of trains that represent existing construction types.
4. A preliminary investigation of applying impact absorption devices to transit vehicles.
5. A design study of car structural configurations for improved impact energy management.
6. A review of engineering standards for Urban Rail Car Crashworthiness.

Related reports are: Volume I - Chapters 1 through 7 (PB 249-142) and Volume II: Chapters 8 through 12 and Appendices and References (PB 249-143). The order number for Volumes 1 and 2 as a set is PB 249-141-SET.

NTIS ORDER NO.: PB 254-695/AS

PRICE: \$4.50

TITLE: CONSTRUCTION MONITORING OF SOFT GROUND RAPID TRANSIT TUNNELS
Volume I: A Definition of Needs and Potential Developments
Volume II: Appendixes

AUTHOR: Parsons, Brinckerhoff, Quade & Douglas
(Birger Schmidt and C. John Dunicliff)

DATE: November 1974

PROJECT NO.: MA-06-0025

KEYWORDS:

- | | |
|---------------------------|--|
| 1. Tunnels & Tunneling | 5. Instrumentation |
| 2. Underground Structures | 6. Rail, Rapid Transit |
| 3. Construction, Cost | 7. Environment and Environmental Control |
| 4. Computer Applications | 8. Safety |
-

The UMTA Tunneling Program concentrates its efforts on reducing tunneling costs, minimizing environmental impact and enhancing safety as it applies to planning, organization, design, construction, and maintenance cycles of rapid transit tunnels in the urban environment. This report investigates the area of construction monitoring of rapid transit tunnels in soft ground.

Soft ground tunnel construction monitoring has the potential to reduce construction costs, safety hazards, and environmental impacts. Monitoring can diagnose face stability and ground movement problems, and allow appropriate preventive or remedial action. Monitoring provides data for prediction of ground movements and allows the compilation of useful legal documentation. Such data are also required for improving design and prediction methods.

According to the authors, monitoring practices now in use do not usually allow full utilization of the data for the project from which they were gathered. Deficiencies in present practices are pointed out, and a systematic approach to monitoring is presented. Information presented could aid owners, design managers, specification writers and instrumentation engineers. A computer program for data storage, interpretation and retrieval is proposed. An interim quality control specification for instrumentation procurement is presented, and instrumentation hardware improvements are suggested.

NTIS order number for the volumes are: Volume I, PB 241-536, \$7.50, and Volume II, PB 241-537, \$5.50.

NTIS ORDER NO.: PB 241-535/AS-SET

PRICE: \$11.00

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

AUTHOR: Parsons, Brinckerhoff, Quade & Douglas, Inc.
(Birger Schmidt)

DATE: January 1977

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Tunnels and Tunneling
2. Construction, Cost
3. Instrumentation
4. Transportation Systems Management
5. Planning, Tools
6. Guides and Guidance
7. Rail, Rapid Transit

This report aims to fit the objectives of the Urban Mass Transportation Administration (UMTA) Tunneling Program: to lower subway construction costs and to reduce construction hazards and damage to the environment. This report generated from an UMTA-sponsored study that disclosed the art of instrumentation and monitoring as being advanced but not as potentially sufficient on tunneling projects. The main reasons for this stemmed from a lack of general procedures and guidelines as well as a lack of expertise among decision-makers regarding tunnel monitoring. Hence, UMTA commissioned this Handbook to remove these difficulties.

The principal purpose of this Handbook is to encourage and improve the use of monitoring for urban mass transit tunnels as well as for other types of tunnels and deep excavations. This Handbook documents the findings of a recent UMTA construction monitoring instrumentation research project. The Handbook is directed to systems managers, planners, and engineers and points out the way to incorporate successful monitoring programs that help control and reduce costs into their systems. It is intended to stimulate discussion beyond the scope of its contents, as well as the development of new ideas and concepts that may benefit from monitoring and the intelligent use of field observation.

A companion handbook, directed to design engineers, specification writers, and instrumentation and monitoring engineers is planned for issue in the near future. This handbook would treat in detail the selection of monitoring hardware, procurements and installation procedures and specifications, and related matters.

NTIS ORDER NO.: PB 264-361/AS

PRICE: \$4.50

TITLE: CRASHWORTHINESS ANALYSIS OF THE UMTA
STATE-OF-THE-ART CARS

AUTHOR: Boeing Vertol Company
(Under contract to Transportation Systems Center)
(Edward Widmayer, A.E. Tanner, and Robert Klump)

DATE: October 1975

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Crashworthiness
2. Rail, Systems and Planning Design
3. Safety
4. SOAC

An engineering assessment of the crashworthiness of the UMTA State-of-the-Art Car (SOAC) has been conducted for the Urban Mass Transportation Administration under the technical direction of the Transportation Systems Center by the Boeing Vertol Company as part of a program to provide safer transportation to urban rail vehicles.

Crash dynamics and crashworthiness methodology based on post-yield energy absorption characteristics and a "weighted acceleration" severity index has been applied. A review of the applicable static test data and crash damage has been conducted to provide a basis for the substantiation of the assumptions in the analysis. Sensitivity studies have been conducted to show the effect of car buff strength, passenger relative velocity, passenger spacing, and cushioning on casualties as defined by the severity index. Major gains in injury reduction through improved internal cushioning are indicated. The prevention of car penetration by override is treated.

The SOAC collision dynamics model is validated by comparison to the SOAC-gondola accident of August 11, 1973, and by comparison to a nonlinear finite element mathematical simulation of the SOAC in crash conditions. SOAC crashworthiness is assessed. Studies have been conducted leading to improved crashworthiness of the SOAC.

Conclusions are presented and recommendations are made for further crashworthiness research.

NTIS ORDER NO.: PB 247-230/AS

PRICE: \$7.50

TITLE: DATA ANALYSIS AND INSTRUMENTATION REQUIREMENTS FOR
EVALUATING RAIL JOINTS AND RAIL FASTENERS IN URBAN TRACK

AUTHOR: Battelle-Columbus Laboratories
(under contract to Transportation Systems Center)
(Robert H. Prause and Harold D. Harrison)

DATE: February 1975

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Rail
 2. Tracks and Trackage
 3. Instrumentation
 4. Wheels
 5. Measuring and Measurements
-

This report was prepared as part of the Urban Mass Transportation Administration's (UMTA) Rail Supporting Technology Program.

Rail fasteners for concrete ties and direct fixation and bolter rail joints have been identified as key components for improving track performance. However, the lack of statistical load data limits the development of improved design criteria and evaluation tests.

This report evaluates the data required for design, laboratory tests, and for the development and verification of analytical models of fastener and joint performance. Available track instrumentation is reviewed for fulfilling these requirements, and functional specifications have been developed for improved tie plate load cells and instrumented wheels. Also included are recommendations for data analysis and data processing procedures and test site selection criteria needed to plan and conduct comprehensive measurement programs.

NTIS ORDER NO.: PB 253-192/AS

PRICE: \$6.75

TITLE: ENGINEERING TESTS FOR ENERGY STORAGE CARS
AT THE TRANSPORTATION TEST CENTER

AUTHOR: AiResearch Manufacturing Company
(William T. Curran)

DATE: May 1977

PROJECT NO.: MA-06-0025

KEYWORDS:

- | | |
|----------------------------|-------------------------|
| 1. Energy Storage | 5. Transit User Comfort |
| 2. Noise and Noise Control | 6. Fuel, Consumption |
| 3. Propulsion Systems | 7. Testing Facilities |
| 4. Vehicle, Design | |

This report describes the Energy Storage Car (ESC) tests performed by AiResearch from May 1974 through January 1975 at the Transportation Test Center, Pueblo, Colorado. The AiResearch prepared this report for the Transportation Systems Center of the U.S. Department of Transportation.

The primary purpose of the tests documented herein is 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. Data recorded during these tests is stored on magnetic analog tape and adds to UMTA's growing data bank for urban rail vehicles.

This report consists of four volumes:

Volume I: Program Description and Test Summary PB 269-400/AS, \$6.00

Volume II: Performance, Power Consumption, and Ratio Frequency Interference Tests PB 269-401/AS, \$5.50

Volume III: Noise Tests PB 269-402/AS, \$5.00

Volume IV: Ride Roughness Tests PB 269-403/AS, \$6.75.

NTIS ORDER NO.: PB 269-399/AS-SET OF 4

PRICE: \$20.00

TITLE: GENERAL VEHICLE TEST INSTRUMENTATION EVALUATION
Final Report

AUTHOR: Transportation Systems Center
(Lowell V. Babb)

DATE: March 1977

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Testing Facilities
 2. Instrumentation
 3. Measuring and Measurements
-

A General Vehicle Test System (GVTS) has been developed by the Transportation Systems Center of the U.S. Department of Transportation to facilitate rail transit vehicle testing at the Transportation Test Center, 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-MA-06-0025-75-14.

This report presents the results of evaluation tests carried out on the GVTS at the Transportation Test Center 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

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 48 required Standard Outputs described in the GVTP. Additional equipment and/or development is required to provide full coverage of the required 48 outputs. The instrumentation common to all of the tests in this series is described in Appendix A; subsequent appendices describe each individual test including data samples.

NTIS ORDER NO.: PB 269-598/AS

PRICE: \$7.75

TITLE: GENERAL VEHICLE TEST PLAN (GVTP) FOR URBAN RAIL TRANSIT CARS

AUTHOR: Boeing Vertol Company
(under contract to Transportation Systems Center)

DATE: September 1975

PROJECT NO.: MA-06-0025

KEYWORDS:

- | | |
|---------------------------------------|------------------------|
| 1. Rail, Systems &
Planning Design | 5. Instrumentation |
| 2. Power Distribution | 6. Rail, Rolling Stock |
| 3. Noise and Noise Control | 7. Testing Facilities |
| 4. Vehicle, Monitoring | |
-

The General Vehicle Test Plan (GVTP) provides a system for general vehicle testing and for documenting and utilizing data and information in the testing of urban rail transit cars.

Test procedures are defined for nine categories: 1) Performance; 2) Power Consumption; 3) Power System Interaction; 4) Adhesion; 5) Ride Roughness; 6) Passenger Compartment Noise; 7) Community Noise; 8) Simulated Revenue Service; and 9) Structure Dynamics.

The procedures can be adapted to any vehicle class of urban rail vehicles. They are derived from testing on UMTA's Rail Transit Test Track in Pueblo, Colorado. In addition, these procedures can be modified for use on other urban rail tracks as required.

Specifications are included for instrumentation required to implement the tests. Data processing and analysis requirements are defined by specifying standard output formats for the parameters of interest.

NTIS ORDER NO.: PB 251-086/AS

PRICE: \$10.00

TITLE: IN-SERVICE PERFORMANCE AND COSTS OF METHODS FOR
CONTROL OF URBAN RAIL SYSTEM NOISE Experimental Design

AUTHOR: DeLeuw, Cather & Co. and Wilson, Ihrig & Associates
(under contract to Transportation Systems Center)

DATE: May 1976

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Noise and Noise Control
 2. Rail, Materials
 3. Wheels
 4. Vehicle, Design
-

This report presents an experimental design for a project to evaluate four techniques for reducing wheel/rail noise on urban rail transit systems: 1) resilient wheels, 2) damped wheels, 3) wheel truing, and 4) rail grinding

The design presents the project questions to be answered: 1) What reduction in noise can be achieved by the techniques, individually and in combinations? 2) What are the costs of the techniques?

The design gives data requirements for acoustic testing on the Southeastern Pennsylvania Transportation Authority Market-Frankford Line, as well as requirements for collection of nonacoustic data covering all United States rapid transit systems. It prescribes methods for analysis of the data, means for drawing inferences to answer the questions posed, and formats for presentation.

The design requires that the findings of the completed study be presented in a manner such that the information can be used by transit system personnel who may not have a background in acoustics or cost analysis.

NTIS ORDER NO.: PB 257-200/AS

PRICE: \$5.50

TITLE: NOISE PREDICTION MODELS FOR ELEVATED RAIL TRANSIT STRUCTURES

AUTHOR: Cambridge Collaborative, Inc.
(Under contract to Transportation Systems Center)
(J.E. Manning, D.C. Hyland, J.J. Fredberg, and N. Senapati)

DATE: August 1975 PROJECT NO.: MA-06-0025

KEYWORDS: 1. Noise and Noise Control
2. Vibrations
3. Models and Modeling
4. Rail
5. Tracks and Trackage

This report is one of three reports prepared under the UMTA Urban Rail Supporting Technology Program dealing with noise and vibration control for urban rail transit track and elevated structures. The other two reports are "Prediction and Control of Rail Transit Noise and Vibration--A State-of-the-Art Assessment" (PB 233-363) and "Vibration Prediction Model for Floating-Slab Rail Transit Track" (PB 245-638).

This report presents the theoretical development of a model for the prediction of noise radiated by elevated structures on rail transit lines. The model described allows for the prediction of both the vibration transmission between elements of the structure and the resulting noise radiation from each major structural element, in terms of design parameters for the different elements. Thus, the potential effectiveness of various alternative methods for noise control can be evaluated.

Results of a field study of three different types of elevated structures on Boston's MBTA Rapid Transit System are also summarized. These results support the validity of the prediction model.

Conclusions are presented. Appendices include refined models for studying rail vibration, prediction model for low frequencies, compilation of coupling loss factors, and report of inventions. References are furnished.

NTIS ORDER NO.: PB 244-509/AS

PRICE: \$8.00

TITLE: RAIL TRANSIT SYSTEM COST STUDY

AUTHOR: Thomas K. Dyer, Inc.
(T. K. Dyer, et al)
(under contract to Transportation Systems Center)

DATE: January 1976

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Rail, Light
2. Rail, Commuter
3. Rail, Rapid Transit
4. Rail, Cost
5. Construction, Cost
6. Maintenance, Costs

The Transportation Systems Center serves as Systems Manager for the Rail Supporting Technology Program of the Urban Mass Transportation Administration. One task under this program has been to assess the costs of constructing, operating and maintaining three kinds of urban rail systems: light rail, rapid rail and commuter rail.

Cost data from several North American and European transit authorities were collected and analyzed.

These cities and transit authorities are: Boston, MA--Massachusetts Bay Transportation Authority; Camden, NJ--Port Authority Transit Corporation, Chicago, IL--Chicago Transit Authority; Cleveland, OH--Cleveland Transit System; New York, NY--New York City Transit Authority; Philadelphia, PA--Southeastern Pennsylvania Transportation Authority; San Francisco/Oakland, CA--Bay Area Rapid Transit District; Toronto, Ontario, Canada--Ministry of Transportation and Communications and Toronto Transit Commission; Washington, DC--Washington Metropolitan Area Transit Authority; Bern, Switzerland--Verkehrsbetriebe Bern; Cologne, West Germany--Kolner Verkehrsbetriebe; Gothenburg, Sweden--Göteborgs Sparvagnar; Hamburg, West Germany--Hamburger Hochbahn AG; Munich, West Germany--München Verkehrsbetriebe; and Zurich, Switzerland--Zurich Transport Authority.

These data, together with the recent experience of the consultant in several transit construction projects, served as the basis of the cost projections. Factors influencing appreciable cost variations in construction and operations were reviewed and included as criteria for cost projections.

NTIS ORDER NO.: PB 254-627/AS

PRICE: \$5.50

TITLE: RAIL TRANSIT SYSTEM COST STUDY
Revision I
Final Report

AUTHOR: Thomas K. Dyer, Inc.
(T.K. Dyer, W.K. Hale, F.A. Ingalls, and R.B. Whelan)

DATE: March 1977

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Rail, Commuter
 2. Rail, Light
 3. Rail, Rapid Transit
 4. Planning, Tools
 5. Information Aids
 6. Rail, Cost
-

The Transportation Systems Center (TSC) of the U.S. Department of Transportation serves as Systems Manager for the Rail Supporting Technology Program of the Urban Mass Transportation Administration. The primary objective of this study is to develop up-to-date estimates of the various cost elements encountered in constructing, operating, and maintaining urban rail transportation systems, including light rail vehicles, rapid transit, and commuter rail systems, with the intent of developing cost information that would be useful to transportation planners, policy makers, and others involved in the preliminary evaluation and selection of rail transportation alternatives. The findings are presented herein.

Cost data from several North American and European transit authorities were collected and analyzed. These data, together with recent experience of the consultant in several transit construction projects, served as the basis for the cost projections. Factors influencing appreciable cost variations in construction and operations were reviewed and included as criteria for cost projections.

This document supersedes RAIL TRANSIT SYSTEM COST STUDY, January 1976, PB 254-627.

NTIS ORDER NO.: PB 266-918/AS

PRICE: \$5.50

TITLE: SOAC (STATE-OF-THE-ART CAR) ENGINEERING TESTS AT THE DEPARTMENT OF TRANSPORTATION HIGH SPEED GROUND TEST CENTER FINAL TEST REPORT
Volume I: Program Description and Test Summary

AUTHOR: Boeing Vertol Company
Transportation Systems Center

DATE: January 1975

PROJECT NO.: MA-06-0025

KEYWORDS:

- | | |
|-----------------------|------------------------------------|
| 1. Rail | 5. Rail, Systems & Planning Design |
| 2. Testing Facilities | 6. SOAC |
| 3. Tracks & Tracking | 7. Rail, Rolling Stock |
| 4. Vehicle, Design | |

This report presents the technical methodology, data samples, and results of tests conducted on the State-of-the-Art Car (SOAC) on the Rail Transit Test Track at the High Speed Ground Test Center in Pueblo, Colorado, during the period April to July 1975.

UMTA's Urban Rail Supporting Technology Program emphasizes three major development task areas: facilities, technology, and test program. Test program development comprises three subareas: vehicle testing, ways and structures testing, and track geometry measurement.

The objective of the SOAC program is to demonstrate the current state-of-the-art in rail rapid transit vehicle technology, with passenger convenience and operating efficiency as primary goals. The objectives of the Engineering Test program are to provide a set of SOAC engineering data and to further develop the methodology for providing transit vehicle comparisons. These objectives were met with the presentation of the test results in this report and the incorporation of refinements to the testing methodology into the General Vehicle Test Plan, GSP-064.

This report, Volume I, contains a description of the SOAC test program and vehicle, and a one-page summary of each of the fourteen test sets completed during the SOAC engineering test program.

Other volumes are: Volume II: Performance Tests (PB 244-748); Volume III: Ride Quality Tests (PB 244-749); Volume IV: Noise Tests (PB 244-750); Volume V: Structural Vibration, and Radio Frequency Interference Tests (PB 244-751); and Volume VI: SOAC Instrumentation System (PB 244-752). The order number and price for the entire set of six reports is PB 244-746-SET, \$28.00.

NTIS ORDER NO.: PB 244-747/AS

PRICE: \$4.75

TITLE: SOAC (STATE-OF-THE-ART CAR) ENGINEERING TESTS AT THE DEPARTMENT OF
TRANSPORTATION HIGH SPEED GROUND TEST CENTER FINAL TEST REPORT
Volume II: Performance Tests

AUTHOR: Boeing Vertol Company
Transportation Systems Center

DATE: January 1975

PROJECT NO.: MA-06-0025

KEYWORDS:

- | | |
|-----------------------|------------------------------------|
| 1. Rail | 5. Rail, Systems & Planning Design |
| 2. Testing Facilities | 6. SOAC |
| 3. Tracks & Tracking | 7. Rail, Rolling Stock |
| 4. Vehicle, Design | 8. Brakes and Braking |

This report presents the technical methodology, data samples, and results of tests conducted on the State-of-the-Art Car (SOAC) on the Rail Transit Test Track at the High Speed Ground Test Center in Pueblo, Colorado, during the period April to July 1973.

UMTA's Urban Rail Supporting Technology Program emphasizes three major development task areas: facilities, technology, and test program. Test program development comprises three subareas: vehicle testing, ways and structures testing, and track geometry measurement.

The objective of the SOAC program is to demonstrate the current state-of-the-art in rail rapid transit vehicle technology, with passenger convenience and operating efficiency as primary goals. The objectives of the Engineering Test Program are to provide a set of SOAC engineering data and to further develop the methodology for providing transit vehicle comparisons. These objectives were met with the presentation of the test results in this report and the incorporation of refinements to the testing methodology into the General Vehicle Test Plan, GSP-064.

This report, Volume II, contains performance test data. Chapters discuss the following: acceleration tests; deceleration tests; traction resistance tests; friction braking duty cycle tests; power consumption tests during simulated transit operation; spin/slide protection system tests; and, adhesion tests.

Other volumes are: Volume I: Program Description and Test Summary (PB 244-747); Volume III: Ride Quality Tests (PB 244-749); Volume IV: Noise Tests (PB 244-750); Volume V: Structural, Voltage, and Radio Frequency Interference Tests (PB 244-751); and Volume VI: SOAC Instrumentation System (PB 244-752). The order number for the entire set of six reports is PB 244-746-SET, \$28.00.

NTIS ORDER NO.: PB 244-748/AS

PRICE: \$6.25

TITLE: SOAC(STATE-OF-THE-ART CAR) ENGINEERING TESTS AT THE DEPARTMENT OF
TRANSPORTATION HIGH SPEED GROUND TEST CENTER FINAL TEST REPORT
Volume III: Ride Quality Tests

AUTHOR: Boeing Vertol Company
Transportation Systems Center

DATE: January 1975

PROJECT NO.: MA-06-0025

KEYWORDS

1. Rail	7. Rail, Rolling Stock
2. Testing Facilities	8. Transit User Comfort
3. Tracks & Tracking	
4. Vehicle, Design	
5. Rail, Systems & Planning Design	
6. SOAC	

This report presents the technical methodology, data samples, and results of tests conducted on the State-of-the-Art Car (SOAC) on the Rail Transit Test Track at the High Speed Ground Test Center in Pueblo, Colorado during the period April to July 1973.

UMTA's Urban Rail Support Technology Program emphasizes three major development task areas: facilities, technology, and test program. Test program development comprises three sub-areas: vehicle testing, ways and structures testing, and track geometry measurement.

The objective of the SOAC program is to demonstrate the current state-of-the-art in rail rapid transit vehicle technology, with passenger convenience and operating efficiency as primary goals. The objectives of the Engineering Test program are to provide a set of SOAC engineering data and to further develop the methodology for providing transit vehicle comparisons. These objectives were met with the presentation of the test results in this report and the incorporation of refinements to the testing methodology into the General Vehicle Test Plan, GSP-064.

This report, Volume III, contains ride quality test data. Test description instrumentation, test produces and preliminary data analyses are presented. The appendix is entitled "Ride Quality Power Spectral Density and Peak Amplitude Machine Plots."

Other volumes are: Volume I: Program Description and Test Summary (NTIS# PB 244-747); Volume II: Performance Tests (NTIS# PB 244-748); Volume IV: Noise Tests (NTIS# PB 244-750); Volume V: Structural, Voltage, and Radio Frequency Interference Tests (NTIS# PB 244-751); and Volume VI: SOAC Instrumentation System (NTIS# PB 244-752); The order number for the entire set of six reports is PB 244-746-SET.

NTIS ORDER NO.: PB 244-749/AS

PRICE: \$7.50

TITLE: SOAC (STATE-OF-THE-ART-CAR) ENGINEERING TESTS AT THE DEPARTMENT OF
TRANSPORTATION HIGH SPEED GROUND TEST CENTER FINAL TEST REPORT
Volume IV: Noise Tests

AUTHOR: Boeing Vertol Company
Transportation Systems Center

DATE: January 1975

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Rail
2. Testing Facilities
3. Tracks & Tracking
4. Vehicle, Design
5. Rail, Systems & Planning Design
6. SOAC
7. Rail, Rolling Stock
8. Noise & Noise Control

This report presents the technical methodology, data samples, and results of tests conducted on the State-of-the-Art Car(SOAC) on the Rail Transit Test Track at the High Speed Ground Test Center in Pueblo, Colorado during the period April to July 1973.

UMTA's Urban Rail Supporting Technology Program emphasizes three major development task areas: facilities, technology, and test program. Test program development comprises three sub-areas: vehicle testing, ways and structures testing, and track geometry measurement.

The objective of the SOAC program is to demonstrate the current state-of-the-art in rail rapid transit vehicle technology, with passenger convenience and operating efficiency as primary goals. The objectives of the Engineering Test program are to provide a set of SOAC engineering data and to further develop the methodology for providing transit vehicle comparisons. These objectives were met with the presentation of the test results in this report and the incorporation of refinements to the testing methodology into the General Vehicle Test Plan, GSP-064.

This report, Volume IV, contains noise test data; Interior noise and wayside noise are discussed.

Other volumes are: Volume I: Program Description and Test Summary (PB 244-747); Volume II: Performance Tests (PB 244-748); Volume III: Ride Quality Tests (PB 244-749); Volume V: Structural, Voltage, and Radio Frequency Interference Tests (PB 244-751); and Volume VI: SOAC Instrumentation System (PB 244-752). The order number for the entire set of six reports is PB 244-746-SET, \$28.00.

NTIS ORDER NO.: PB 244-750/AS

PRICE: \$5.25

TITLE: SOAC (STATE-OF-THE-ART CAR) ENGINEERING TESTS AT THE DEPARTMENT OF
TRANSPORTATION HIGH SPEED GROUND TEST CENTER FINAL TEST REPORT
Volume V: Structural, Voltage, and Radio Frequency Interference Tests

AUTHOR: Boeing Vertol Company
Transportation Systems Center

DATE: January 1975

PROJECT NO.: MA-06-0025

KEYWORDS:

- | | |
|------------------------|------------------------------------|
| 1. Rail | 5. Rail, Systems & Planning Design |
| 2. Testing Facilities | 6. SOAC |
| 3. Tracks and Tracking | 7. Rail, Rolling Stock |
| 4. Vehicle, Design | |

This report presents the technical methodology, data samples, and results of tests conducted on the State-of-the-Art Car (SOAC) on the Rail Transit Test Track at the High Speed Ground Test Center in Pueblo, Colorado, during the period April to July 1973.

UMTA's Urban Rail Supporting Technology Program emphasizes three major development task areas: facilities, technology, and test program. Test program development comprises three subareas: vehicle testing, ways and structures testing, and track geometry measurement.

The objective of the SOAC program is to demonstrate the current state-of-the-art in rail rapid transit vehicle technology, with passenger convenience and operating efficiency as primary goals. The objectives of the Engineering Test program are to provide a set of SOAC engineering data and to further develop the methodology for providing transit vehicle comparisons. These objectives were met with the presentation of the test results in this report and the incorporation of refinements to the testing methodology into the General Vehicle Test Plan, GSP-064.

This report, Volume I, contains a description of the SOAC test program and vehicle, and a one-page summary of each of the fourteen test sets completed during the SOAC engineering test program.

Other volumes are: Volume I: Program Description and Test Summary (PB 244-747); Volume II: Performance Tests (PB 244-748); Volume III: Ride Quality Tests (PB 244-749); Volume IV: Noise Tests (PB 244-750); Volume VI: SOAC Instrumentation System (PB 244-752). The order number and price for the entire set of six reports is PB 244-746-SET, \$28.00.

NTIS ORDER NO.: PB 244-751/AS

PRICE: \$4.75

TITLE: SOAC (STATE-OF-THE-ART CAR) ENGINEERING TESTS AT THE DEPARTMENT OF
TRANSPORTATION HIGH SPEED GROUND TEST CENTER FINAL TEST REPORT
Volume VI: SOAC Instrumentation System

AUTHOR: Boeing Vertol Company
Transportation Systems Center

DATE: January 1975

PROJECT NO.: MA-06-0025

KEYWORDS:

- | | |
|------------------------|------------------------------------|
| 1. Rail | 5. Rail, Systems & Planning Design |
| 2. Testing Facilities | 6. SOAC |
| 3. Tracks and Tracking | 7. Rail, Rolling Stock |
| 4. Vehicle, Design | |

This report presents the technical methodology, data samples, and results of tests conducted on the State-of-the-Art Car (SOAC) on the Rail Transit Test Track at the High Speed Ground Test Center in Pueblo, Colorado, during the period April to July 1973.

UMTA's Urban Rail Supporting Technology Program emphasizes three major development task areas: facilities, technology, and test program. Test program development comprises three subareas: vehicle testing, ways and structures testing, and track geometry measurement.

The objective of the SOAC program is to demonstrate the current state-of-the-art in rail rapid transit vehicle technology, with passenger convenience and operating efficiency as primary goals. The objectives of the Engineering Test program are to provide a set of SOAC engineering data and to further develop the methodology for providing transit vehicle comparisons. These objectives were met with the presentation of the test results in this report and the incorporation of refinements to the testing methodology into the General Vehicle Test Plan, GSP-064.

This report, Volume VI, contains a description of the Instrumentation System used for performance, ride quality and structural testing. Appendices are "Sensor Descriptions" and "Sensor Photographs."

Other volumes are: Volume I: Program Description and Test Summary (PB 244-747); Volume II: Performance Tests (PB 244-748); Volume III: Ride Quality Tests (PB 244-749); Volume IV: Noise Tests (PB 244-750); Volume V: Structural Voltage, and Radio Frequency Interference Tests (PB 244-751). The order number and price for the entire set of six reports is PB 244-746-SET, \$28.00.

NTIS ORDER NO.: PB 244-751/AS

PRICE: \$4.75

TITLE: STATE-OF-THE-ART CAR ENGINEERING TESTS AT DEPARTMENT OF
TRANSPORTATION HIGH SPEED GROUND TEST CENTER FINAL TEST REPORT
Volume VII: Postrepair Tests

AUTHOR: Boeing Vertol Company
(under contract to Transportation Systems Center)
(Ray Oren)

DATE: November 1975

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Rail, Systems and Planning Design
 2. SOAC
 3. Testing Facilities
 4. Rail, Rolling Stock
-

This document presents the test results for the State-of-the-Art Car Post-Repair Engineering Test Program conducted at the DOT High-Speed Ground Test Center (HSGTC), Pueblo, Colorado, from March 18th to 29th, 1974. The SOAC has been developed under UMTA's Urban Rapid Rail Vehicle and Systems Program to enhance the attractiveness of rapid rail transportation to the urban traveller.

The test data continuity between the original HSGTC Engineering Tests and the Post-Repair Test was established. Test data of variations from the original data have not been significant in terms of overall vehicle performance.

A description of test procedures, equipment, and facilities was provided in the original six-volume report, UMTA-MA-06-0025-75-1 through 6. PB 244-746 is the complete six-volume set; PB 244-747 through PB 244-752 are the NTIS document numbers for each volume, I through VI respectively.

NTIS ORDER NO.: PB 252-337/AS

PRICE: \$7.75

TITLE: STUDY OF SUBWAY STATION DESIGN AND CONSTRUCTION
Final Report

AUTHOR: DeLeuw, Cather & Company and Skidmore, Owings & Merrill
(R.S. O'Neil, J.S. Worrell, P. Hopkinson, and R.H. Henderson)

DATE: March 1977

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Subways
 2. Underground Structures
 3. Stations and Terminals
 4. Tunnels and Tunneling
 5. Construction, Cost
-

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 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.

NTIS ORDER NO.: PB 268-894/AS

PRICE: \$7.75

TITLE: SUBSURFACE EXPLORATION METHODS FOR SOFT GROUND RAPID TRANSIT TUNNELS
Volume I: Sections 1-6 and References
Volume II: Appendixes A-f

AUTHOR: Parsons, Brinckerhoff, Quade & Douglas and
Soil and Rock Instrumentation, Inc.
(under contract to Transportation Systems Center)

DATE: April 1976

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Tunnels and Tunneling
 2. Construction, Cost
 3. Underground Structures
 4. Site Selection
 5. Subways
-

The objectives of the Urban Mass Transportation Administration (UMTA) Tunneling Program are to lower subway construction costs and reduce construction hazards and damage to the environment. Some measure of each of these objectives for bored tunnels and deep excavations can be achieved through a more detailed knowledge of the subsurface and of how changes in soil types or characteristics will affect construction.

This study assesses subsurface exploration methods with respect to their ability to provide adequate data for the construction of rapid transit, soft-ground bored and cut-and-cover tunnels.

Geophysical and other exploration tools not now widely used in urban underground construction are investigated, their potential is discussed, and performance specifications and ideas for future development are presented. The effect of geotechnical variations on construction costs is modeled, and the effect of the prior knowledge of variations estimated. Requirements for the best methods of site investigation, including preliminary designs, specifications, cost estimates, and development plans, are formulated.

Volume I contains Sections 1-6 and all references. Volume II contains Appendixes A-F. The order number for the set of two volumes is PB 258-342-SET.

Volume I: PB 258-343/AS, \$7.75
Volume II: PB 258-344/AS, \$6.00

NTIS ORDER NO.: PB 258-342/AS-SET

PRICE: \$12.75

TITLE: URBAN RAIL SUPPORTING TECHNOLOGY
A Five Year Progress Summary 1971-1976

AUTHOR: Transportation Systems Center

DATE: June 1976

PROJECT NO.: MA-06-0025

KEYWORDS:

- | | |
|---|-----------------------|
| 1. Noise and Noise Control | 5. Safety |
| 2. Tunnels and Tunneling | 6. Testing Facilities |
| 3. Rail, Systems and
Planning Design | 7. Interfaces |
| 4. Research Operations | 8. Wheels |
-

As Systems Manager for the Rail Supporting Technology portion of the UMTA R&D program, the Transportation Systems Center is charged with the development and conduct of a comprehensive program of test and evaluation of vehicles, structures, and related components. The activities in support of test and evaluation have included the design and technical support for development and construction of the UMTA rail transit test track and related facilities at the DOT Transportation Test Center, Pueblo, Colorado. Of equal importance has been the development of general vehicle test plans and measurement system which have been used to test rail transit vehicles at the DOT Transportation Test Center and on operating properties. A major objective of these test activities is the acquisition of data to facilitate standardization and to assure safe and reliable vehicles in revenue service.

Another major activity within the program is the noise abatement effort which is directed at reducing acoustic noise in urban rail systems in order to improve environmental quality both for system users and the community alike. The effort is developing technology for evaluation and control of noise and vibration so that abatement measures can be recommended to system operators and planners. An effort to assess the noise condition on all U.S. rapid transit systems is nearing completion. The objective is a common data base from which to measure improvements. Work is underway to define the noise-generating mechanisms in the wheel-on-rail and in the track-guideway interfaces and to test promising abatement techniques in the field and revenue property environments. An effort in tunneling technology is also underway and safety and reliability technology are other areas of directed study.

NTIS ORDER NO.: PB 259-090/AS

PRICE: \$6.00

TITLE: URBAN RAIL SUPPORTING TECHNOLOGY PROGRAM,
FISCAL YEAR 1975 YEAR END SUMMARY

AUTHOR: Transportation Systems Center
(Ronald J. Madigan)

DATE: December 1975

PROJECT NO.: MA-06-0025

KEYWORDS:

- | | |
|--------------------------|-----------------------|
| 1. Rail | 5. Crashworthiness |
| 2. Track | 6. Rail, Cost |
| 3. Noise & Noise Control | 7. SOAC |
| 4. Tunnels & Tunneling | 8. Energy Storage Car |
-

The Urban Rail Supporting Technology Program is described for the 1975 fiscal year period. Important areas include program management, technical support and applications engineering, facilities development, test and evaluation, and technology development. New projects were started in all important areas.

Specific technical discussion includes: Technical Support and Applications Engineering, the Crashworthiness of Vehicles, Advanced Concept Train, and Rail Transit System Costs; Facilities Development, Permanent Track Power, Catenary, Wheel Truing Machine, and Track Scale; Test Evaluation, State-of-the-Art Car testing and Revenue Service Demonstration, the testing of existing Revenue Service Vehicles, testing on the UMTA RTTT (Energy Storage Car Gas-Turbine/Electric cars, Standard Light Rail Vehicle, Track Geometry Measurement System, and General Vehicle Test System); Technology Development, Noise Abatement, and Tunneling.

NTIS ORDER NO.: PB 250-447

PRICE: \$5.00

TITLE: VIBRATION PREDICTION MODEL FOR FLOATING-SLAB RAIL TRANSIT TRACK

AUTHOR: Cambridge Collaborative, Inc. (under contract to Transportation Systems Center
(J. E. Manning, D. C. Hyland, and G. Tocci)

DATE: August 1974

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Vibrations
 2. Models and Modeling
 3. Tracks and Trackage
 4. Rail
 5. Noise and Noise Control
 6. Subways
 7. Tunnels and Tunneling
-

This is one of three reports prepared under the UMTA Urban Rail Supporting Technology Program dealing with noise and vibration control for urban rail transit track and elevated structures. The other two reports are entitled "Prediction and Control of Rail Transit Noise and Vibration---A State-of-the-Art Assessment" (PB 233-363) and "Noise Prediction Models for Elevated Rail Transit Structures" (PB 244-509).

This report presents the theoretical development of a model to predict the vibration reduction by floating-slab tracks in subway tunnels. Data from a field study of a floating-slab in New York City are also presented.

The theoretical model described allows for the prediction of the force transmissibility---the ratio of the amplitudes of the force on the tunnel floor and the force on the rail. Data from the field study support the use of a simple single-degree-of-freedom oscillator for predicting the vibration reduction due to the particular floating slab that was studied. The theoretical model developed allows predictions to be made for a more general case.

Conclusions and design recommendations are presented. References are furnished.

NTIS ORDER NO.: PB 245-638/AS

PRICE: \$5.75

TITLE: WHEEL/RAIL NOISE AND VIBRATION
Volume I: Mechanics of Wheel/Rail Noise Generation

AUTHOR: Bolt, Beranek and Newman, Inc. (under contract to Transportation
Systems Center)
(P. J. Remington, M. J. Rudd and I. L. Ver)

DATE: May 1975 PROJECT NO.: MA-06-0025

KEYWORDS: 1. Noise and Noise Control 7. Interfaces
2. Vibrations
3. Rail
4. Wheels
5. Models and Modeling
6. Personal Rapid Transit

This two-volume report presents the final results of a project under UMTA's Urban Rail Supporting Technology Program to develop a basic understanding of urban transit wheel/rail noise control measures.

Analytical models of impedance, response, radiation efficiency, and directivity of wheels and rails are presented and compared with field and laboratory measurements. Analytical formulas for the prediction of noise in three general categories of wheel/rail noise---squeal, impact, and roar---are presented and verified by comparison with laboratory measurements as well as field measurements using a small steel-wheeled personal rapid transit vehicle on a test track.

In general, the agreement between the predictions and the measurements is adequate to verify the formulas, although uncertainties in the wheel/rail stick-slip curve and significant variations in roughness across the faces of wheels and rails (measured by a device developed during the program) lead to some uncertainties in the squeal and roar predictions, respectively.

A number of new devices for the control of wheel/rail noise are suggested and a number of old techniques are evaluated in light of new information generated during this program. Testing techniques are suggested for reproducibly evaluating wheel/rail noise control measures.

Volume I deals with the theory of wheel/rail noise generation and Volume II deals with applying the theory to the control of wheel/rail noise.

NTIS ORDER NO.: PB 244-514/AS

PRICE: \$7.75

TITLE: WHEEL/RAIL NOISE AND VIBRATION
Volume II: Applications to Control of Wheel/Rail Noise

AUTHOR: Bolt, Beranek and Newman, Inc. (under contract to Transportation
Systems Center)
(P. J. Remington, M. J. Rudd and I. L. Ver)

DATE: May 1975 PROJECT NO.: MA-06-0025

KEYWORDS:

1. Noise and Noise Control
2. Vibrations
3. Rail
4. Wheels
5. Models and Modeling
6. Personal Rapid Transit
7. Interfaces

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Volume I deals with the theory of wheel/rail noise generation and Volume II deals with applying the theory to the control of wheel/rail noise.

NTIS ORDER NO.: PB 244-515/AS

PRICE: \$6.75

TITLE: PRT IMPACT STUDY PRE-PRT PHASE
Volume I: Travel Analysis

AUTHOR: West Virginia University
(S.E.G. Elias, C.N. Redwine, and G.K. Deshpande)

DATE: March 1976

PROJECT NO.: MA-06-0026

KEYWORDS:

1. Personal Rapid Transit (PRT)
 2. Surveys
 3. Traffic Analysis, Flow
 4. Travel Demand
 5. Trip Generation
-

A Personal Rapid Transit (PRT) system has been built in Morgantown, West Virginia, as an Urban Mass Transportation Administration (UMTA) research, development, and demonstration project. It began passenger service operation in October 1975. The Morgantown PRT is the first of its kind ever operated in a city, and thus it generated this study of the interaction of a new mode and its service area.

The purpose of this PRT Impact Study is to determine the effects of system operation on various transportation and economic factors in the PRT corridor. Such information can then be utilized by cities trying to evaluate whether such a system could satisfy their transportation needs. This Impact Study will evaluate data collected in two phases: the Pre-PRT Phase (before passenger-carrying service), and the Post-PRT Phase.

The Pre-PRT data collection phase has been completed and is presented in three volumes. This volume, Volume I, describes the analysis performed on travel data collected for the Pre-PRT Phase, namely, travel behavior, travel patterns, modal utilization, and travel costs of various modes of travel in Morgantown before the revenue operation of the PRT. Volume II: Data Collection Procedure and Coding Manual (PB 254-482) describes the surveys conducted to obtain information about travel patterns, attitudes, and demographic traits of the residents. Volume II includes documentation of the format and codes used for placing the survey data on magnetic tape. Volume III: Frequency Tabulations from Four Transportation-Related Surveys (PB 254-483) gives, without commentary, tabulations of survey responses (Telephone, On-Board, and Mailback Surveys) as part of a study to assess the impact of the installation of the PRT System.

DIS ORDER NO.: PB 254-481/AS

PRICE: \$5.00

TITLE: PRT IMPACT STUDY PRE-PRT PHASE
Volume II: Data Collection Procedure and Coding Manual

AUTHOR: West Virginia University
(S.E.G. Elias, et al.)

DATE: March 1976

PROJECT NO.: MA-06-0026

KEYWORDS:

1. Personal Rapid Transit (PRT)
 2. Surveys
 3. Traffic Analysis, Flow
 4. Travel Demand
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NTIS ORDER NO.: PB 254-482/AS

PRICE: \$6.75

TITLE: PRT IMPACT STUDY PRE-PRT PHASE
Volume III: Frequency Tabulations from Four Transportation-Related Surveys

AUTHOR: West Virginia University
(C.N. Redwine)

DATE: March 1976

PROJECT NO.: MA-06-0026

KEYWORDS:

1. Personal Rapid Transit (PRT)
 2. Surveys
 3. Traffic Analysis, Flow
 4. Travel Demand
-

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TTIS ORDER NO.: PB 254-483/AS

PRICE: \$6.75

TITLE: DEVELOPMENT AND TEST OF AN EDDY-CURRENT CLUTCH-PROPULSION SYSTEM

AUTHOR: Mobility Systems & Equipment Company
(under contract to Transportation Systems Center) (G.J. Adams)

DATE: October 1973

PROJECT NO.: MA-06-0027

KEYWORDS:

1. Propulsion Systems, Electric
 2. Personal Rapid Transit (PRT)
 3. Brakes and Braking
-

This work performed under this project covered the design, fabrication, test and evaluation of propulsion system components basic to Personal Rapid Transit Systems. These include: the prime mover- an A-C Drive with eddy-current clutch and brake; its suspension system, and the delineation of the operational duty cycles in which PRT systems perform.

The focus of the project was directed toward advancing the state-of-the-art propulsion drives and improving the performance of Personal Rapid Transit systems.

The A-C propulsion drive with eddy-current clutch and brake was selected for study and comparison with other types of drives, proposed for, or presently used in, electrically powered vehicles. A 15-horsepower-drive A-C motor incorporating an air-cooled eddy-current clutch and brake was designed and fabricated, applying current state-of-the-art technology in electric drive units.

Control systems were designed and built applying TransMobile Systems technology to ensure a drive performance which met the requirements of a realistic PRT system duty cycle. An analysis of PRT system duty cycles supported the selection of the parameters used in the simulated versions of operational systems. Also, complete drive and bogie assemblies suitable for a PRT monorail configuration vehicle were fabricated.

The A-C drive with eddy-current clutch and brake was tested under simulated loads in evaluating its response during two PRT system duty cycles: (1) a current operational system ("Jetrail", Love Field, Dallas, Texas); and (2) an "optimized" system for an advanced Personal Rapid Transit system. Data recorded during the test runs were studied to establish the drive unit's performance during specific phases of a simulated duty cycle. An analysis of the data produced a comprehensive picture of the dynamics of the drive unit, which were then compared with the predicted performance. Also, the characteristics of static A-C drive units, A-C drive with eddy-current clutch and brake, and D-C drives were compared and evaluated.

The conclusions and recommendations resulting from the study are reported herein.

NTIS ORDER NO.: PB 225-093/AS

PRICE: \$7.75

TITLE: TEST AND EVALUATION OF AN EDDY CURRENT CLUTCH/BRAKE
PROPULSION SYSTEM

AUTHOR: Mobility Systems & Equipment Company
(under contract to Transportation Systems Center)
(George J. Adams)

DATE: February 1975

PROJECT NO.: MA-06-0027

KEYWORDS:

1. Propulsion Systems
 2. Personal Rapid Transit
 3. Vehicle, Design
 4. People Movers, Monorail
 5. Brakes and Braking
-

The purpose of this program was to design, fabricate, and evaluate a propulsion system consisting of a 15-hp, 3-phase induction motor, an eddy current clutch and an eddy current brake. These components were to be suitable for incorporation in the suspension system of a vehicle to operate on an existing monorail guideway. Control circuits for the propulsion system were to be packaged in a form suitable for installation in a test vehicle.

At the inception of Phase 1, there was no vehicle propulsion system with an eddy current clutch (ECC) drive larger than $7\frac{1}{2}$ hp. The details of the propulsion system design and evaluation tests for Phase 1 are given in final report for Phase 1, "Development and Test of an Eddy-Current Clutch-Propulsion System," (PB 225-093).

The program objectives for Phase 2 contained in this report were: 1) design and build a test vehicle having features essential for testing the ECC variable speed propulsion system built in Phase 1; 2) if necessary, adapt an existing track so it could be used for testing; 3) install the test vehicle on the track; 4) test the ECC propulsion system and determine its characteristics; and 5) assess the test results. The Phase 2 schedule is shown in Figure 1.1. The establishment of a test program plan is a continuing effort throughout the first part of the program. It will coincide with the design and fabrication of the test vehicle and also with the modifications to the test site.

The eddy current clutch propulsion system was installed in a vehicle for testing on a monorail track. Figure 1.2 shows area view of the test vehicle in operation during one of the tests on the test track. The monorail track that was used is located at the Los Angeles County Fairgrounds, where it is used as an amusement ride during the time the fair is open. A series of tests were conducted providing performance data on the propulsion system and of the vehicle. Analyses of the tests have been prepared, and the results are presented in this report.

NTIS ORDER NO.: PB 242-686/AS

PRICE: \$5.00

TITLE: HEADWAY SEPARATION ASSURANCE SUBSYSTEM (HSAS)

AUTHOR: Alden Self-Transit Systems Corporation (under contract to Transportation Systems Center)
(Robert T. Evans and Kenneth Cowes)

DATE: July 1975

PROJECT NO.: MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
 2. Safety
 3. Headways
 4. Testing Facilities
-

This report discusses the design, fabrication, test and evaluation of a Headway Separation Assurance Subsystem (HSAS) capable of reliable, failsafe performance in Personal Rapid Transit (PRT) systems. The items designed included both hardware and software packages. These packages are applicable, with minimum modification, to any PRT system, and are designed to allow economical full-scale installation. Supported by an "in-place" prototype control system, the demonstrations and tests took place on the Alden test track, Bedford, Massachusetts, where the interactions of the HSAS with vehicles, control computers and vehicle guideways were evaluated. Tests were performed at 9-3/4 mph with 8-1/3 seconds headway.

The system design studies and the tests performed at the track show that the HSAS has the capability of operating at 2-1/2 seconds headway on a 30 mph guideway.

NTIS ORDER NO.: PB 244-667/AS

PRICE: \$5.50

TITLE: PERFORMANCE EVALUATION OF AN AIR-LEVITATED, AIR-PROPELLED,
PASSIVE VEHICLE PERSONAL RAPID TRANSIT SYSTEM

AUTHOR: Uniflo Systems Company (under contract to Transportation Systems Center)
(Charles H. Smoot, Editor)

DATE: June 1975

PROJECT NO.: MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
 2. Air Cushion Vehicle
 3. Distribution Systems
 4. Noise and Noise Control
 5. Switches and Switching
-

An eight-passenger Uniflo vehicle was tested to 30 ft/sec on an enclosed guideway through curved, straight and switch sections. The following parameters were measured:

- ride quality, as 3 axis acceleration
- noise emission as perceived by passengers and in area near guideway
- vehicle acceleration and service braking
- switch response time
- levitation air flow and power requirements
- propulsion air flow and power requirements
- performance and reliability between -20 F and +90 F

Performance highlights included:

- ride quality approximates goals in UMTA's HPPRT Program
- noise near guideway substantially better than HPPRT goals
- noise in vehicles meets HPPRT goals above 1,000 Hz and improvement at lower frequencies is feasible
- safe and reliable switching with 150 millisecond switching time
- power requirement at 50 ft/sec cruise currently at 0.21 kwh per seat mile, and can be reduced below 0.12 kwh per seat mile
- consistent performance and safety, independent of weather
- established practicality of field-adjustable guideway alignment.

NTIS ORDER NO.: PB 255-844/AS

PRICE: \$5.50

TITLE: POWER AND PROPULSION CHARACTERISTICS OF THE DULLES TRANSPO '72
Personal Rapid Transit Vehicles

AUTHOR: Transportation Systems Center
(Alexander Kusko, Inc.)
(Frank L. Rapose and Mendell E. Phillips, Jr.)

DATE: July 1975

PROJECT NO.: MA-06-0031

KEYWORDS:

- | | |
|------------------------------|--|
| 1. Personal Rapid Transit | 6 |
| 2. Propulsion Systems | 6. People Movers, Transportation
Technology, Inc. |
| 3. Power Distribution | 7. Propulsion Systems, Linear
Induction |
| 4. People Movers | 8. Testing Facilities |
| 5. People Movers, Dashaveyor | |
-

As part of a program for the development of new urban transportation systems, UMTA initiated a project for the construction and testing of four prototype "Personal Rapid Transit (PRT) Systems" at Dulles International Airport in conjunction with Transpo '72. These four systems were the Bendix Dashaveyor System, the Ford Motor ACT System, the Rohr Monocab System, and the Transportation Technology TTI System.

Each prototype system consisted of two vehicles with a minimum of 1000 feet of guideway, off-line stations, and fully automatic control. One system (TTI) used air cushions for vertical support and a linear induction motor for propulsion. The other systems used rubber tires, two being supported from a roadway and the other (Monocab) suspended from an overhead guidebeam. Both scheduled operation and demand-actuated operation were demonstrated.

The systems were operated during Transpo '72 and were subject to intensive testing in the period 1 August to 11 November 1972. The objectives of these tests were: 1) to obtain a data base on those system characteristics that could be tested in the Dulles configurations for use in formulating specifications, evaluating systems, developing analytical models, and identifying component development requirements; 2) to determine the capabilities and limitations of these systems and to assess the current state-of-the-art; and 3) to determine the adequacy of specific subsystem and component designs.

The purpose of this report is to establish the power and propulsion characteristics of each of these vehicles. These characteristics are to be determined by using analytical descriptions, manufacturer's data and the test data from the Post-Transpo '72 Test Program.

NTIS ORDER NO.: PB 245-027/AS

PRICE: \$5.50

TITLE: A STUDY OF THE COSTS AND BENEFITS ASSOCIATED WITH AVM

AUTHOR: Transportation Systems Center
(H.D. Reed, M. Roos, M. Wolfe, and R. DiGregorio)

DATE: February 1977

PROJECT NO.: MA-06-0041

KEYWORDS:

1. Vehicle, Monitoring
2. Benefit-Cost Analysis
3. Life Cycle Costing
4. Management, Operations and Techniques
5. Taxis
6. Models and Modeling

Automatic Vehicle Monitoring (AVM) systems provide an information gathering and processing tool for the centralized management and control of urban vehicles. The potential benefits of AVM, namely, increased efficiency and productivity of transit operations, have led UMTA and the Transportation Systems Center (TSC) to explore the technical, operational, and economic feasibility of AVM. This study was conducted within TSC. It is a benefit-cost analysis that focuses specifically on AVM. This study addresses AVM utilization by bus, police, and taxi operators, and by cost-sharing, multiple user fleet. This analysis looks beyond field experimentation and focuses on the probable costs and achievable benefits of an AVM system fully deployed in a major metropolitan area.

The core of this analysis is a newly developed, computerized, benefit-cost accounting model. A comprehensive analysis of the literature and AVM-related experience in the U.S., Europe, and Canada have been integrated with research at TSC to develop this computerized cost-benefit mode. This model is a management tool that calculates the total life cycle costs of alternative AVM location systems, then determines the dollar value of cost reduction benefits made possible through use of AVM's real-time position location information. This model calculates the costs/benefits which would accrue to bus, police, and taxi operators in any metropolitan area. It can be useful for a wide range of AVM sensitivity analyses, for studies of AVM programs, and for the analysis of other technical or management innovations which address transportation operating efficiencies. This report discusses AVM deployment costs, AVM payoffs, and the sensitivity of those payoffs to the dimension of the model and the base case fleets. The Appendices contain Base Case Data Inputs, User's Manual for Benefit-Cost Model, and Input-Output Formats. The AVM systems offers a unique combination of capabilities which, in theory, offer the means for significant service, management, and economic benefits.

TTIS ORDER NO.: PB 266-293/AS

PRICE: \$9.00

TITLE: HANDICAPPED AND ELDERLY VERTICAL MOVEMENT ASSESSMENT STUDY

AUTHOR: Transportation Systems Center
(Ronald Kangas, et al.)

DATE: February 1976

PROJECT NO.: MA-06-0047

KEYWORDS: 1. Handicapped
2. Elderly
3. Rail, Stations and Terminals
4. Access, Planning and Control
5. Elevators

This report discusses the selection and assessment of seven types of vertical movement devices for potential use in older types of fixed rail urban mass transit facilities. The potential utilization of these devices is directed toward an increased usage of transit facilities by physically handicapped and elderly persons.

The study concentrates on the technical and cost considerations in the implementation and utilization of various standard (e.g., elevators, escalators, moving walks) and nonstandard (e.g., inclined stairlifts, stair-climbing wheel chairs) vertical movement devices in providing access and egress for elderly and handicapped persons to three configurations of rapid-rail stations typically found in the older transit systems of the U.S.

The stations surveyed presented three basic designs for traveler access. Each type of device was costed out for potential use in each station design. Cost comparisons showed that in a hypothetical situation the unit cost per device per installation per station indicated that the installation of nonstandard devices represented a lower total cost. However, in a practical application, the actual situation is more complex. Station surveys indicated that some of the nonstandard vertical movement devices could not be installed in stairwells or existing stations because of severe space limitations. In other instances, local or state safety ordinances and regulations would restrict the use of the nonstandard devices in station stairwells.

The general conclusion reached in this study is that each station has its own unique character and unique access/egress problems which would restrict or enhance the implementation of specific types of vertical movement devices. Hence, the determination of the device option which is technically most effective for a given station must await the results of a detailed architectural study of the individual station under consideration.

NTIS ORDER NO.: PB 252-516/AS

PRICE: \$5.00

TITLE: AUTOMATED GUIDEWAY GROUND TRANSPORTATION NETWORK SIMULATION

AUTHOR: Transportation Systems Center
(Charles R. Toye)

DATE: August 1975

PROJECT NO.: MA-06-0048

KEYWORDS:

1. Automated Guideway Transit
2. Management, Operations and Techniques
3. Algorithms
4. Models and Modeling
5. Routes and Routing
6. Schedules and Scheduling

The objectives of the Automated Guideway Transit Technology (AGTT) Program are to: (a) determine what is technologically feasible and to explore the advantages and disadvantages of alternatives; (b) resolve technological controversies; (c) through sponsorship of research and dissemination of technological data develop an AGTT network simulation capability and explore performance of a variety of breadboard and test solutions to critical technology problems; and (d) develop a national knowledge base for use by system designers and developers, local planners and government officials, and to assist them in selecting and evaluating new automated guideway technologies for a variety of applications (thereby reducing the technical and financial risk involved in the development of AGTT systems).

The work presented in this report was conducted in support of the AGTT program and relates to the development of a network simulation capability.

This report discusses some automated guideway management problems relating to ground transportation systems and provides an outline of the types of models and algorithms that could be used to develop simulation tools for evaluating system performance. The system management problems related to the routing and scheduling of both passengers and vehicles, as well as to control strategies such as synchronous and quasi-synchronous. The simulation outline provides background material for model descriptive, functional requirements, and simulation structure that can be used in future development activities.

NTIS ORDER NO.: PB 246-758/AS

PRICE: \$4.50

TITLE: THE AVAILABILITY SIMULATION OF AGT SYSTEMS

AUTHOR: Transportation Systems Center
(Charles R. Toye)

DATE: February 1975

PROJECT NO.: MA-06-0048

KEYWORDS:

1. Dual-Mode Systems
 2. Automated Guideway Transit
 3. Models and Modeling
-

This report discusses the analytical and simulation procedures that were used to evaluate the effects of failure in a complex dual mode transportation system based on a "worst" case steady-state condition. The computed results are an availability figure of merit and not an absolute prediction with associated confidence levels of system availability. The advantage of this procedure is that it avoids the use of a dynamic network traffic flow simulation which is both costly and time-consuming.

The availability calculation of a complex ground-automated transportation system such as that described in the urban deployment scenario of the UMTA dual mode transit program is most understandable when expressed in terms of the fraction of system time lost due to either passenger or vehicle delays. This involves both system reliability and maintainability, including the number of system failures per time interval, their effects, and corrective action times required to avoid vehicle delays.

In a dual mode transportation system, vehicles are capable of operating on conventional streets in a manual mode, and also, on specially constructed guideways in a completely automated mode.

The objective of this dual mode program is to combine the best automated transit such as the Personal Rapid Transit (PRT) system currently being demonstrated in Morgantown, West Virginia with the best aspects of modern bus technology. The dual mode concept combines two methods of operation; a driver-operated mode on surface streets of highways and an automated mode of fixed guideways.

The analytical and simulation approach taken encompasses fault tree and failure mode and effect analyses. The novel aspect of this approach is the use of the Monte Carlo technique to determine the physical location of failed vehicles in the system (on or off the guideway, in station berths, or at various merge/demerge sectors).

NTIS ORDER NO.: PB 247-061/AS

PRICE: \$4.00

TITLE: MORGANTOWN PERSONAL RAPID TRANSIT LONGITUDINAL CONTROL SYSTEM
DESIGN SUMMARY

AUTHOR: Boeing Aerospace Company (under contract to Transportation Systems
Center)
(Robert P. Lang)

DATE: December 1975

PROJECT NO.: MA-06-0048

KEYWORDS:

1. Personal Rapid Transit
 2. Vehicle, Design
-

Experience with the longitudinal control system used on each vehicle in the Morgantown Personal Rapid Transit System has shown that nonlinearities and variations in control system parameters can significantly affect performance if such characteristics are not adequately considered in the system design.

A design summary is provided that documents this experience and emphasizes the important analysis and hardware design problems encountered. The performance capability of the final design is computed on the basis of analysis and test results. A description of the detailed nonlinear analytical model developed is included for possible use in future studies. Potential system improvements are described that may be the objects of future research and development.

NTIS ORDER NO.: PB 256-139/AS

PRICE: \$6.75

TITLE: A SURVEY OF PROPULSION SYSTEMS FOR HIGH CAPACITY
PERSONAL RAPID TRANSIT

AUTHOR: Alexander Kusko, Inc.
(under contract to Transportation Systems Center)
(Thorleif Knutrud)

DATE: July 1975

PROJECT NO.: MA-06-0048

KEYWORDS:

1. Propulsion Systems
 2. Personal Rapid Transit
 3. Vehicle, Design
 4. Computer Applications
 5. Quantitative Analysis
-

The objective of this work was to examine the applicability of various state-of-the-art motor drive systems for propulsion of High Capacity Personal Rapid Transit Vehicles.

The High Capacity Personal Rapid Transit (HCPRT) system must operate with very short headways. To achieve safe operation at these headways, the propulsion system should meet certain unconventional requirements. They include: 1) reversible thrust capabilities; 2) short response time, and peak thrust exceeding three times nominal thrust.

These requirements were determined by analysis, computer simulations, and data provided by DOT/TSC. Five propulsion systems capable of meeting these requirements have been surveyed in this report. As background to the survey, several vehicle resistance curves were calculated for a "baseline" vehicle with assumed dimensions and weight. Four types of vehicle suspension methods were considered.

NTIS ORDER NO.: PB 250-581/AS

PRICE: \$5.50

TITLE: EVALUATION GUIDELINES FOR SERVICE AND METHODS
DEMONSTRATION PROJECTS

AUTHOR: Transportation Systems Center and
CACI, Inc.
(Carla Heaton, Chester McCall, Robert Waksman)

DATE: February 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Evaluation Guidelines
 2. Demonstrations
 3. Evaluation Methodology
 4. Survey Techniques
 5. Statistical Methodology
-

This document consists of evaluation guidelines for planning, implementing, and reporting the findings of the evaluation of Service and Methods Demonstration (SMD) projects sponsored by the Urban Mass Transportation Administration (UMTA).

The objective of these guidelines is to foster consistency of evaluation philosophy and techniques, and comparability of results so as to improve the output of the UMTA demonstration program. In addition to describing procedures for developing and executing the evaluation of SMD projects, this document contains background information on the SMD Program, a general discussion of the demonstration evaluation process, and appendixes on survey techniques and statistical methodology.

Although these guidelines were prepared specifically for use in evaluating SMD projects, their potential applicability covers the evaluation of any type of transit innovation.

NTIS ORDER NO.: PB 251-891/AS

PRICE: \$7.50

TITLE: PROCEEDINGS: TSC WORKSHOP ON ATTITUDINAL SURVEYS FOR
TRANSPORTATION PLANNING AND EVALUATION

AUTHOR: Transportation Systems Center
(Mary D. Stearns)

DATE: November 1975

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Surveys
 2. Planning, Tools
 3. Socioeconomic Analyses
-

The major conclusions of the Workshop on Attitudinal Surveys for Transportation Planning and Evaluation held at the Transportation Systems Center on January 30, 1975, are presented.

The Workshop participants, including transportation planners, transit system operators, market researchers, and social scientists, assessed the practical utility of attitudinal survey techniques for transportation planning and evaluation.

These proceedings summarize participants' opinions on the possible roles for attitudinal surveys in transportation planning and evaluation. The proceedings also evaluate attitudinal survey applications and attitude measurement issues in terms of their current usage in transportation contexts.

A list of Workshop participants is included in the appendix of this report.

NTIS ORDER NO.: PB 248-898/AS

PRICE: \$4.00

TITLE: SERVICE AND METHODS DEMONSTRATION PROGRAM
Annual Report

AUTHOR: Transportation Systems Center
(P. Benjamin, et al.)

DATE: November 1975

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Elderly
 2. Handicapped
 3. Transportation Disadvantaged
 4. Demand Responsive Systems
 5. Bus, Priorities
-

This report contains a description of the Urban Mass Transportation Administration's (UMTA's) Service and Methods Demonstration Program. Transit demonstration projects undertaken in previous years are reviewed. Recently completed and current demonstration projects are described and project results from similar demonstrations are compared. The comparisons are made by grouping projects according to the program objectives addressed: 1) decrease transit travel time; 2) increase transit reliability; 3) increase transit coverage; 4) increase transit vehicle productivity, and 5) improve the mobility of transit dependents. Demonstrations are categorized as either experimental, i.e., those intended to develop and test concepts to the point where they merit widespread use, or exemplary, i.e., those conducted to achieve more widespread diffusion of proven concepts and techniques.

Independent activities carried out in support of the demonstrations are described, such as the development of evaluation guidelines and improved methodologies for demonstration evaluation, analytical studies in support of the development of experimental demonstrations, and case studies of independent local innovations. Information dissemination mechanisms and activities intended to facilitate more widespread knowledge of effective approaches to improving transit are discussed.

The Appendix contains a detailed description of each demonstration project including the objectives, history, status, results, evaluation and conclusions.

NTIS ORDER NO.: PB 251-325/AS

PRICE: \$8.00

TITLE: SMALL CITY TRANSIT CHARACTERISTICS: AN OVERVIEW

AUTHOR: Transportation Systems Center
(Donald Kendall, et al.)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

- | | |
|--|---------------------------|
| 1. Small Cities | 6. Community Response |
| 2. Demand Responsive Systems | 7. Routes and Routing |
| 3. Ridership, Attraction | 8. Manpower and Personnel |
| 4. Fare, Cost Determination | 9. Labor Relations |
| 5. Management, Operations and Techniques | |
-

This report is based on information and operating data from thirteen small community transit systems which were studied as part of a larger project on small community transit and its potential. It summarizes organizational, institutional, and operational aspects of the case studies and contains an analysis of some of the relationships among service, cost and community response. Hypotheses are offered regarding the types of trips which are served, the cost and service trade-offs which are relevant when choosing between fixed-route and demand-responsive modes of operation, the critical variables such as labor agreements and maintenance arrangements which affect operating costs, the level of subsidy which may be anticipated, and the trade-offs between single-ride fares and transit passes as a means of fare collection. A number of conclusions are offered which bear on these topics, but the uniqueness of each community situation is stressed as an often dominant factor.

The thirteen communities used for this study are: Amherst, Massachusetts; Ann Arbor, Michigan; Bremerton, Washington; Chapel Hill, North Carolina; East Chicago, Indiana; El Cajon, California; Eugene/Springfield, Oregon; Evansville, Indiana; Merced, California; Merrill, Wisconsin; Sudbury, Massachusetts; Westport, Connecticut; Xenia, Ohio.

These studies are covered in reports UMTA-MA-06-0044-76-2 through -14, respectively.

NTIS ORDER NO.: PB 251-501/AS

PRICE: \$4.00

TITLE: SMALL CITY TRANSIT---AMHERST, MASSACHUSETTS
Free-Fare, Student-Operated Transit in a University Community

AUTHOR: Transportation Systems Center
(Robert Casey and Willa Michener)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Small Cities
 2. Fare, Free
 3. Universities
 4. Bus, Shuttle
-

Amherst, Massachusetts is an illustration of a free-fare transit service serving a university campus. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs for transit service within the local context is stressed.

Examples of transit service operating in other communities are covered in UMTA-MA-06-0049-76-3 through -14 and include, respectively: Ann Arbor, Michigan; Bremerton, Washington; Chapel Hill, North Carolina; East Chicago, Indiana; El Cajon, California; Eugene/Springfield, Oregon; Evansville, Indiana; Merced, California; Merrill, Wisconsin; Sudbury, Massachusetts; Westport, Connecticut; Xenia, Ohio.

Separate reports cover an overview of small city transit characteristics (UMTA-MA-06-0049-76-1) and summary of state aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-502/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT---ANN ARBOR, MICHIGAN
Pilot Dial-A-Ride Project in a Sector of the City

AUTHOR: Transportation Systems Center
(Willa Michener and Robert Waksman)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Small Cities
 2. Demand Responsive Systems,
Dial-A-Ride
 3. Bus
 4. Fare, Passes
-

Ann Arbor, Michigan, is an example of a pilot dial-a-ride project implemented to test the feasibility of a coordinated dial-a-ride/fixed-route service. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs for transit service within the local context is stressed.

Examples of transit services operating in other communities are covered in UMTA-MA-06-0049-76-2 and -4 through -14 and include, respectively: Amherst, Massachusetts; Bremerton, Washington; Chapel Hill, North Carolina; East Chicago, Indiana; El Cajon, California; Eugene/Springfield, Oregon; Evansville, Indiana; Merced, California; Merrill, Wisconsin; Sudbury, Massachusetts; Westport, Connecticut; Xenia, Ohio.

Separate reports cover an overview of small city transit characteristics (UMTA-MA-06-0049-76-1) and summary of state aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-503/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT---BREMERTON, WASHINGTON
Privately Operated Subscription Bus Service to
an Industrial Site

AUTHOR: Transportation Systems Center
(Donald Kendall and Joseph Misner)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Bus
 2. Small Cities
 3. Subscription Services
-

Bremerton, Washington, is an illustration of a privately operated, profit-making subscription bus service. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs for transit service within the local context is stressed.

Examples of transit services operating in other communities are covered in UMTA-MA-06-0049-75-2/-3 and -5 through -14 and include, respectively: Amherst, Massachusetts; Ann Arbor, Michigan; Chapel Hill, North Carolina; East Chicago, Indiana; El Cajon, California; Eugene/Springfield, Oregon; Evansville, Indiana; Merced, California; Merrill, Wisconsin; Sudbury, Massachusetts; Westport, Connecticut; Xenia, Ohio.

Separate reports cover an overview of small city characteristics (UMTA-MA-06-0049-76-1) and summary of state aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-504/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT---CHAPEL HILL, NORTH CAROLINA
Public Transit Serving a University and Town

AUTHOR: Transportation Systems Center
(Robert Casey)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Small Cities
 2. Bus
 3. Parking, Park-and-Ride
 4. Fare, Passes
 5. Universities
-

Chapel Hill, North Carolina, is an illustration of a public transit service providing a high level of service for a town its size and a good example of a cooperative arrangement between a town and a resident university. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs for transit service within the local context is stressed.

Examples of transit services operating in other communities are covered in UMTA-MA-06-0049-76-2, -3, -4, and -6 through -14, and include, respectively: Amherst, Massachusetts; Ann Arbor, Michigan; Bremerton, Washington; East Chicago, Indiana; El Cajon, California; Eugene/Springfield, Oregon; Evansville, Indiana; Merced, California; Merrill, Wisconsin; Sudbury, Massachusetts; Westport, Connecticut; Xenia, Ohio.

Separate reports cover an overview of small city transit characteristics (UMTA-MA-06-0049-76-1) and summary of state aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-505/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT---EAST CHICAGO, INDIANA
Free-Fare Transit in a High Density, Industrialized Area

AUTHOR: Transportation Systems Center
(Joseph Misner)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Small Cities
 2. Bus
 3. Transportation Disadvantaged
 4. Fare, Free
-

East Chicago, Indiana, is an illustration of a free-fare transit service operating in a high density area. The transit service was devised with a minimum of help from professional consultants, and without sophisticated routing, scheduling, or marketing plans. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs for transit service within the local context is stressed.

Examples of transit services operating in other communities are covered in UMTA-MA-06-0049-76-2 through -5 and -7 through -14 and include, respectively: Amherst, Massachusetts; Ann Arbor, Michigan; Bremerton, Washington; Chapel Hill, North Carolina; El Cajon, California; Eugene/Springfield, Oregon; Evansville, Indiana; Merced, California; Merrill, Wisconsin; Sudbury, Massachusetts; Westport, Connecticut; Xenia, Ohio.

Separate reports cover an overview of small city transit characteristics (UMTA-MA-06-0049-76-1) and summary of state aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-506/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT---EL CAJON, CALIFORNIA
City-Wide Shared Ride Taxi Service

AUTHOR: Transportation Systems Center
(Robert Casey and Grant Paul)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Small Cities
 2. Taxis
 3. Paratransit
-

El Cajon, California, is an illustration of a shared ride taxi service. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs for transit service within the local context is stressed.

Examples of transit services operating in other communities are covered in UMTA-MA-06-0049-76-2 through -6 and -8 through -14 and include, respectively: Amherst, Massachusetts; Ann Arbor, Michigan; Bremerton, Washington; Chapel Hill, North Carolina; East Chicago, Indiana; Eugene/Springfield, Oregon; Evansville, Indiana; Merced, California; Merrill, Wisconsin; Sudbury, Massachusetts; Westport, Connecticut; Xenia, Ohio.

Separate reports cover an overview of small city transit characteristics (UMTA-MA-06-0049-76-1) and summary of state aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-507/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT---EUGENE/SPRINGFIELD, OREGON
Extensive County-Wide Transit Coverage

AUTHOR: Transportation Systems Center
(Donald Kendall and David Reed)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Small Cities
 2. Bus
 3. Routes and Routing
-

Eugene/Springfield, Oregon, is an illustration of a fixed-route transit service with extensive, county-wide coverage. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs for transit service within the local context is stressed.

Examples of transit services operating in other communities are covered in UMTA-MA-06-0049-76-2 through -7 and -9 through -4 and include, respectively: Amherst, Massachusetts; Ann Arbor, Michigan; Bremerton, Washington; Chapel Hill, North Carolina; East Chicago, Indiana; El Cajon, California; Evansville, Indiana; Merced, California; Merrill, Wisconsin; Sudbury, Massachusetts; Westport, Connecticut; Xenia, Ohio.

Separate reports cover an overview of small city transit characteristics (UMTA-MA-06-0049-76-1) and summary of state aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-508/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT---EVANSVILLE, INDIANA
A Low Subsidy Transit Service

AUTHOR: Transportation Systems Center
(Joseph Misner)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Small Cities
 2. Bus
 3. Management, Operations and Techniques
-

Evansville, Indiana, is an illustration of a transit service in which a large percentage of operating costs are obtained from fare-box revenues. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs for transit service within the local context is stressed.

Examples of transit services operating in other communities are covered in UMTA-MA-06-0049-76-2 through -8, and -10 through -3 and include, respectively: Amherst, Massachusetts; Ann Arbor, Michigan; Bremerton, Washington; Chapel Hill, North Carolina; East Chicago, Indiana; El Cajon, California; Eugene/Springfield, Oregon; Merced, California; Merrill, Wisconsin; Sudbury, Massachusetts; Westport, Connecticut, Xenia, Ohio.

Separate reports cover an overview of small city transit characteristics (UMTA-MA-06-0049-76-1) and summary of state aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-509/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT---MERCED, CALIFORNIA
Dial-A-Ride Transit in an Agricultural Community

AUTHOR: Transportation Systems Center
(Leonard Bronitsky and Donald Kendall)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Small Cities
 2. Demand Responsive Systems,
Dial-A-Ride
 3. Subscription Services
 4. Rural Areas
-

Merced, California, is an illustration of a dial-a-ride transit service with a relatively low operating cost. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs for transit service within the local context is stressed.

Examples of transit services operating in other communities are covered in UMTA-MA-06-0049-76-2 through -9, and -11 through -14 and include, respectively: Amherst, Massachusetts; Ann Arbor, Michigan; Bremerton, Washington; Chapel Hill, North Carolina; East Chicago, Indiana; El Cajon, California; Eugene/Springfield, Oregon; Evansville, Indiana; Merrill, Wisconsin; Sudbury, Massachusetts; Westport, Connecticut; Xenia, Ohio.

Separate reports cover an overview of small city transit characteristics (UMTA-MA-06-0049-76-1) and summary of state aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-510/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT---MERRILL, WISCONSIN
Point Deviation Service in a Rural Community

AUTHOR: Transportation Systems Center
(Joseph Mergel)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Small Cities
 2. Suburbs
 3. Bus
 4. Point Deviation Service
 5. Routes and Routing
-

Merrill, Wisconsin, is an illustration of an innovative point-deviation transit service. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs of transit service within the local content is stressed.

Examples of transit services operating in other communities are covered in UMTA-MA-06-0049-76-2 through -11 and -14 and -15 and include, respectively: Amherst, Massachusetts; Ann Arbor, Michigan; Bremerton, Washington; Chapel Hill, North Carolina; East Chicago, Indiana; El Cajon, California; Eugene/Springfield, Oregon; Evansville, Indiana; Merced, California; Westport, Connecticut; Xenia, Ohio.

Separate reports cover an overview of small city transit characteristics (UMTA-MA-06-0049-76-1) and summary of states aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-511/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT---SUDBURY, MASSACHUSETTS
A Short-Lined Suburban Transit Service

AUTHOR: Transportation Systems Center
(Joseph Mergel)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Small Cities
 2. Suburbs
 3. Bus
 4. Fare, Passes
 5. Routes and Routing
-

Sudbury, Massachusetts, is an illustration of an over-extended, fixed-route transit service which was rather short-lived. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs for transit service within the local context is stressed.

Examples of transit services operating in other communities are covered in UMTA-MA-06-0049-76-2 through -11 and -14 and -15 and include, respectively: Amherst, Massachusetts; Ann Arbor, Michigan; Bremerton, Washington; Chapel Hill, North Carolina; East Chicago, Indiana; El Cajon, California; Eugene/Springfield, Oregon; Evansville, Indiana; Merced, California; Merrill, Wisconsin; Westport, Connecticut; Xenia, Ohio.

Separate reports cover an overview of small city transit characteristics (UMTA-MA-06-0049-76-1) and summary of state aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-512/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT---WESTPORT, CONNECTICUT
Comprehensive Transit Service in an Affluent
Suburban Community

AUTHOR: Transportation Systems Center
(Joseph Misner)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Small Cities
 2. Suburbs
 3. Bus
 4. Bus, Commuter
 5. Fare, Passes
-

Westport, Connecticut is an illustration of a fixed-route transit service operating in an affluent suburban community. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs for transit service within the local context is stressed.

Examples of transit services operating in other communities are covered in UMTA-MA-0049-76-2 through -12 and -14 and include, respectively: Amherst, Massachusetts; Ann Arbor, Michigan; Bremerton, Washington; Chapel Hill, North Carolina; East Chicago, Indiana; El Cajon, California; Eugene/Springfield, Oregon; Evansville, Indiana; Merced, California; Merrill, Wisconsin; Sudbury, Massachusetts; Xenia, Ohio.

Separate reports cover an overview of small city transit characteristics (UMTA-MA-06-0049-76-1) and summary of state aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-513/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT---XENIA, OHIO
A Transit Service for a Rebuilding City

AUTHOR: Transportation Systems Center
(Robert Casey and Charles Cofield)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Bus
 2. Small Cities
 3. Fare, Free
 4. Paratransit
 5. Emergency Vehicles and Services
-

Xenia, Ohio, is an illustration of a transit service which evolved from a free-fare emergency service to a demonstration of a paratransit service. This case study is one of thirteen examples of a transit service in a small community. The background of the community is discussed along with a description of the implementation process and operational characteristics of the transit service. The process through which the community responds to the specific needs for transit service within the local context is stressed.

Examples of transit services operating in other communities are covered in UMTA-MA-06-0049-76-2 through -12 and include, respectively: Amherst, Massachusetts; Ann Arbor, Michigan; Bremerton, Washington; Chapel Hill, North Carolina; East Chicago, Indiana; El Cajon, California; Eugene/Springfield, Oregon; Evansville, Indiana; Merced, California; Merrill, Wisconsin; Sudbury, Massachusetts; Westport, Connecticut.

Separate reports cover an overview of small city transit characteristics (UMTA-MA-06-0049-76-1) and summary of state aid programs (UMTA-MA-06-0049-76-15).

NTIS ORDER NO.: PB 251-514/AS

PRICE: \$3.50

TITLE: SMALL CITY TRANSIT: SUMMARY OF STATE AID PROGRAMS

AUTHOR: Transportation Systems Center
(Robert Casey, Editor)

DATE: March 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Small Cities
 2. Financing Mass Transportation,
Sources
 3. Planning, Tools
 4. Management, Operations and Techniques
-

This document presents a review of the financial and technical assistance that each state provides to communities of less than 200,000 population. In one section, state capital and operating assistance is examined. A separate section discusses the availability of technical and planning assistance. For all types of state assistance, administration procedures, funding strategies and sources, and interaction with UMTA requirements are presented. Data sheets and summary tables showing aid programs by state are presented in the Appendix.

Examples of transit services operating in other communities are covered in UMTA-MA-06-0049-76-2 through -14 and include, respectively: Amherst, Massachusetts; Ann Arbor, Michigan; Bremerton, Washington; Chapel Hill, North Carolina; East Chicago, Indiana; El Cajon, California; Eugene/Springfield, Oregon; Evansville, Indiana; Merced, California; Merrill, Wisconsin; Sudbury, Massachusetts; Westport, Connecticut; Xenia, Ohio.

NTIS ORDER NO.: PB 251-515/AS

PRICE: \$5.50

TITLE: TRANSIT FARE PREPAYMENT

AUTHOR: The Huron River Group, Inc.
(W.R. Hershey, et al.)

DATE: August 1976

PROJECT NO.: MA-06-0049

KEYWORDS:

1. Fare, Passes
 2. Management, Operations and
Techniques
 3. Ridership
 4. Surveys
-

This study is part of a Service and Methods Demonstration (SMD) Program administered by UMTA's Office of Transit Planning and contracted through the Transportation Systems Center. An overall objective of the SMD Program is to bring new techniques into full operational application and to demonstrate the use of proven techniques. The purpose of this study is the examination of the overall ridership and revenue impacts of on-going and completed prepayment programs.

Fare prepayment encompasses all methods of paying for transit rides other than by cash, i.e., tickets, tokens, punch cards, passes, and permits. This study examines past and current experience with fare prepayment programs and draws conclusions concerning their potential. The major objectives of this study are: 1) to survey ongoing and completed transit fare prepayment programs; 2) to identify key features and problems related to prepayment; 3) to measure public response to fare prepayment; 4) to assess advantages and market potential of fare prepayment; 5) to analyze cost-effectiveness of fare prepayment; and 6) to identify best applications of and implementation structures for transit fare prepayment.

To achieve these objectives, three separate and complimentary approaches are utilized: 1) a history and background that traces transit fare prepayment as far back as 1860 and follows its development through to the current state-of-the-art; 2) a survey of 146 U.S. transit operators; and 3) a discussion of transit user attitudes. These surveys are described, and the results are presented and analyzed in Section 5 of this report.

This study concludes that fare prepayment can be an important element of a transit system's marketing program, both for attracting and holding riders and for building the system's image. It also states that day passes have significant, but largely undiscovered, advantages related to providing passenger convenience, encouraging off-peak travel, and meeting the needs of low-income passengers.

NTIS ORDER NO.: PB 265-227/AS

PRICE: \$7.50

TITLE: A COMPARISON OF METHODS FOR EVALUATING URBAN TRANSPORTATION ALTERNATIVES

AUTHOR: Transportation Systems Center
(Leonard Bronitsky and Joseph Misner)

DATE: February 1975

PROJECT NO.: MA-06-0053

KEYWORDS: 1. Benefit-Cost Analysis
2. Qualitative Analysis
3. Quantitative Analysis
4. Urban Development and Planning

This report compares five possible methods for evaluating urban transportation alternatives.

These methods include: (1) Unaided judgmental evaluation: the raw impact predictions are subjectively weighed to decide the relative merits of the alternatives; (2) Cost-benefit analysis: Monetary values of costs and benefits are aggregated to decide the relative desirability of the alternatives; (3) Cost-effectiveness analysis based on a single measure of effectiveness: A single standard of performance is declared in advance and alternatives are compared based on their cost of meeting that standard; (4) Cost-effectiveness analysis based on multiple measures of effectiveness: A set of several standards of performance is declared in advance, and alternatives are compared based on their cost of meeting all standards simultaneously; and (5) Scoring function methods: Subjectively derived weights, which represent the importance of each impact, are explicitly declared. The weighted cost and benefits are then aggregated into a single score which is used to judge the relative merits of alternatives.

Each method was assessed within the framework of eight methodological criteria relating to the three major concerns of feasibility, review-ability, and relevancy.

Among the conclusions drawn was that of the systematic evaluation methods, cost-effectiveness analysis based on multiple measures of effectiveness poses the fewest difficulties in simultaneously serving the local and Federal purposes.

NTIS ORDER NO.: PB 245-312/AS

PRICE: \$4.25

TITLE: A STUDY DESIGN FOR DUAL MODE TRANSIT PLANNING CASE STUDY

AUTHOR: Cambridge Systematics, Inc.
Barton-Aschman Associates, Inc.

DATE: March 1975

PROJECT NO.: MA-06-0056

KEYWORDS:

1. Planning
 2. Dual-Mode Systems
 3. Management, Operations and Techniques
-

This document is a Study Design for a Dual Mode Planning Case Study to be carried out for the Milwaukee, Wisconsin metropolitan region. The 14-month case study is expected to develop a methodology for dual mode planning at the sketch-planning level of detail, to provide feedback to the UMTA dual-mode, hardware-design effort, and to evaluate the usefulness of recent UMTA software development efforts for conducting such a case study.

The Study Design includes a detailed description of the individual project tasks and subtasks which will be carried out. The tasks emphasize both the need to represent dual mode as a new transportation technology with many uncertainties as to its characteristics; and the need to consider the goals, objectives, and socio-economic and trip making characteristics of the local area.

In addition to the description of the planned technical work steps, this document also contains cost allocations, time schedules, organizational arrangements and management control procedures for the conduct of this project.

NTIS ORDER NO.: PB 250-476/AS

PRICE: \$7.75

TITLE: ASSESSMENT OF OPERATIONAL AUTOMATED GUIDEWAY
SYSTEMS-AIRTRANS (PHASE I)

AUTHOR: Transportation Systems Center
(Ronald Kangas, et al.)

DATE: September 1976

PROJECT NO.: MA-06-0067

KEYWORDS:

1. Airports, Access
 2. Automated Guideway Transit
 3. Communications
 4. Guideways
 5. Vehicle, Design
 6. Transportation Systems Management
-

This report presents the results of an evaluation study of AIRTRANS, a unique, automated guideway system located at the Dallas/Ft. Worth Airport. AIRTRANS was designed to move passengers, employees, baggage, mail, trash and supplies. The newest and largest system of its type in the world, it comprises 13 miles of single lane guideway and 68 vehicles, and serves 53 stations at different points in the airport complex. The system is one of the first intra-airport transit systems conceived, designed and constructed as an integral part of the airport development.

The study, conducted in cooperation with the Dallas/Ft. Worth Regional Airport and the Vought Corporation, was intended to codify the information and experience gained in the planning, development, implementation, and initial operation of the system into an integrated body of knowledge from which those concerned with any phase of future, similar system planning and implementation could profit.

The assessment team found AIRTRANS an impressive accomplishment. As a pioneering project, AIRTRANS did not have an extensive data base to build on, and consequently some problems arose attributable to insufficient system planning, analysis, organization and specification, as well as optimism about schedules and component reliability. Considering this, AIRTRANS is impressive and commendable but it could be more efficient and effective and is being constantly improved towards these goals. The report provides information useful to planners, designers, developers and operators of automated transit systems for intra-airport and other applications.

NTIS ORDER NO.: PB 261-339/AS

PRICE: \$9.25

TITLE: PEOPLE MOVER PROFILE

AUTHOR: Urban Mass Transportation Administration
(Office of Technology Development and Deployment)

DATE: May 1977

PROJECT NO.: MA-06-0081

KEYWORDS:

1. Automated Guideway Transit
 2. Group Rapid Transit
 3. People Movers
 4. Personal Rapid Transit
 5. Urban Development and Planning
-

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. The current title in this series, "People Mover Profile," has been prepared by the Department's Office of Technology Sharing in cooperation with the Office of AGT Applications of UMTA.

This publication 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 our 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.

NTIS ORDER NO.: PB 268-335/AS

PRICE: \$4.00

TITLE: INTEGRATED DIAL-A-RIDE AND FIXED ROUTE TRANSIT
IN ANN ARBOR, MICHIGAN

AUTHOR: Cambridge Systematics, Inc. and Multisystems, Inc.
(L.A. Neuman, J.A. Wojno, and R.D. Juster)

DATE: March 1977

PROJECT NO.: MA-06-1083

KEYWORDS:

1. Demand Responsive Systems,
Dial-A-Ride
 2. Intermodal, Integration
 3. Transportation Systems Management
 4. Computer Applications
-

Since the conclusion of a dial-a-ride pilot project in the fall of 1972, the Ann Arbor Transportation Authority (AATA) has developed and incrementally implemented an integrated dial-a-ride and conventional fixed-route bus transit system (Teltran) which utilizes a computer assisted reservation system and provides the city with 100 percent geographical coverage during all hours of operation. The final phase of the Teltran system was implemented in the summer of 1976. The AATA's experience with integrated demand responsive and fixed-route service provides some valuable insights for other communities considering major transportation improvements.

This evaluation was conducted as part of UMTA's Service and Methods Demonstration project to help disseminate information on an innovated transit system. This evaluation focuses on the integrated service provided within Ann Arbor.

This report describes the development, implementation, and current status of the Teltran system as it existed in the spring of 1976. In particular, this evaluation provides a detailed description of Teltran system configuration (and changes in that configuration by time of day and day of the week), system dispatching and operation, and the effectiveness of an incremental implementation process. In addition, the effect of Teltran on improving transit level of service and ridership is examined as well as the productivities achieved. This report states that Teltran has achieved the city-wide coverage objective. The other local objective, reducing auto ownership to one car per family, lacks data to determine the success in achieving this objective.

NTIS ORDER NO.: PB 267-941/AS

PRICE: \$7.75

TITLE: PATH FINDING ALGORITHMS AND DATA STRUCTURES FOR POINT-TO-POINT TRIP MANAGEMENT

AUTHOR: National Bureau of Standards
(Judith F. Gilsinn, Patsy B. Saunders, and Martin H. Pearl)

DATE: January 1975

PROJECT NO.: MD-06-0013

KEYWORDS:

1. Algorithms
 2. Information Aids
 3. Computer Applications
 4. Models and Modeling
 5. Routes and Routing
 6. Schedules and Scheduling
 7. Trip Generation
-

This report identifies and characterizes the data base and computer software requirements for a Point-to-Point Trip Management (PTPTM) System which provides detailed transit trip itineraries in response to inquiries made by prospective passengers.

The requirements fall into four categories, corresponding to successive stages in processing such an inquiry: (1) reception and interpretation; (2) location and connection; (3) path calculation; and (4) report. Procedures for path calculation are discussed in detail, including techniques for improving shortest path algorithm performance both through optimized computational schemes and through special methods of representing and manipulating the data base describing transit routes and schedules. Estimates, based on step-by-step schemes presented in an appendix, indicate that computation time will be sufficiently small (less than one second per request) and that on-line path computation is feasible.

Since path finding represents only a fraction of the total time spent in answering a request for itinerary, a queuing model is developed to establish how many formerly lost calls would be captured by a computerized system which achieved a prescribed fractional saving in service time; illustrative application of this model indicates a sharp reduction in lost calls.

NTIS ORDER NO.: COM-75-10697

PRICE: \$5.00

TITLE: POINT-TO-POINT TRIP MANAGEMENT PROGRAM
Preliminary Analysis

AUTHOR: National Bureau of Standards
(William G. Kienstra and Daniel J. Minnick)

DATE: February 1975

PROJECT NO.: MD-06-0013

KEYWORDS:

1. Information Aids
2. Computer Applications
3. Trip Generation
4. Routes and Routing
5. Schedules and Scheduling

Point-to-Point Trip Management (PTPTM) is concerned with providing prospective mass transit riders with necessary detailed information regarding use for particular trips. PTPTM is one effort aimed at improving the transit telephone information systems. Explicit instructions are provided to potential riders so that they may accomplish a complete origin to destination trip using public transportation. The nearest available telephone is used to communicate the following information to the transit systems: where you are, where you want to go, and when you wish to arrive. The transit system responds with individualized instructions telling the rider where and when to enter the station system, what transfers to make, if necessary, at what times and at which stations, and where and when the rider will exit the system in order to arrive at the destination by the desired time. The fare necessary for the trip will also be stated.

This report contains the results of a literature search on automation in the telephone information center, and analyzes data collected from 29 existing centers. On-site visits were made to three operational centers, and tapes of actual telephone inquiries and responses were obtained and analyzed. The use of microfiche and computers is examined as an aid to operators in these centers. Total automation of the centers is also discussed.

Conclusions and recommendations for further study are presented. An annotated bibliography is provided.

NTIS ORDER NO.: COM-75-10421

PRICE: \$4.00

TITLE: ADAPTIVE MERGING UNDER CAR-FOLLOWER CONTROL

AUTHOR: Johns Hopkins University Applied Physics Laboratory
(Samuel J. Brown, Jr.)

DATE: October 1974

PROJECT NO.: MD-06-0018

KEYWORDS: 1. Vehicle, Monitoring
2. Guideways
3. Computer Applications
4. Headways
5. Algorithms
6. Safety

This report investigates methods by which vehicles may be safely merged into automated transit systems under the car-follower longitudinal control concept.

A technique is presented for the control of vehicle merging in an automated transit system. This technique, "adaptive merging", is applicable to systems in which vehicle speeds and spacings are regulated according to the behavior of preceding vehicles on the guideway (i.e., car-following). Adaptive merging resolves merge conflicts by paralleling the car-follower control logic between the two merging lines for a distance of several hundred feet upstream of the actual merge junction. The developed algorithm for adaptive merging assures safe vehicle merges for traffic flows up to 100% of downstream guideway capacity, with acceptable transients in vehicle accelerations and speeds.

Chapters address characteristics and design of car-follower controllers, adaptive merging algorithm, simulation description, and algorithm performance from simulation.

Abbreviations and symbols are explained. Illustrations, tables, and references are furnished.

NTIS ORDER NO.: PB 250-551/AS

PRICE: \$5.00

TITLE: ANALYSIS OF MULTIPLE PARTY VEHICLE OCCUPANCY IN AN AUTOMATED GUIDEWAY SYSTEM

AUTHOR: Johns Hopkins University Applied Physics Laboratory
(M. B. Williams, B. M. Ford, and W. C. Wadde11)

DATE: March 1976

PROJECT NO.: MD-06-0018

KEYWORDS:

1. Automated Guideway Transit
 2. Guideways
 3. Computer Applications
 4. Models and Modeling
 5. Ridership, Volume
-

Many proposed new urban transit systems offer demand-actuated service between stations, with vehicles being shared by several passengers.

In this report an analysis has been made of the operation of multiple-party occupancy systems in which the guideway network consists of a single loop or of several interconnecting loops. Vehicles circulate freely around the loop or loops of the network. A vehicle enters a station only if it has passengers to discharge or the station has passengers waiting for service and the vehicle can accomodate them. Vehicles placed in storage at each station may be used whenever serious queuing of waiting passengers develops. A means for replenishing storages and a procedure for limiting the number of intermediate stops experienced by a passenger are described.

The analysis consists of establishing relationships between performance parameters (e.g., delays to passengers) and system parameters (e.g., fleet size, vehicle capacity). A computer simulation was constructed for use in the analysis that shows that system operation can be satisfactory. The use of vehicle storage limits passenger waits and also permits a modest reduction in fleet size. Placing a meaningful limit on intermediate stops will increase the required fleet size and will limit the needed vehicle capacity.

NTIS ORDER NO.: PB 251-930/AS

PRICE: \$5.00

TITLE: COMMAND AND CONTROL STUDIES FOR PERSONAL RAPID TRANSIT,
PROGRAM STATUS, 1974

AUTHOR: Johns Hopkins University Applied Physics Laboratory
(E. J. Hinman, Editor)

DATE: December 1974

PROJECT NO.: MD-06-0018

KEYWORDS: 1. Personal Rapid Transit 7. Safety
2. Rail, Automatic Control 8. Vehicle, Monitoring
3. Management, Operations and Techniques
4. Routes and Routing
5. Guideways
6. Headways

Personalized automated transit provides a high level of service through use of an extensive network of guideways. Vehicle management for such a system is concerned with such problems as how to select an efficient route from origin to destination, how to direct an empty vehicle to a suitable storage area, how to maintain an optimum fleet size, and how to reinitialize the system following a failure.

The analyses performed and simulations developed in the investigations of these problem areas are summarized in Sections 3 through 5.

Automated transit control is concerned with the details of the regulation and protection of vehicles as they move along the guideway. These two functions - regulation and protection - while closely related from an operational point of view, are quite distinct in terms of design requirements and constraints. In the context of investigations, vehicle protection has meant providing adequate assurance that collisions will be prohibited between vehicles operating at short headways. Vehicle regulation is provided by control of vehicle position, speed, and longitudinal acceleration and jerk.

Both aspects of vehicle control have been extensively investigated and the principal results and conclusions are reviewed in Sections 6 through 11.

A related report is "Command and Control Studies for Personal Rapid Transit, Program Status, 1973" (PB 231-681).

NTIS ORDER NO.: PB 250-553 /AS

PRICE: \$6.75

TITLE: MODELS FOR ASSESSING TRIP DEPENDABILITY IN
AUTOMATED GUIDEWAY TRANSIT NETWORKS

AUTHOR: The Johns Hopkins University Applied Physics Laboratory
(D.L. Kershner and W.J. Roesler)

DATE: August 1976

PROJECT NO.: MD-06-0018

KEYWORDS:

1. Automated Guideway Transit
 2. Models and Modeling
 3. Trip, Dependability
 4. Group Rapid Transit
 5. Transportation Systems Management
 6. Topography
 7. Travel Demand
-

Equipment failures and how to correct them are significant factors affecting the quality of service of Automated Guideway Transit (AGT) systems. The network configuration, subsystem failure rates, and recovery modes, interact to provide the operational configuration that passengers ultimately view in terms of the ability of the AGT system to provide reliable service for their trip.

This report describes a procedure that permits evaluation of the Group Rapid Transit networks in terms of trip dependability. The model uses a flow representation of vehicle traffic determined by network topography, demands for travel, and operational service policy. The trip dependability indices are developed for trips between particular origins and destinations as influenced by the interaction of traffic bound for other stations. The model has its most useful application in the intermediate design stage where there are tradeoffs to be evaluated in network configuration, system design parameters, and service policy, and where the effects of various allocations of reliability and maintainability need to be assessed.

NTIS ORDER NO.: PB 258-129/AS

PRICE: \$4.50

TITLE: NETWORK MODEL STUDIES FOR AUTOMATED GUIDEWAY TRANSIT: ADVANCED
GROUP RAPID TRANSIT MODELS

AUTHOR: Johns Hopkins University Applied Physics Laboratory
(D. L. Kershner, R. C. Rand, and W. J. Roesler)

DATE: February 1976

PROJECT NO.: MD-06-0018

KEYWORDS:

1. Automated Guideway Transit
 2. Models and Modeling
 3. Advanced Ground Rapid Transit
-

This report describes the development of network models for the Advanced Group Rapid Transit (GRT) concept of automated guideway transit (AGT) systems. These models, which include basic network geometries and trip-making characteristics, can provide a baseline model for service policy/cost trade-off studies, and for the design of the various system management algorithms required to implement a chosen service policy. A basic requirement of the network models is that they must not represent a particular urban installation. They must, however, provide a realistic setting for the studies that will use them.

The method used in generating the network models has been to determine the discriminating characteristics of the Group Rapid Transit (GRT) System concept, to review pertinent planning studies, and to attempt to determine basic forms for the networks and travel patterns. The planning studies were reviewed to determine special constraints considered in the urban implementation. This latter information is useful in setting constraints on the network geometries.

Finally, a review was made of some characteristics of conventional transit systems to obtain data on ridership, service quality, and operating parameters in order to provide a frame of reference for considering the performance of automated guideway systems.

NTIS ORDER NO.: PB 251-881/AS

PRICE: \$7.50

TITLE: VEHICLE-FOLLOWER CONTROLS FOR SHORT HEADWAY AGT
SYSTEMS-FUNCTIONAL ANALYSIS AND CONCEPTUAL DESIGNS

AUTHOR: The Johns Hopkins University Applied Physics Laboratory
(H.Y. Chiu, G.B. Stupp, Jr., and S.J. Brown, Jr.)

DATE: December 1976

PROJECT NO.: MD-06-0018

KEYWORDS:

1. Automated Guideway Transit
 2. Guideways
 3. Personal Rapid Transit
 4. Headways
 5. Vehicles, Monitoring
-

This report documents an investigation into the feasibility of short headway operations of Personal Rapid Transit (PRT) systems using the vehicle-follower longitudinal control concept.

This document examines the requirements and constraints imposed upon a control system using vehicle-following with headways from 3.0 to 0.4s and at speeds from 8 to 24 m/s. Specifically, the focus is on short headway operation in the regulation mode and on the mode transition problem. The analysis is limited to control systems operating under nominal (service) conditions as opposed to emergency operation.

Vehicle-following is a technique for the longitudinal control of vehicles in an automated transit system where the speed and spacing of a given vehicle are governed by the behavior of the preceding vehicle on the guideway. Vehicle-follower control at very short headways may be achieved by introducing a variable-gain capability. This approach entails two modes of operation: velocity-command (open loop) control and regulation (closed loop) control. Significant problems can arise when transitions are attempted from velocity-command to regulation mode because of jerk and acceleration constraints for ride-quality considerations. The minimum spacings required for service braking to avoid possible emergency braking are kinematically determined and used as operational requirements can produce large initial errors that are incompatible with vehicle-follower controller design for the regulation mode. This report investigates the use of variable-gain techniques to resolve the transition problem. The application of controller gains continuously varying in time is shown to be successful in two typical transition situations. The time-varying gain technique is considered feasible for use in the overtake-mode transition, and its applicability to other situations should be evaluated. Its performance, observed during this study, shows promise for its successful use in merging and flow regulation.

NTIS ORDER NO.: PB 266-272/AS

PRICE: \$5.50

TITLE: THE GRAND RAPIDS DIAL-A-RIDE
A Demand Responsive Community Service Transportation Project

AUTHOR: City of Grand Rapids, Michigan, and
City Coach Lines, Inc.

DATE: August 1974

PROJECT NO.: MI-06-0004

KEYWORDS:

1. Demand Responsive Systems, 5. Inner City
 Dial-A-Ride 6. Models and Modeling
 2. Transportation Disadvantaged
 3. Elderly
 4. Handicapped
-

This is the final report of a demonstration project, conducted in Grand Rapids, Michigan, from June 1971 through August 1974.

The purpose of this project was to develop a demand-responsive public transportation system which would supplement the existing fixed-route, fixed-schedule transit operations. The system was primarily oriented to the inner-city poor and elderly residents and their needs for travel to jobs, health and social service facilities, and cultural and recreational activities.

The chapters of this report are: Introduction; Operating Plan Summary; Dispatching and Evaluation Design; Operations and Training; Interim Results from Summer Operations; Final Results from 13 Month Full Operation; and Conclusions. Appendices are "Transportation Inventory Survey of the Grand Rapids Model Neighborhood" and "Model Cities Evaluation Report."

NTIS ORDER NO.: PB 253-195/AS

PRICE: \$5.50

TITLE: FORT BERTHOLD INDIAN RESERVATION BUS DEMONSTRATION PROJECT

AUTHOR: Crain & Associates (For Three Affiliated Tribes, Inc.)
(J.L. Crain, P.G. Fitzgerald, and F.C. Stoffel)

DATE: January 1975

PROJECT NO.: ND-06-0001

KEYWORDS: 1. Transportation Disadvantaged
2. Socioeconomic Analyses
3. Bus
4. Surveys
5. Transportation Systems Management

This demonstration project was designed to develop and evaluate a transit system for a growing urban-rural Indian Region in Central North Dakota. Fort Berthold is a reservation of about 650 square miles, with an Indian population of approximately 2,775. The residents are located mainly in five small towns within a radius of approximately 110 miles.

The primary focus of the project was to support the economic and social development of the entire region by interconnecting the various and otherwise isolated communities with employment, commercial, medical, and educational centers in the region.

An element of the project was to search for ways of incorporating all of the transit services in the region into a package that would sustain the system to a point where it would become economically self-sufficient. The demonstration provided data (contained in this report), concerning ways in which an environment characterized by depressed socio-economic conditions and limited transit expertise can support badly needed transportation services.

Chapters describe the reservation, transit system analysis, marketing analysis and household survey, and post-demonstration plans. Appendices include the household survey questionnaire, household survey trip pattern data, and the post-demonstration transportation plan.

NTIS ORDER NO.: PB 245-211/AS

PRICE: \$7.25

TITLE: LINCOLN EXPERIMENTAL TRANSPORTATION DEMONSTRATION PROJECT
Final Evaluation Report

AUTHOR: Applied Planning and Management & Associates
(Prepared for Lincoln-Lancaster Commission on Aging)

DATE: October 1975

PROJECT NO.: NE-06-0002

KEYWORDS: 1. Handicapped
2. Elderly
3. Transportation Disadvantaged
4. Demand-Responsive Systems
5. Subscription Services
6. Planning, Tools
7. Surveys

This is the final evaluation report of the Lincoln, Nebraska, Experimental Transportation Demonstration Project which involves the provision of a specialized transportation service, known as the HANDIBUS system, for handicapped and elderly citizens who encounter barriers to existing mass transportation services.

The service includes door-to-door transportation for qualified handicapped and elderly citizens at the same fare as the regular city bus service. Special tickets are purchased by qualified applicants. The specialized service is operated by Lincoln Transportation Service, a city-owned mass transportation system which operates the regular city bus lines.

The evaluation specifically addresses five primary objectives of the HANDIBUS service: 1) to achieve a high level of penetration of the target population; 2) to eliminate, to the degree possible, existing barriers to mass transportation among the target population; 3) to substantially increase mobility among the target group; 4) to increase community social and economic integration with the target population; and 5) to provide efficient equipment and operating methods for providing the intended service.

It is intended that this report will serve as a planning base for other communities considering the implementation of similar programs. The sections of the report are as follows: Introduction, Rider Survey, Registrant Survey, Registrant Characteristics, Utilization Characteristics, Operations and Costs, and a Summary and Conclusion.

Appendices contain data collection instruments and specification of primary variables and parameters.

NTIS ORDER NO.: PB 248-735/AS

PRICE: \$4.50

TITLE: OPERATING PROCEDURES MANUAL FOR AN AUTOMATED SCHEDULING SYSTEM
FOR DEMAND-RESPONSIVE PUBLIC TRANSPORTATION (Haddonfield Dial-A-
Ride)
Part I: Controller Functions
Part II: Computer Operator Functions

AUTHOR: MITRE Corporation, LEX Systems, Inc., DAVE Systems, Inc., New
Jersey Department of Transportation and Massachusetts Institute
of Technology

DATE: October 1974 PROJECT NO.: NJ-06-0002

KEYWORDS:

1. Demand Responsive Transportation, Dial-A-Ride
2. Computer Applications
3. Schedules and Scheduling
4. Manpower and Personnel
5. Management, Training Techniques
6. Information Aids

This two-volume manual is a user's guide for a computer-controlled, demand-responsive transportation system (Dial-A-Ride). The goal of the manual is to provide information needed by Dial-A-Ride Control Center personnel to operate an automatic Dial-A-Ride transit service using a Westinghouse 2500 mini-computer, its associated peripheral devices, and its software.

The user of the manual should have a thorough knowledge of the operation of a manually-scheduled, demand-responsive public transportation system. Suggested reports for reference are: "Implementation and Operation of a Demand Responsive Public Transportation System" (PB 233-380), "Summary of an Automated Scheduling System for Demand Responsive Public Transportation" (PB 232-419), and "System Performance Data Processing for Demand Responsive Public Transportation" (PB 248-921).

With the exception of the Introduction chapter, which is needed by all Control personnel, this manual is sectioned functionally. Personnel involved will find within their functional sections all the information necessary for them to do the tasks connected with their functions. Although not needed for day-to-day guidance, personnel with related functional area responsibilities should be aware of and familiar with pertinent sections of the manual.

Part I contains the telephonist, dispatcher and supervisory functions (PB 248-568/AS, \$7.50).

Part II encompasses the computer operations function and the appendices---scheduling function, computer hardware and glossary of terms (PB 248-569/AS, \$6.00).

The techniques for changing between manual and computer scheduling are explained in each section.

NTIS ORDER NO.: PB 248-567/AS - SET

PRICE: \$12.00

TITLE: ENERGY STORAGE PROPULSION SYSTEM FOR RAPID TRANSIT CARS
System Design and Equipment Description

AUTHOR: Metropolitan Transit Authority, N.Y. State Department of
Transportation, and AiResearch Manufacturing Company
(Donald Raskin and Ronald T. Yutko)

DATE: September 1975

PROJECT NO.: NY-06-0006

KEYWORDS: 1. Propulsion Systems
2. Flywheels
3. Underground Structures
4. Vehicle, Design
5. Subways
6. Energy Storage Car

When a transit rail car accelerates, it draws energy from a wayside electric power source; when it decelerates, the car must rid itself of this energy. Conventional rail cars dissipate this energy in the form of heat.

This report describes a transit car propulsion system which will save much of this presently wasted energy by storing the car's kinetic energy in flywheels which are mounted below the car floor. The stored energy is then available for the subsequent acceleration of the car. Thus a significant reduction in energy usage is expected, along with a resultant reduction in subway tunnel heating.

This energy storage propulsion system has been installed on two New York City subway cars and will be subjected to an extensive series of tests. This report discusses the background and design approach and describes the technical features of the Energy Storage propulsion system.

The system was developed by The Garrett Corporation, under contract from New York State Metropolitan Transportation Authority (MTA). The development and test program is sponsored by the Urban Mass Transportation Administration, New York State Department of Transportation, Garrett, and MTA.

Chapters discuss system design and equipment. Appendices are entitled: "System Function and Operation" and "Performance Curves - Conventional R-32 and Energy Storage Cars".

NTIS ORDER NO.: PB 249-063/AS

PRICE: \$4.50

TITLE: TRANSIT STATION AREA JOINT DEVELOPMENT:
Strategies for Implementation
Final Report

AUTHOR: Administration and Management Research
Association of New York City, Inc.

DATE: February 1976

PROJECT NO.: NY-06-0047

KEYWORDS:

1. Economics
 2. Joint Development
 3. Land, Use
 4. Stations and Terminals
-

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 year 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.

NTIS ORDER NO.: PB 268-103/AS

PRICE: \$10.00

TITLE: TRANSIT STATION AREA JOINT DEVELOPMENT:
Strategies for Implementation
Economic Case Studies

AUTHOR: Administration and Management Research
Association of New York City, Inc.

DATE: February 1976

PROJECT NO.: NY-06-0047

KEYWORDS:

1. Economics
 2. Joint Development
 3. Land, Use
 4. Stations and Terminals
 5. Planning, Tools
-

Case Studies is a separate and supplement volume to the Final Report of the Joint Development Study (PB 268-103) 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 the 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 "living" 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.

NTIS ORDER NO.: PB 268-104/AS

PRICE: \$10.50

TITLE: STUDY OF THE TRANSPORTATION PROBLEMS OF THE
TRANSPORTATION HANDICAPPED Off-Peak Half-Fare Study
Inventory Report

AUTHOR: Grey Advertising, Inc.

DATE: July 1976

PROJECT NO.: NY-06-0054

KEYWORDS:

1. Elderly
 2. Handicapped
 3. Off-Peak Traffic
 4. Fare, Reductions
 5. Information Aids
-

This is the first report of a study of off-peak half-fare practices related to the overall study of the transportation problems of the transportation handicapped. This study is presented in two separate reports: "Inventory Report"--An analysis of Section 5 applications; and "Case Study Report"--An in-depth study of half-fare programs in ten cities. Information in this report is derived mainly from an analysis of applications for Federal funding of transit operations under Section 5 of the Urban Mass Transportation Act of 1964, as amended.

The purpose of this report is to catalogue the approaches used in meeting the requirements of half-fares for elderly and handicapped persons, as described in Section 5 applications. This catalogue can serve as a source document for transit systems or planning agencies interested in developing such half-fare programs. It can also be used by urban areas and transit properties to review procedures used in other areas with similar conditions, and to identify desirable features of existing half-fare programs that could be used in new or modified programs.

This report contains 196 listings of half-fare practices on transit systems, as well as a description of two state-wide programs, in New Jersey and Pennsylvania, that apply to all transit systems participating in half-fare programs. The 196 listings include 163 of the 269 urbanized areas eligible for Section 5 funds and covers a total of 241 transit operators. Of the 196 listings, 153 were obtained from applications approved by UMTA, and 43 from applications which are still pending.

NTIS ORDER NO.: PB 263-867/AS

PRICE: \$7.75

TITLE: STUDY OF THE TRANSPORTATION PROBLEMS OF THE
TRANSPORTATION HANDICAPPED Off-Peak Half-Fare Study
Ten Case Studies

AUTHOR: Grey Advertising, Inc.

DATE: October 1976

PROJECT NO.: NY-06-0054

KEYWORDS:

1. Fare, Reduction
2. Elderly
3. Handicapped
4. Off-Peak Traffic

To receive subsidy funds under Section 5 of the Urban Mass Transportation Act of 1964, as amended, transit operating agencies are required by Congressional mandate to provide a half-fare transportation program for the elderly and handicapped persons. Since this mandate lacks detailed guidelines for implementing such a program, UMTA has sponsored this study in order to review the implementation procedures of the existing half-fare programs in ten cities receiving Section 5 funds, and to provide guidance to transit agencies that have not yet implemented such a program. This review is presented in two separate reports: "Inventory Report"--An inventory of procedures for implementing the half-fare program, as reported in applications for operating assistance; and "Case Study Report"--An in-depth study of the organization of half-fare programs, the approaches used in implementing them and their overall effects.

This second report presents the case studies of the half-fare programs for the elderly and handicapped of ten representative cities. The program is described in terms of five major areas: 1) eligibility criteria, 2) certification and identification procedures, 3) hours of availability, 4) fare structure, and 5) publicity and communication. All ten cities are discussed within this five-area context.

In summary, the case studies of the ten transportation systems indicate that the Section 5 requirements have had a significant impact on local programs for the elderly and handicapped. Most of the systems have had reduced fare programs in effect prior to the Section 5 requirements. However, all earlier programs designed only for the elderly have been modified to include the handicapped. All of the ten systems have adjusted either their fare structure or their definition of elderly and handicapped in order to comply with the requirements of Section 5.

NTIS ORDER NO.: PB 263-868/AS

PRICE: \$6.00

TITLE: ASSESSMENT OF SERVICE REQUIREMENTS & DESIGN CHARACTERISTICS
OF PRESENT AND FUTURE PARATRANSIT VEHICLES

AUTHOR: Ronald Adams

DATE: April 1977

PROJECT NO.: NY-06-0058

KEYWORDS:

- | | |
|--------------------|-------------------------|
| 1. Paratransit | 6. Transit User Comfort |
| 2. Taxis | 7. Safety |
| 3. Vehicle, Design | |
| 4. Elderly | |
| 5. Handicapped | |
-

The objective of this research project is to provide an assessment of present and future paratransit vehicles, their design characteristics and service requirements from the viewpoint of the passenger, the community, and the driver. This assessment includes comfort, safety, and accessibility of all occupants with particular attention to the special driver problems associated with paratransit service; it focuses on the problems of the elderly and handicapped; and it identifies relevant aspects of the operating environment, namely, pedestrian safety. Shortcomings of vehicles now in service and new prototype vehicles are identified, and strategies are described to remedy them with minor and low cost modifications. The scope of this study includes vehicles designed for the Museum of Modern Art (MOMA) Taxi Project, including two paratransit vehicles designed to specifications of the Urban Mass Transportation Administration.

This study aims to develop requirements and recommends vehicle design parameters to satisfy them. Recommendations are developed as to future requirements to be met by more extensive redesigns and/or new designs. Special consideration is given to the exclusive-ride as opposed to the shared-ride versions. An assessment is also made of ancillary equipment now in use, and recommendations are made as to requirements in this area for future vehicle development programs.

NTIS ORDER NO.: PB 267-574/AS

PRICE: \$5.50

TITLE: EVALUATION OF THE WABCO AC PROPULSION SYSTEM
Volume I: CTS/UMTA AC Propulsion Project
Volume II: Related Reports and Exhibits

AUTHOR: Cleveland Transit System (prepared by TRW, Inc.)
(C. F. Hoppe, et al.)

DATE: September 1974 PROJECT NO.: OH-06-0006

KEYWORDS: 1. Propulsion Systems, Electric
2. Rail, Rolling Stock
3. Wheels
4. Safety
5. Transit User Comfort
6. Life Cycle Costing

In 1971, the Cleveland Transit System received a grant from UMTA to test, demonstrate and evaluate a solid state, A-C propulsion system on three rapid transit cars (Project OH-06-0006). The A-C propulsion system was developed by the Westinghouse Air Brake Company (WABCO), Wilmerding, Pennsylvania. This is the final project report.

A-C Pulse Width Modulation (PWM) propulsion test data were evaluated to determine whether the advantages claimed for the A-C PWM propulsion are demonstrated. Retrofit feasibility, A-C/D-C car compatibility, signal compatibility, and electromagnetic interference were assessed. Measurements of wheel wear, window safety glazing, ride quality, and passenger reaction to the restyled car interiors and new A-C propulsion system are discussed.

Volume I (PB 245-389) presents project objectives, project description, summary and conclusions, principal task evaluations, the A-C/PWM Propulsion System, and ancillary task evaluations. A bibliography is furnished.

Contents of Volume II (PB 245-390) are: Experimental Design Description for the CTS/WABCO A-C Propulsion Demonstration Program; Instrumentation Assessment, A-C Propulsion Project; Life Cycle Cost Analysis Plan for the Cleveland Transit System A-C Propelled Cars; Passenger Reaction to A-C Propelled Restyled Rapid Transit Cars; Evaluation of Safety Glazing; Survey of Cleveland Transit System Rapid Transit Maintenance Procedures and Facilities; and Telephone Influence Factor Measurements.

NTIS ORDER NO.: PB 245-388/AS - SET PRICE: \$15.00
Volume I - PB 245-389/AS \$7.75
Volume II - PB 245-390/AS \$9.75

TITLE: REVENUE SERVICE OPERATION-1973
AC Propulsion Project

AUTHOR: Cleveland Transit System
(R.D. Smith and E.T. Skantar)
Westinghouse Air Brake Company

DATE: April 1974

PROJECT NO.: OH-06-0006

KEYWORDS:

1. Research, Operations
 2. Propulsion Systems, Electric
 3. Rail, Rolling Stock
-

In 1971, the Cleveland Transit System received a grant from UMTA to test, demonstrate and evaluate a solid state, AC propulsion system on three rapid transit cars. The AC propulsion system was developed by the Westinghouse Air Brake Company (WABCO), Wilmerding, Pennsylvania. This report is one of a series on various aspects of the project.

The object of this project was to retrofit three existing Cleveland Transit System Airporter Cars with a new AC propulsion system (Pulse Width Modulation or PWM) developed by WABCO and to develop baseline performance data with these cars.

This report discusses the integration of the AC powered cars into the Cleveland Transit System's revenue operation during 1973. The year of operation was divided into two distinct operating periods. In the first period, January through June, the three AC cars were not compatible with the remaining Airporter fleet. During the second period, July through December, the three AC cars were modified in such a manner as to render them compatible with the DC cars and were operated the remainder of the year in mixed service.

Figures illustrate, among other things, the performance summary for the three AC cars throughout the twelve-month revenue service test period, AC car availability and utilization on a monthly basis, and a month-by-month compilation of the statistics which describe why the AC cars were not available for scheduled trips.

Chapters contain discussion of revenue service operation and monthly experience. Under the topic of revenue service period tasks, project tests, operational compatibility, defect/fault reporting and configuration management are examined. Conclusions are reached.

Related reports include: "WABCO Data Acquisition System" PB 223-898; "Pre Revenue Service Activities" PB 228-983; "Single Car Performance" PB 228-987; and "Multiple Car Performance" PB 239-173.

NTIS ORDER NO.: PB 238-568/AS

PRICE: \$4.75

TITLE: CITY OF CLEVELAND NEIGHBORHOOD ELDERLY TRANSPORTATION
PROJECT--Dial-A-Bus
Interim Report

AUTHOR: Portions prepared by DAVE Systems, Inc., under contract to the
Neighborhood Elderly Transportation (N.E.T.) Project, by the
City Planning Commission and by the N.E.T. Project

DATE: January 1976

PROJECT NO.: OH-06-0018

KEYWORDS:

1. Demand Responsive Systems
Dial-A-Ride
2. Elderly

The Neighborhood Elderly Transportation Project (N.E.T.) establishes door-to-door, local transportation service with vehicles specifically adapted to the needs of older people.

Seventeen thousand five hundred (17,500) persons 60 years of age and older reside within the three service areas of Cleveland's Buckeye, Model Cities, and Tremont areas, which total about ten square miles. Revenue service began in mid-March 1975 and by the end of December 1975, over 100,000 Dial-A-Bus passengers had been carried. This report documents the implementation efforts and actual operational experience during the first nine and one-half months of revenue service.

The project has as its principal goal to determine if a local specialized transportation service is able to contribute in a positive way to a state of independent living, defined here as living in private residence. The project has a number of sub-goals which include an effort to determine whether or not the travel needs of the elderly are in fact confined to the local neighborhood, and the impact/ability of large existing urban transit operations to undertake such specialized services which are so different from traditional general population services. As a by-product, the project aims to increase the utilization of existing social and health services and to encourage the creation of more of these for use by the elderly because suitable transportation services--connective services--are available.

A related report is "City of Cleveland Neighborhood Elderly Transportation (N.E.T.) Project--Quarterly Report." (PB 248-903)

NTIS ORDER NO.: PB 253-237/AS

PRICE: \$5.50

TITLE: CITY OF CLEVELAND NEIGHBORHOOD ELDERLY TRANSPORTATION (N.E.T.) PROJECT
Quarterly Report

AUTHOR: DAVE Systems, Inc., for the City of Cleveland
(Bruce McLaughlin)

DATE: March-May 1975

PROJECT NO.: OH-06-0018

KEYWORDS: 1. Demand-Responsive Transportation,
Dial-A-Ride
2. Elderly
3. Handicapped
4. Transportation Disadvantaged

The Neighborhood Elderly Transportation Project (N.E.T.) establishes for people 60 years of age and older what is variously called "demand-responsive," "dial-a-bus," and "dial-a-ride" door-to-door local transportation service with vehicles specifically adapted to the needs of older people.

This demonstration project, sponsored by the City of Cleveland, Ohio, serves three neighborhoods (Buckeye, Model Cities, and Tremont) selected, among other reasons, on the basis of large concentrations of elderly. Seventeen thousand (17,000) persons 60 years of age and older reside within these three areas which encompass approximately ten square miles.

Revenue service began in mid-March 1975 and by the end of May, over 21,000 Dial-A-Bus passengers were carried. This report documents the implementation efforts and actual operational experience during the first six weeks of revenue service.

The project concept was developed to: 1) ascertain the economic and institutional feasibility of a general public transit system (Cleveland Transit System) providing specialized vehicles and services for the elderly as part of its everyday operations; 2) examine the benefits of a coordinated neighborhood transportation approach in achieving the objectives of existing and future health and social programs designed to serve the elderly; and 3) determine the economic and social impact of a system which increases the mobility potential of a major segment of the transit-dependent population of a large city.

Chapters discuss general project characteristics, implementation, first quarter operations, problems/corrective actions, and work emphasis, 3rd quarter, 1975.

TITLE: PROJECT SUPER BUS
High-Capacity Bus Conceptual Design Study

AUTHOR: Booz-Allen Applied Research (prepared for the National Transportation Center)

DATE: December 1974

PROJECT NO.: PA-06-0007

KEYWORDS: 1. Bus, Design
2. Vehicle, Design
3. Propulsion Systems

This study of design concepts for high-capacity transit buses was conducted in support of Project Super Bus, a program designed to evaluate experience with such buses and to establish technical and economic feasibility of high-capacity buses for U.S. production and operation. A high-capacity bus, for the purposes of this study, is defined as one which provides at least 50% more usable floor area than the conventional 40-foot bus. Indications are that both the double-deck bus and articulated buses can play significant roles in public transportation.

In the design study, a length of 60 feet was assumed for the articulated bus. Principal emphasis was placed on the articulated bus concept since the maneuverability of these buses makes them suitable for service on routes normally served by the standard 40-foot bus. A height of 14 feet was considered desirable for the double-deck bus. While this concept offers some cost advantages, vertical clearance problems would limit its use to about 30 percent of the high-capacity routes.

Design studies were made of a number of special configurations for the two generic concepts. Several options were considered, including different powerplant and driveline configurations for the articulated bus, in an effort to arrive at the lowest possible floor height. A configuration using a conventional rear-mounted engine driving the mid-axle was selected as promising, but would require considerable development. The objective of the double-deck design was to achieve maximum height in the aisle in both decks while maintaining the maximum number of seats in a conventional arrangement.

Information is presented on market potential and production costs.

A related document is: "Project Super Bus - Specification for an Articulated Transit Bus" (PB 243-692). The order number of the set of two documents is PB 243-691-SET.

TITLE: PROJECT SUPER BUS
Specification for an Articulated Transit Bus

AUTHOR: Booz-Allen Applied Research (prepared for the National Transportation Center)

DATE: October 1974

PROJECT NO.: PA-06-0007

KEYWORDS: 1. Bus, Design
2. Vehicle, Design
3. Propulsion Systems
4. Suspension
5. Heating
6. Air Conditioning
7. Guides and Guidance

Project Super Bus was initiated to investigate the potentialities of high-capacity transit vehicles for use on high-volume service routes in the United States. A major portion of the effort in the project was dedicated to the conceptual design of the maximum, single-deck, articulated bus.

This report contains a specification intended to provide the prospective manufacturer with sufficient guidelines to prepare a technical and cost proposal for articulated bus vehicle prototype development. It covers the design and construction requirements for an articulated transit bus suitable for use as a supplement to the standard 40-foot rigid bus. It specifies basic physical dimensions, passenger accommodations, and propulsion for a series-built, multi-passenger, public service vehicle, designed primarily for urban service with adaptability to arterial and truck line service.

The nominal design capacity is for a vehicle having a single operator and a capacity for 70 or more seated passengers, with state-of-the-art propulsion and human factors design. The vehicle shall not exceed 60 feet in length, 102 inches in width, or 125 inches in height, and shall be capable of accommodating various seating configurations. It shall be suitable for routes now served by existing transit buses and shall meet all applicable U.S. Federal, state, and local safety and performance standards.

Chapters discuss vehicle structure, furnishings, driver's station and controls, energy conversion, suspension and guidance (steering), heating, ventilation, and air conditioning. Appendices contain definitions and abbreviations.

A related report, "Project Super Bus - High-Capacity Bus Conceptual Design Study" (PB 243-693), contains support data. The order number for both reports is PB 243-691-SET.

NTIS ORDER NO.: PB 243-692/AS

PRICE: \$5.00

TITLE: A DIRECTORY OF VEHICLES AND RELATED SYSTEM COMPONENTS FOR
THE ELDERLY AND HANDICAPPED

AUTHOR: The Franklin Institute Research Laboratories
(John A. DeBenedictis and Edmond J. Dougherty)

DATE: June 1975

PROJECT NO.: PA-06-0031

KEYWORDS:

1. Elderly
 2. Handicapped
 3. Vehicle, Design
 4. Information Aids
-

The purpose of this report is to determine which manufacturers offer products for over-the-road transportation of elderly and handicapped persons. The report is basically a catalog of small, medium, and large transit bus, school bus, and other vehicle manufacturers offering special features to accomodate the elderly and handicapped. It also includes companies which modify vehicles by adding lifts, ramps, wheelchair securement devices and retractable steps for vehicles. Information contained in this report is intended to be a guide for the selection of equipment for purchase.

Data were generated by compiling a list of potential manufacturers from registers and mass transit operators. Then, all companies identified were requested, in writing, to send pertinent catalog information. Telephone inquiries were made to substantiate and augment data received.

Demand for the types of vehicles and devices listed in this catalog will, no doubt, continue to increase. The authors recommend that the directory be updated every three months and would welcome any feedback concerning the data contained in the current issue. The authors state that this issue probably contains some assembly errors. Furthermore, all information contained in the catalog is subject to change without notice. For these reasons, the authors emphasize verification of information by direct communication with the manufacturers in question.

NTIS ORDER NO.: PB 244-474/AS

PRICE: \$6.00

TITLE: A STUDY ON MAKING TRANSPORTATION FACILITIES ACCESSIBLE TO THE
HANDICAPPED AND ELDERLY

AUTHOR: Franklin Institute Research Laboratories
(Edmond J. Dougherty and John A. DeBenedictis)

DATE: June 1975

PROJECT NO.: PA-06-0031

KEYWORDS: 1. Elderly
2. Handicapped
3. Access, Planning and Control
4. Rail, Stations and Terminals

This report was conducted as part of a project to study the accessibility of urban transportation to the elderly and handicapped. The study presents a classification scheme for vertical circulation devices, a classification scheme for fixed facilities, a station questionnaire for recording barriers and a transit user scenario which considers psychological as well as physical barriers. It is recommended that these aids be used to computer catalog all transportation fixed facility barriers and all potential solutions to these barriers as well as computer analyze the matching of barriers and specific solutions.

Existing vertical circulation devices which, to date, have not been used in mass transit facilities (typical use is home environment), have been studied in detail. They are grouped according to their specific mode of operation, and their potential for use is discussed. Vertical circulation devices currently used in transportation facilities, their assets and shortcomings are detailed. A scheme is presented for comparing all devices against an idealized set of specifications.

New concepts for vertical circulation are grouped into ramp, stair, escalator and elevator devices. The concepts are designed to stimulate creative design approaches to the problem.

Conclusions center around the applicability of existing vertical circulation devices, the aspect of human engineering, problems related to various devices, and improvements concerning escalators and elevators. Recommendations for further study are: escalators and elevators (emphasis on modified escalator); shaftless elevator and platform stair lift; feasibility study of new concepts (emphasis on modified wheelchair); device classification and survey; and safe traveling wheelchair.

A partial list of manufacturers and developers of shaftless elevators, wheelchair elevators, stairway platform lifts, and stairclimbing wheelchairs is presented in Appendix A. Appendix B is a bibliography and Appendix C is preliminary specifications for selected devices (modified escalator, platform stair lift and escalator riding wheelchair).

TITLE: JOINT EPA/UMTA/FEA STRATEGY FOR URBAN TRANSPORTATION AND AIR QUALITY
Volume 2: Public-Private Urban Transportation Modal Mixes

AUTHOR: INTERPLAN Corporation
(Roman Krzyczkowski, et al.)

DATE: December 1974

PROJECT NO.: RI-06-0005

KEYWORDS:

- | | |
|------------------------|--|
| 1. Air Pollution | 6. Planning, Tools |
| 2. Algorithms | 7. Socioeconomic Analyses |
| 3. Fuel, Consumption | 8. Environment and Environmental Control |
| 4. Modal Choice | |
| 5. Models and Modeling | |
-

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 paratransit compared to the no-diversion case. This exercise is supported by appendices showing the derivation of the methodology and the data base.

This 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. About 30 sources are listed at the ends of sections and appendices.

Other volume titles are: Volume 1: Joint Action Programs; Volume 3: The Potential of Dual Mode (PB263-842); Volume 4: Information Data Base: Status of Urban Congestion, Air Pollution, and Energy Use; Summary (PB 263-843).

NTIS ORDER NO.: PB 263-841/AS

PRICE: \$5.00

TITLE: JOINT EPA/UMTA/FEA STRATEGY FOR URBAN TRANSPORTATION AND AIR QUALITY
Volume 3: The Potential of Dual Mode

AUTHOR: INTERPLAN Corporation
(Roman Krzyczkowski, et al.)

DATE: December 1974

PROJECT NO.: RI-06-0005

KEYWORDS:

- | | |
|----------------------|-----------------------|
| 1. Algorithms | 6. Joint Development |
| 2. Air Pollution | 7. Environment and |
| 3. Dual-Mode Systems | Environmental Control |
| 4. Energy | |
| 5. Planning | |
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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 third volume discusses the applicability, timing, and impact of dual-mode, urban-transportation technologies. A three-system, three-phase, gradual evolution of demand for dual mode is suggested. The advantages dual mode shares with other advanced urban transportation systems and propulsion technologies is discussed, as well as dual mode systems application and the impact of integrating dual mode with the present urban environment. Dual mode's potential is to offer improvements in per passenger energy efficiency and to provide the basis for the conversion of most private and public urban travel from petroleum-fueled engines to electricity-based propulsion systems. To place dual mode in a perspective which includes current urban technology and other advanced systems, INTERPLAN first assembles a brief overview and comparison of propulsion technology and energy efficiency characteristics for conventional modes and other modes now under consideration by UMTA, such as personal rapid transit, over-the-water vehicles, air cushion vehicles, and magnetic levitation. Following this overview, INTERPLAN examines the potential application of dual-mode systems. The prospective impact of integrating dual mode with the present urban environment is evaluated by determining: 1) the potential application of dual mode and the features required for its acceptance; 2) the effect of dual mode on the mix and efficiency of urban area transportation from the point of view of the community, the user, and the operator in terms of mobility (congestion), air pollution, and energy use.

Other volume titles: Vol.1: Joint Action Programs; Vol. 2: Public-Private Urban Transportation; Vol. 4: Information Data Base: Status of Urban Congestion, Air Pollution, and Energy Use; Summary.

A 14-item reference list is also included.

NTIS ORDER NO.: PB 263-842/AS

PRICE: \$4.00

TITLE: JOINT EPA/UMTA/FEA STRATEGY FOR URBAN TRANSPORTATION AND AIR QUALITY
Volume 4: Information Data Base: Status of Urban Congestion,
Air Pollution, and Energy Use

AUTHOR: INTERPLAN Corporation
(Roman Krzyczkowski, et al.)

DATE: December 1974

PROJECT NO.: RI-06-0005

KEYWORDS:

1. Air Pollution
2. Energy
3. Joint Development
4. Environment and
Environmental Control
5. Traffic Analysis, Congestion

This is the fourth volume of a four-volume report. The premise of this study is that the administrative independence of UMTA, EPA, and FEA should not obscure the interdependence of the goals of these three agencies: to improve urban mobility, upgrade the quality of urban air, and assure an adequate supply of energy. The common issues around which all three agencies' policies revolve is the use of the private auto involving both incentives and penalties to catalyze a change in existing urban travel characteristics.

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. To accomplish this end, the study evaluates current and proposed policy actions directed toward attaining the goal of urban mobility, air quality, and energy conservation (Volume 1); evaluates the trends opposing these goals (Volume 4); and explores future options in urban transportation modal mixes (Volume 2), and the use of dual mode technology (Volume 3).

This fourth volume contains INTERPLAN's initial definition of transportation-related urban problems now faced by UMTA, EPA, and FEA, and their authority to cope with them. The scope is limited to an examination of those aspects of air pollution and energy usage which are related to UMTA's goals of providing for urban mobility. The current status of urban congestion, air pollution, and energy usage is analyzed on a national level, and the future status likely to obtain if present trends continue unchecked is projected. Congestion and air pollution are examined in four cities: Los Angeles, Philadelphia, Seattle, and Baltimore. The goals, authority, and programs of the three agencies are reviewed to define the potential for a joint interagency action program. Volume 4 was written first but presented last because it constitutes a kind of technical and statistical appendix. A preliminary bibliographic listing is included as an appendix; the study's final 376-item bibliography is contained in Volume 1.

NTIS ORDER NO.: PB 263-843/AS

PRICE: \$9.00

TITLE: JOINT STRATEGIES FOR URBAN TRANSPORTATION, AIR QUALITY AND ENERGY CONSERVATION

AUTHOR: Interplan Corporation
(R. Krzyczkowski, et al)

DATE: January 1975

PROJECT NO.: RI-06-0005

KEYWORDS:

1. Air Pollution
 2. Environment and Environmental Control
 3. Traffic Analysis, Congestion
 4. Fuel, Consumption
 5. Energy
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Problems of mobility in cities, the quality of urban air, and transportation-related energy consumption constitute major issues of national concern. This report represents a joint effort of the Urban Mass Transportation Administration of the Department of Transportation, the Environmental Protection Agency, and the Federal Energy Administration to develop an integrated approach for resolving problems created by traffic congestion, air pollution, and petroleum shortages.

The purposes of the report are to: (1) identify all principal strategies and actions which impact on each of the agencies' transportation-related goals; (2) systematically elucidate the interrelationships among them; (3) devise a way of isolating those groups of strategies and actions whose total impacts would be synergistically enhanced if implemented jointly. The report represents the culmination of the study effort to attain these objectives.

In Part I, the basic relationships among the strategies and actions are summarized in a matrix display. Each item is ranked to assess its impact on six subgoals, or phenomena, in the near and long term: improved auto alternatives; improved vehicular flow; reduced auto use; reduced travel demand; reduced vehicular emissions; and reduced vehicular petroleum consumption. Two synergistic joint action programs are presented.

Part II contains an information review of experience, impacts of goals (mobility, air quality, energy conservation), and an overall evaluation of 54 specific actions, based on the 376 sources listed in the Appendix.

NTIS ORDER NO.: PB 244-473/AS

PRICE: \$10.75

TITLE: SAFETY IN URBAN MASS TRANSPORTATION: GUIDELINES MANUAL

AUTHOR: Battelle-Columbus Laboratories
(E. S. Cheaney, J. A. Hoess, R. E. Thompson, and R. L. Svehla)

DATE: May 1975

PROJECT NO.: RI-06-0005

KEYWORDS:

1. Safety
2. Management, Operations and Techniques
3. Government, Intergovernmental Relations
4. Interfaces
5. Guides and Guidance

This report presents a series of organizational and technical safety guidelines designed for the use of the transit management community. By describing ways in which suppliers and operators can set logical safety goals and establish organizations and engineering procedures to attain them, this manual sets forth a model for industry management and for basing the interaction, regarding safety, between pertinent Government agencies and the transit industry.

The report covers the following topics in separate chapters: (1) Foundations of Safety in Urban Mass Transportation---defines problem areas and sets forth safety-assurance strategy for operators and suppliers; (2) Safety Management and Planning---describes management structures for safety programs and covers relationships between transit management and the external environment, including Federal and local government; (3) Techniques for Safety Analysis---describes engineering and analytical techniques to be used by transit firms in conjunction with safety programs; (4) Trade-Off Considerations---describes the interaction of safety considerations with other facets of transit system performance and cost; (5) System Safety Data Base---describes the data needed for safety management including its organization and processing; (6) Safety Standards and Specifications---describes the type of standards and specifications available to the transit community and how the use of standards interacts with the test of the industry's safety program; and (7) Intermodal Interface Safety Considerations---describes the safety problems pertaining to areas where passengers change modes or where urban transportation systems physically intersect or mix with other systems.

This report presents these guidelines in the form of suggested or recommended practices accompanied by explanation. The guidelines are designed to have a considerable latitude of user interpretation so they can fit the wide variety of specific situations found in the transit industry.

NTIS ORDER NO.: PB 245-413/AS

PRICE: \$5.00

TITLE: CRANSTON TRANSVAN

AUTHOR: Duffy & Shanley, Inc.

DATE: February 1975

PROJECT NO.: RI-06-0006

KEYWORDS: 1. Elderly
2. Handicapped
3. Demand-Responsive Systems, Dial-A-Ride
4. Demography
5. Bus, Transbus

This is the final report of the Cranston TRANSVAN, a demonstration project of low-cost, demand-responsive transportation for the elderly (persons age 62 or older) and the handicapped of Cranston, Rhode Island, a suburban community of over 75,000 population. This report covers activities from September 1972 through December 1974.

TRANSVAN's unique and innovative scheduling provides a combination of services to maximize utilization of the system's three buses to best serve subscriber demands. Fixed and flexible routes, variable fixed schedule and dial-a-ride, operate in concert.

Transportation services offered are: Monday through Friday personal trips for medical services, grocery and retail shopping, senior club meetings, personal business, and charters and connections; Saturday recreational trips; and Friday evening and Sunday worship services.

The report presents a picture of the project in terms of planning, organization and operation and includes maps of the service areas as well as statistical data. Tables include average monthly ridership figures, average riders per bus trip, daily ridership averages, TRANSVAN budget figures, breakdown of riders by categories, types of trips taken, and number of subscriberships. Subscribership has risen in every calendar quarter since the inception of the program. In December 1972, subscribership was 278, and one year later it was 545.

Drawings and pictures of the 19-passenger buses as redesigned for the program are included. Of the three buses, one has a special elevator to allow easy access for passengers in wheelchairs.

Chapters of the report address the history of the project, the community of Cranston, the program developed, communications, and conclusions.

NTIS ORDER NO.: PB 244-639/AS

PRICE: \$4.00

TITLE: TRANSPORTATION SYSTEM MANAGEMENT: STATE OF THE ART

AUTHOR: INTERPLAN Corporation
(Barbara I. Keyanni and Evelyn S. Putnam)

DATE: September 1976

PROJECT NO.: RI-06-0008

KEYWORDS:

- | | |
|--------------------------------------|--------------------------------------|
| 1. Transportation Systems Management | 5. Air Pollution |
| 2. Traffic Analysis, Control | 6. Paratransit |
| 3. Traffic Analysis, Flow | 7. Information Aids |
| 4. Traffic Analysis, Peak-Hour | 8. Management, Planning and Analysis |
-

This report summarizes current information concerning the spectrum of actions that are relevant to Transportation Systems Management (TSM). Under the Department of Transportation regulations, urban areas with population greater than 50,000 are required to develop TSM plans that document their strategy for improving air quality, conserving energy, and increasing transportation efficiency and mobility through coordinated operation and management of existing urban transportation facilities and services. TSM therefore includes actions to influence transportation demand as well as actions to manage the supply of service or its performance characteristics.

This report presents state-of-the-art information on 31 specific TSM actions within the following seven major categories: improving vehicular flow, preferential treatment of high-occupancy vehicles, reducing peak-period travel, parking management, promoting non-auto or high-occupancy auto use, transit and paratransit service improvements, and transit management efficiency measures.

Each summary includes examples of successful experience, advantages and disadvantages, guideline conditions concerning implementation, the range of costs involved, and interrelationships with the other actions.

A related report is "Transportation System Management, A Bibliography of Technical Reports," May 1976 (PB 257-273).

NTIS ORDER NO.: PB 266-953/AS

PRICE: \$7.75

TITLE: AN ANALYSIS OF THE DEMAND FOR BUS AND SHARED-RIDE TAXI SERVICE
IN TWO SMALLER URBAN AREAS

AUTHOR: The University of Tennessee Transportation Center
(D. Middendorf, K. Heathington, and F. Davis)

DATE: May 1975

PROJECT NO.: TN-06-0004

KEYWORDS: 1. Small Cities 7. Surveys
2. Demand Responsive Systems
3. Taxis
4. Paratransit
5. Travel Demand
6. Modal Choice

This report is a study of the demand for publicly owned, fixed-route, fixed-schedule bus service and privately owned, demand-responsive transportation service in two smaller urban areas -- Davenport, Iowa, and Hicksville, New York.

The objective of the study were to compare the travel patterns and markets of the bus and shared-ride taxi systems, to compare the travel patterns and markets of the shared-ride taxi system in each study area, to analyze factors and circumstances underlying the choice of either the bus or the shared-ride taxi, and to measure public sentiment toward each form of public transportation.

Several sources of data were utilized. Information was gathered through on-board surveys, mail surveys, home interviews, and dispatching records and drivers' logs maintained by the taxicab companies. Users as well as non-users of public transportation were interviewed.

Conclusions and recommendations are presented and a bibliography is furnished. Appendices contain Customer Data Record, Vehicle Data Record, and bus passenger, taxi passenger, and household survey questionnaires.

Related documents are: "Shared Ride Taxi Systems: An Analysis in Summary" (PB 245-101); "A Preliminary Analysis of Two Shared-Ride Taxi Systems" (PB 245-102); "An Organizational and Environmental Review of Two Privately Owned, Shared Ride Taxi Systems" (PB 245-103); "Economic Characteristics of Privately Owned Shared-Ride Taxi Systems" (PB 245-104); and "An Analysis of Two Privately Owned Shared-Ride Taxi Systems: Executive Summary" (PB 245-106). The order number for the entire set is PB 245-099-SET.

NTIS ORDER NO.: PB 245-105/AS

PRICE: \$9.75

TITLE: AN ANALYSIS OF TWO PRIVATELY OWNED SHARED-RIDE TAXI SYSTEMS:
EXECUTIVE SUMMARY

AUTHOR: The University of Tennessee Transportation Center
(Kenneth W. Heathington, et al.)

DATE: April 1975

PROJECT NO.: TN-06-0004

KEYWORDS: 1. Small Cities
2. Demand-Responsive Systems
3. Taxis
4. Paratransit
5. Ridership, Volume
6. Modal Choice

This report is the executive summary of a comprehensive study of the market demand, economic characteristics and organization of two privately-owned demand responsive transportation systems in operation in Davenport, Iowa, and Hicksville, New York.

Objectives of the study are stated and study areas examined. The characteristics of bus and shared-ride taxi usage are addressed in terms of the level of ridership, roles of bus and shared-ride taxi service, level of service, market composition, frequency of use and modal choice determinants. Revenues, goods movement, and costs are examined. Other areas discussed are attitudes toward public involvement, management and organization, and the potential of shared-ride taxi service.

Related documents are: "Shared Ride Taxi Systems: An Analysis in Summary" (PB 245-101); "A Preliminary Analysis of Two Shared-Ride Taxi Systems" (PB 245-102); "An Organizational and Environmental Review of Two Privately Owned, Shared-Ride Taxi Systems" (PB 245-103); "Economic Characteristics of Privately Owned Shared-Ride Taxi Systems" (PB 245-104); and "An Analysis of the Demand for Bus and Shared-Ride Taxi Service in Two Smaller Urban Areas" (PB 245-105). The order number for the entire set of reports is PB 245-099-SET.

NTIS ORDER NO.: PB 245-106/AS

PRICE: \$3.50

TITLE: ECONOMIC CHARACTERISTICS OF PRIVATELY OWNED SHARED-RIDE TAXI SYSTEMS

AUTHOR: The University of Tennessee Transportation Center
(Frank W. Davis, et al.)

DATE: October 1974

PROJECT NO.: TN-06-0004

KEYWORDS: 1. Small Cities
2. Demand Responsive Systems
3. Taxis
4. Paratransit
5. Ridership, Profiles
6. Benefit-Cost Analysis

This report presents an analysis of the costs, revenues, and investment requirements associated with two privately-owned, demand-responsive transportation systems in Davenport, Iowa, and Hicksville, New York. Objectives of this report were: (1) determination of the costs, revenues, ridership characteristics, and benefits of providing public transportation services with two privately owned systems; (2) measurement of the economic viability of the different levels of service; and (3) determination of the economic feasibility of combining the transportation of people and goods into a single operation.

Primary sources of taxi revenue are identified and driver and vehicle productivity are evaluated. The financial analysis of taxi operations includes both capital costs and operating expenses for each of the four operational areas (vehicles, garage, dispatching, and administrative). A generalized model for predicting shared-ride investment requirements is presented.

A comparison of privately-owned, shared-ride taxi systems and publicly owned dial-a-ride systems is offered on the basis of costs, investments, and revenues.

Conclusions and recommendations are developed and references are furnished.

Related documents are: "Shared Ride Taxi Systems: An Analysis in Summary" (PB 245-101); "A Preliminary Analysis of Two Shared-Ride Taxi Systems" (PB 245-102); "An Organizational and Environmental Review of Two Privately Owned, Shared-Ride Taxi Systems" (PB 245-103); "An Analysis of the Demand for Bus and Shared-Ride Taxi Service in Two Smaller Urban Areas" (PB 245-105); and "An Analysis of Two Privately Owned Shared-Ride Taxi Systems: Executive Summary" (PB 245-106). The order number for the entire set is PB 245-099-SET.

NTIS ORDER NO.: PB 245-104/AS

PRICE: \$5.50

TITLE: AN ORGANIZATIONAL AND ENVIRONMENTAL REVIEW OF TWO PRIVATELY OWNED, SHARED-RIDE TAXI SYSTEMS

AUTHOR: The University of Tennessee Transportation Center
(Kenneth W. Heathington, et al.)

DATE: October 1974

PROJECT NO.: TN-06-0004

KEYWORDS: 1. Small Cities
2. Demand Responsive Systems
3. Taxis
4. Paratransit
5. Fare, Cost Determination

This report has been based primarily on data from two privately owned demand-responsive public transportation systems operating in two different urban environments. Both are radio-dispatched shared-ride taxi systems, one in the industrial-agricultural city of Davenport, Iowa, and the other in the residential-commercial city of Hicksville, New York.

Secondary data concerning national averages were obtained to enable generalized statements. Organizational aspects of these systems are discussed in terms of functional structure and methods of providing operational services. Requirements for, and characteristics of, the taxi system's managerial personnel, dispatchers and drivers are examined. Regulatory issues confronting taxi systems are delineated. Meter zone, multi-zone, and trip length pricing are discussed as alternative pricing mechanisms for taxi service.

The data lead the authors to the major conclusion that the most important factor to be considered in the use of shared-ride taxi services is the needs of the various market segments in the urban public transportation market. It was also concluded that a taxi company operated under a highly innovative manager is an effective public transportation service. Recommendations are presented.

Related documents are: "Shared Ride Taxi Systems: An Analysis in Summary (PB 245-101); "A Preliminary Analysis of Two Shared-Ride Taxi Systems." (PB 245-102); "Economic Characteristics of Privately Owned Shared-Ride Taxi Systems" (PB 245-104); "An Analysis of the Demand for Bus and Shared-Ride Taxi Service in Two Smaller Urban Areas" (PB 245-105); and "An Analysis of Two Privately Owned Shared-Ride Taxi Systems: Executive Summary" (PB 245-106). The order number for the entire set is PB 245-099-SET.

NTIS ORDER NO.: PB 245-103/AS

PRICE: \$6.00

TITLE: A PRELIMINARY ANALYSIS OF TWO SHARED-RIDE TAXI SYSTEMS

AUTHOR: University of Tennessee Transportation Center
(Frank W. Davis, et al.)

DATE: August 1973

PROJECT NO.: TN-06-0004

KEYWORDS: 1. Small Cities
2. Demand Responsive Systems
3. Taxis
4. Paratransit
5. Computer Applications
6. Schedules and Scheduling

This report examines two taxicab companies located in the two diverse urban areas of Hicksville, New York, and Davenport, Iowa. Both the Orange and White Cab Company of Hicksville and the Royal Cab Company of Davenport are privately owned. They provide good examples of shared-ride, demand-responsive transportation utilizing automobile vehicles.

Although these two companies share the relatively unique shared-riding characteristic, there are significant contrasts between the two; the most notable being in terms of geographic location and management philosophies under which they operate. Each of these systems is planning to implement a fully computerized dispatching/fare system. Among the reasons for this implementation is that a computerized operation is necessary to permit application of a more sophisticated pricing structure to eliminate the dependence upon a geographical zone system.

This progress report presents an overview of the cities and transportation systems, a discussion of the methods of data collection utilized, and a preliminary analysis of data thus far collected.

Figures are numerous and appendices contain a Customer Data Record, Vehicle Data Record, Bus Passenger Survey On-Board and Mail-In, and Taxi-Passenger Survey On-Board and Mail-In.

Related documents are: "Shared Ride Taxi Systems: An Analysis in Summary" (PB 245-101); "An Organizational and Environmental Review of Two Privately Owned, Shared-Ride Taxi Systems" (PB 245-103); "Economic Characteristics of Privately Owned Shared-Ride Taxi Systems" (PB 245-104); "An Analysis of the Demand for Bus and Shared-Ride Taxi Service in Two Smaller Urban Areas" (PB 245-105); and "An Analysis of Two Privately Owned Shared-Ride Taxi Systems: Executive Summary" (PB 245-106). The order number for the entire set is PB 245-099-SFT.

NTIS ORDER NO.: PB 245-102/AS

PRICE: \$6.00

TITLE: SHARED RIDE TAXI SYSTEMS: AN ANALYSIS IN SUMMARY

AUTHOR: University of Tennessee Transportation Center
(Kenneth W. Heathington, et al.)

DATE: August 1973

PROJECT NO.: TN-06-0004

KEYWORDS: 1. Small Cities 7. Schedules and Scheduling
2. Demand Responsive Systems
3. Taxis
4. Paratransit
5. Benefit-Cost Analysis
6. Travel Demand

Two privately owned demand-responsive transportation systems, one in Davenport, Iowa, and the other in Hicksville, New York, were studied to determine the economic feasibility and marketability of these systems and the roles which they play in small and medium-sized urban areas. The systems analyzed offer door-to-door service on a shared ride basis using six-passenger automobiles.

The overall objectives of this study were to: (1) determine the cost, revenues, ridership, and other benefits of providing public transportation service with privately owned demand-responsive systems; (2) analyze the market demand for each level of service; (3) analyze the contribution of each level of service for providing mobility for specific segments of the urban community; (4) measure the economic viability of the different levels of service; (5) measure the demand for service as a function of level of service and pricing scheme; (6) determine the effectiveness of automatic scheduling and monitoring of system performance, costs, and revenues, if put into operation; and (7) determine the economic feasibility of combining products (i.e., people and goods) into a single transportation operation.

Related documents are: "Preliminary Analysis of Two Shared-Ride Taxi Systems" (PB 245-102); "An Organizational and Environmental Review of Two Privately Owned, Shared Ride Taxi Systems" (PB 245-102); "Economic Characteristics of Privately Owned Shared-Ride Taxi Systems" (PB 245-104); "An Analysis of the Demand for Bus and Shared-Ride Taxi Service in Two Smaller Urban Areas" (PB 245-105); and "An Analysis of Two Privately Owned Shared-Ride Taxi Systems: Executive Summary" (PB 245-106). The order number for the entire set is PB 245-099-SET.

NTIS ORDER NO.: PB 245-101/AS

PRICE: \$4.00

TITLE: BUS MAINTENANCE FACILITIES
A Transit Management Handbook

AUTHOR: The MITRE Corporation
(Virgil S. Thurlow, J.A. Bachman, and C.D. Lovett)

DATE: November 1975

PROJECT NO.: \$6.00

KEYWORDS: 1. Bus
2. Maintenance, Facilities
3. Maintenance, Equipment
4. Maintenance, Costs
5. Construction, Cost
6. Guides and Guidance
7. Surveys

In response to increased passenger service and the subsequent demand on bus maintenance departments, transit properties are replacing, adding to, or modernizing their maintenance facilities. The primary purpose of this report, then, is to determine composite standards and guidelines for buildings, service facilities, garages, plant layouts, and support equipment, to aid operating properties in their planning and in evaluating capital grant applications.

A total of 54 urban transit properties provided data for this study by returning questionnaires on their inspection garages and maintenance facilities. The 54 properties collectively operate 25,000 motor buses, which represent about one-half of the estimated national urban bus fleet of 50,000 buses.

The compendium of ideas in garage layouts and equipment use obtained from the properties serves as a guide for planning purposes and for judging practices in the industry. The report also includes measures of efficiency in facility use by which properties may reorganize space, change traffic patterns, or otherwise modernize their plants.

Guidelines are given for the development of a Planning Estimate by transit management for new maintenance facility constructions. A background of recent new construction costs is provided, including cost parameters (in dollars per square foot) for maintenance functions of bus storage, shops, and servicing. Building sizes (in square feet) are combined with floor area costs to establish an initial estimate of construction costs for new maintenance facilities.

Subjects related to bus maintenance facilities, yet considered apart from the main theme of the text, are discussed in the final section of the report. For example, an overview of the Federal Occupational Safety and Health Standards and its implications is presented.

The Appendix contains a listing of the participating properties and their fleet sizes. A Bibliography is included.

NTIS ORDER NO.: PB 250-475/AS

PRICE: \$6.00

TITLE: RUCUS IMPLEMENTATION MANUAL

AUTHOR: MITRE Corporation
(E. Nussbaum, K.K. Rebibo, and E. Wilhelm)

DATE: July 1975

PROJECT NO.: VA-06-0004

KEYWORDS: 1. Schedules and Scheduling
2. Bus
3. Computer Applications
4. Management, Operations and Techniques

The Run Cutting and Scheduling (RUCUS) package is a set of computer programs designed to assist transit properties in developing headway sheets, scheduling vehicles, and making driver work assignments. RUCUS has been extensively field-tested and is currently supporting the scheduling activities at a number of properties. The package, which is now available to the transit industry, (through the Transportation Systems Center, Cambridge, Massachusetts) includes detailed program documentation, descriptions of the required input data, output reports and messages, and the program source code.

This handbook provides guidance in implementing the RUCUS system at the user's property, outlining such steps as obtaining and organizing the necessary resources, constructing the initial data base, and using the RUCUS programs. The handbook is to be used as an adjunct to existing documentation which defines in detail the execution of the system programs.

NTIS ORDER NO.: PB 247-754/AS

PRICE: \$7.50

TITLE: SERVICE, INVENTORY AND MAINTENANCE SYSTEM COMPUTER SYSTEM DESCRIPTION
Volume I: Service/Unit Change System

AUTHOR: The MITRE Corporation
(V.S. Thurlow, et al.)

DATE: December 1975

PROJECT NO.: VA-06-0004

KEYWORDS: 1. Computer Applications
2. Bus
3. Maintenance, Equipment
4. Management, Operations and Techniques
5. Fuel, Consumption
6. Reporting System

The Service, Inventory, and Maintenance System (SIMS) is a system developed to record, analyze, and report on the maintenance activities of urban bus systems.

The Service/Unit Change (S/U) System is one component of SIMS. It is designed to provide maintenance management with information that will assist in the control and scheduling of vehicle maintenance. This information is provided in the form of reports pertaining to: 1) the use of consumables--fuel, oil, and coolant--and the relationship of consumption to mileage traveled; and, 2) the performance of maintenance jobs--inspections, unit changes, engine re-rings, engine overhauls, and brake relines. Unit changes are defined as the replacement of vehicular components as a means of effecting repairs.

The descriptions of the S/U System contained in this document include details of inputs, records, files, procedures, and computer program functions. The necessary steps for the installation and initial implementation of the system are described briefly in the last section.

To facilitate the implementation of the S/U System on various object computers, the software has been written in ANSI COBOL, and utilizes the report writer feature for most of the reports it generates. The functions of each program are described in detail. A source listing of each program and the copy library is provided in the Supplement I to this volume (available at Transportation Systems Center, Cambridge, Massachusetts).

The system has been implemented at Alameda-Contra Costa Transit District (ACTD) and Dallas Transit System under demonstrations sponsored by UMTA. In this document, references are made to the details of system implementation at these two locations. These references illustrate the user-specific features of the system. At both locations, the system is run on a service bureau basis. The object computer for ACTD is an IBM 360/65 and for DTS, IBM370/145. Related reports are "Volume II: Inventory System" (PB 249-059) and "Volume III: Repair Cost System" (PB 249-060). The order number for the set of three volumes is PB 249-057-SET.

NTIS ORDER NO.: PB 249-058/AS

PRICE: \$12.50

TITLE: SERVICE, INVENTORY AND MAINTENANCE SYSTEM COMPUTER SYSTEM DESCRIPTION
Volume II: Inventory System

AUTHOR: The MITRE Corporation
(V.S. Thurlow, et al.)

DATE: December 1975

PROJECT NO.: VA-06-0004

KEYWORDS: 1. Computer Applications
2. Bus
3. Maintenance, Equipment
4. Management, Operations and Techniques
5. Logistics
6. Reporting System

The Service, Inventory, and Maintenance System (SIMS) is an automated system to record, analyze, and report on the maintenance activities of urban bus system.

The Inventory System is one component of SIMS. It is designed to provide management with information that will assist in the control of inventory and support of the purchasing function. Records of the materials used in the repair of buses are maintained as a by-product of the system. These records become, in turn, source information to the SIMS Repair Cost System.

The description of the Inventory System contained in this document includes details of inputs, reports, files, procedures, and computer program functions. The last section describes briefly the steps necessary to the installation and implementation of the system.

To facilitate the implementation of the Inventory System on various object computers, the software has been written in ANSI COBOL and utilizes the report writer feature for most of the report generators. The functions of each program are described in detail in this document. A source listing of each program and of the copy library is provided in Supplement I to this document (available at the Transportation Systems Center, Cambridge, Massachusetts).

The system has been implemented at Alameda-Contra Costa Transit District (ACTD) and Dallas Transit System (DTS) under demonstrations sponsored by UMTA. In this document, references are made to the details of system implementation at these locations. These references illustrate the user-specific features of the system. At both locations, the system is run on a service bureau basis. The object computer for ACTD is an IBM 360/65 and for DTS, an IBM 370/145.

Related reports are "Volume I: Service/Unit Change System" (PB 249-058) and "Volume III: Repair Cost System" (PB 249-060). The order number for the set of three volumes is PB 249-057-SET.

NTIS ORDER NO.: PB 249-059/AS

PRICE: \$12.50

TITLE: SERVICE, INVENTORY AND MAINTENANCE SYSTEM COMPUTER SYSTEM DESCRIPTION
Volume III: Repair Cost System

AUTHOR: The MITRE Corporation
(V.S. Thurlow, et al.)

DATE: December 1975

PROJECT NO.: VA-06-0004

KEYWORDS: 1. Computer Applications
2. Bus
3. Maintenance, Equipment
4. Management, Operations and Techniques
5. Maintenance, Costs
6. Reporting System

The Service, Inventory, and Maintenance System (SIMS) is an automated system to record, analyze, and report on the maintenance activities of bus systems in the urban transit industry.

The Repair Cost System is one component of SIMS. It is designed to provide management with detailed monthly reports on maintenance activities. The description of the system includes details of the reports, inputs, files, procedures, and the computer program functions. Each computer program is described in detail. A source listing of each program is provided in Supplement I to this document (available at Transportation Systems Center, Cambridge, Massachusetts).

To facilitate the implementation of the Repair Cost System on various object computers, the software has been written in ANSI COBOL. The programs were tested, using an IBM 360/50 computer.

The system is in use at Alameda-Contra Costa Transit District (ACTD) and Dallas Transit System (DTS) under demonstration sponsored by UMTA. The system is operated on a service bureau basis in the localities of the demonstration projects. The object computer for ACTD is an IBM 360/65 and for DTS, an IBM 370/145. These computers and the 360/50 used for testing operate under OS, version 21.6.

Related reports are "Volume I: Service/Unit Change System," (PB 249-058) and "Volume II: Inventory System" (PB 249-059). The order number for the set of three volumes is PB 249-057-SET.

NTIS ORDER NO.: PB 249-060/AS

PRICE: \$8.00

TITLE: SIMS IMPLEMENTATION HANDBOOK
Service, Inventory, and Maintenance System

AUTHOR: The MITRE Corporation
(Robert L. Scott)

DATE: December 1974

PROJECT NO.: VA-06-0004

KEYWORDS:

1. Management, Operations and Techniques
 2. Bus
 3. Maintenance, Equipment
 4. Computer Applications
 5. Reporting System
-

The Service, Inventory, and Maintenance System (SIMS) has been developed to aid urban bus transit properties in managing their servicing and maintenance activities.

This automated information system is currently operational and consists of three components: The Service/Unit Change System, Inventory System, and Repair Cost System. General descriptions of the system's data requirements and the reports it produces have been published in a related document, "SIMS Overview" (PB 241-495), and detailed software documentation is available through the Transportation Systems Center in Cambridge, Massachusetts.

This handbook furnishes guidance to management in planning the implementation of the SIMS components at individual properties, by outlining such steps as data base generation, training, and acquisition of data processing services.

NTIS ORDER NO.: PB 245-610/AS

PRICE: \$5.00

TITLE: SUMMARY EVALUATION OF THE HADDONFIELD DIAL-A-RIDE DEMONSTRATION

AUTHOR: The MITRE Corporation
(George E. Mouchehoir)

DATE: May 1975

PROJECT NO.: VA-06-0012

KEYWORDS:

1. Demand Responsive Systems, Dial-A-Ride
 2. Community Response
 3. Ridership
-

Demand-responsive transportation (DRT) is one of the transportation concepts that has been investigated to determine its viability as a transit system for our urban areas. The Haddonfield, New Jersey Dial-A-Ride demonstration was instituted in February 1972 to determine public attitudes toward DRT, measure its public acceptance, evaluate its technical and economic feasibility, and measure the impacts of the DRT concept on the community.

This purpose of this report is to summarize the preliminary evaluation of the Haddonfield demonstration in terms of what was learned from the experiment while attempting to achieve the stated objectives.

The concept had favorable public acceptance, and the improvements in the system parameters, such as increase in service area, introduction of shuttle service, and reduction of fares, caused increases in ridership and productivity. Costs of operating the system manually were found to be comparable to the average cost of operation of the fixed-route bus system operating in the area, and productivities of the latter bus system were only slightly higher than those of Dial-A-Ride.

Ridership, productivity, and quality-of-service parameters of the Haddonfield system compare favorably with DRT systems operating in other U.S. cities. Conversely, the average operating cost per ride and per vehicle mile of the Haddonfield Dial-A-Ride is higher than the other DRT's, which are operating with minimum research, development, and experimentation activities, and have much lower labor wage rates.

Tables and charts are included and references are furnished.

NTIS ORDER NO.: PB 248-839/AS

PRICE: \$4.00

TITLE: SYSTEM PERFORMANCE DATA PROCESSING FOR A
DEMAND-RESPONSIVE PUBLIC TRANSPORTATION SYSTEM

AUTHOR: The MITRE Corporation
(Ruth E. Hartzler)

DATE: November 1974

PROJECT NO.: VA-06-0012

KEYWORDS: 1. Demand Responsive Systems, Dial-A-Ride
2. Computer Applications
3. Schedules and Scheduling
4. Guides and Guidance

This report is intended to be a guide for transit operators and managers interested in operating a demand-responsive transportation system and for programmers who maintain the data processing programs.

In the broad evaluation of the Haddonfield, New Jersey Dial-A-Ride Demonstration Project, extensive data are required, including attitude data from personal interviews, cost data, and system performance data. The processing of system performance data is the topic of this report.

The rationale for system performance data collection and processing is presented. The Haddonfield system was scheduled manually from the start of the demonstration in February 1972 until February 1974. During the latter part of this period, the automated scheduling system was phased in; after February 1974, the automated system was the primary scheduling system. The procedures used in collecting and processing data from the manual scheduling system are described. Also discussed are manual system data files and tabulations. The computer programs that process automated system data and the automated system tabulations are presented. Maintenance documentation of the programs that process automated system data is contained in the report.

The summary of experiences in processing system performance data is discussed. The appendices contain detailed information for facilitating use of the data.

NTIS ORDER NO.: PB 248-921/AS

PRICE: \$5.50

TITLE: DATA BASE DESIGN FOR DEMAND-RESPONSIVE TRANSIT

AUTHOR: The MITRE Corporation
(Virgil S. Thurlow and Sam Winchester)

DATE: July 1976

PROJECT NO.: VA-06-0024

KEYWORDS:

1. Demand Responsive Systems,
Dial-A-Ride
 2. Management, Operations
and Techniques
 3. Reporting System
-

This data base design, presented in the form of data recording sheets, contains the elements needed for a basic reporting system of demand-responsive operations. Information may be recorded directly onto the sheets by transit operators and can be used by planners in improving systems and in new systems design.

The steps necessary for the development of the data base include design test, analytical utility, design revision, and reporting procedure. This manual system is structured so that it may be automated in the future.

NTIS ORDER NO.: PB 256-820/AS

PRICE: \$5.00

TITLE: DEMAND RESPONSIVE TRANSPORTATION PLANNING GUIDELINES (1976)

AUTHOR: The MITRE Corporation
(Cady C. Chung and J.R. Ferrantino)

DATE: October 1976

PROJECT NO.: VA-06-0024

KEYWORDS: 1. Demand Responsive Systems, Dial-A-Ride 6. Economics
2. Planning, Tools 7. Guides and Guidance
3. Management, Planning and Analysis
4. Management, Operations and Techniques
5. Ridership, Volume

Demand Responsive Transportation (DRT) is a type of transit operation providing "on-demand", door-to-door service with small buses. More than forty DRT services are now operating in the U.S. These systems provide the data base for a set of relationships which can be used for the planning and design of new DRT systems. In addition, the experience of active operators emphasizes a number of important steps in developing successful DRT services.

The report contains guidelines (based on the experience of DRT system planners and operators in the United States and Canada) to aid planners of new DRT systems. Guidelines are presented in the form of planning considerations for the initialization and subsequent operation of service, and encompass: selecting a site, estimating ridership, developing a system design, establishing operating modes, estimating the capital and operational facilities and costs, estimating personnel levels, estimating fleet size, and estimating revenues.

The significant feature of demand-responsive transportation is its flexibility, i.e., DRT can be tailored to meet the needs of the area by offering services to replace, complement, or augment fixed-route service, or by providing service where none existed previously. This report, therefore, recommends that the DRT operator continuously evaluate the system and adapt it to the changing needs of the community.

*This document supersedes PB 232-970.

NTIS ORDER NO.: PB 261-314/AS

PRICE: \$5.00

TITLE: DIAL-A-RIDE SOFTWARE INSTALLATION GUIDE

AUTHOR: The MITRE Corporation
(John R. Ferrantino)

DATE: September 1976

PROJECT NO.: VA-06-0024

KEYWORDS:

1. Demand Responsive Systems, Dial-A-Ride
2. Computer Applications
3. Management, Operations and Techniques
4. Schedules and Scheduling
5. Guides and Guidance

The Demand-Responsive Scheduling Software Package is a set of procedures and computer programs designed to assist researchers, agencies, and transit operators in the operation of demand-responsive transportation systems. This package is being tested and is currently operating on a PDP-10 time-sharing system in Rochester, New York. The package includes program documentation, descriptions of input data file preparation, operators' guides, and program source code.

This manual contains preliminary guidelines for installing the on-line portion of the software package at a user site. It outlines such steps as obtaining and organizing resources, constructing data bases, and starting, operating and scheduling operations.

NTIS ORDER NO.: PB 258-333/AS

PRICE: \$4.50

TITLE: HADDONFIELD DIAL-A-RIDE DEMONSTRATION, THIRD HOUSEHOLD SURVEY

AUTHOR: The MITRE Corporation
(S.E. Winchester)

DATE: March 1976

PROJECT NO.: VA-06-0024

KEYWORDS:

1. Demand Responsive Systems, Dial-A-Ride
 2. Surveys
 3. Socioeconomic Analyses
 4. Ridership, Attraction
 5. Ridership, Volume
-

The Haddonfield, New Jersey Dial-A-Ride (DAR) System operated from February 1972 to December 1974. The demonstration was sponsored by the New Jersey Department of Transportation under a demonstration grant from UMTA. The overall objective of the project was to determine the public attitudes, economic and technical feasibility, and community impacts of the Demand-Responsive Transportation concept.

The household survey discussed in this report was conducted in September 1974 in the dial-a-ride service areas of Haddonfield, Barrington, Lawnside, and Cherry Hill, New Jersey. The Haddonfield Dial-A-Ride had been in service for twenty months. This survey was administered to obtain data on the socioeconomic profile and travel characteristics of the users of Dial-A-Ride and the users of the taxi, fixed-route bus and auto modes. Tabulations of the responses collected were made for each of four samples on a household, person and trip basis.

This survey shows that use of Dial-A-Ride for travel between home and work had increased during the twenty months since the previous survey. It also suggested that significant impacts on other modes of travel occurred. Ridership of DAR did increase during the time period of the demonstration, i.e., when comparing the second and third household surveys this increase can be attributed partly to a reduction in auto passengers' usage.

NTIS ORDER NO.: PB 257-033/AS

PRICE: \$4.50

TITLE: ENVIRONMENTAL IMPACT ISSUES FOR AUTOMATED GUIDEWAY TRANSIT SYSTEMS

AUTHOR: The MITRE Corporation
(E. Nussbaum and B. Zimwalt)

DATE: July 1976

PROJECT NO.: VA-06-0025

KEYWORDS: 1. Automated Guideway Transit 6. Social Benefits and Costs
2. Air Pollution
3. Energy
4. Environment and
Environmental Control
5. Planning, Tools

The focus herein is not only on the "engineering features" but also on the social and environmental aspects of urban transportation systems. Research on these issues serves as an indication to administrators and the general public that people will use this system, that AGT will serve the needs of the public, and that adverse impacts will be tolerable.

Engineering and nonengineering/social topics discussed in this report are those associated with environmental impact issues in transportation alternatives analyses. The purpose is to identify the trade-offs that must be resolved to consider the influence on the design of major sub-systems, and to record the current status of these aspects of environmental impact.

Section I discusses some critical nonengineering issues that influence the social acceptability of AGT in urban areas, such as crime, system safety, and community disruption. The environmental and social issues that should be considered during the technology development of AGT are discussed from three aspects: 1) nonengineering issues that may affect the social acceptability of AGT; 2) how these issues may influence guideway, vehicle, and station design; and 3) itemized potential impacts, sources, and possible design solution. The concepts presented reflect the opinion of recent publications, including the environmental impact statement guidelines of a number of Federal agencies.

Section II examines three "hard" environmental impact items, namely, the important engineering factors of acoustic noise, electromagnetic interference, and power consumption. This engineering section also contains illustrations of noise criteria curves, alternate curves, and comparisons as well as high speed radiated interferences.

A major point made in this report is that limited data available for existing/proposed AGT systems show no particular trend of consistency in energy usage, and that achievable means of reducing undesirable impacts on the environment due to energy use and conversion will most likely result from a total system-design approach in which the complete cycle from manufacture to disposal is considered.

NTIS ORDER NO.: PB 263-640/AS

PRICE: \$6.00

TITLE: VEHICLE OPERATING STRATEGIES FOR SMALL
AUTOMATED GUIDEWAY TRANSIT NETWORK

AUTHOR: The MITRE Corporation
(A.M. Yen)

DATE: August 1976

PROJECT NO.: VA-06-0025

KEYWORDS:

1. Automated Guideway Transit
 2. Guideways
 3. Management, Operations and Techniques
 4. Vehicle, Monitoring
 5. Demand Responsive Systems
-

The most important technical advancement that Automated Guideway Transit (AGT) systems feature is automation. The trend of related research has been to develop, as a whole, the technology of AGT systems, with emphasis on control and computerized system management. The goal of new urban transit systems, however, is to provide convenient links in time and space between trip origins and destination-- a service that the majority of today's urban travelers enjoy by using private automobiles. To compliment this high level of existing services, this report focuses on the AGT system as a public transportation service that would offer demand-activated service tailored to the passenger's need. Hence, vehicle dispatching strategies are defined in order to provide this level of service.

This report discusses AGT systems that will offer demand-activated service using an on-line dispatching capability. The AGT system management is identified as a large-scale, multicriterion optimization problem, and the approach taken is to formulate this problem into a mathematical form so that known techniques could be used to arrive at solutions. Emphasis is on heuristic solutions by approximation rather than exact solutions through analysis. Actual operating strategies are constructed for point-to-point service with intermediate stops. The strategy involving squared terms of waiting time is found to be optimal for a wide range of demands.

Further information on the simulation program used in this report is contained in the Appendix. Appendix A discusses the validation approach, lists the system parameters, and maps out the operations and logic behind the simulation in a flow chart; Appendix B defines the waiting terms; and Appendix C illustrates the simulation results for the ten strategies discussed in this report.

NTIS ORDER NO.: PB 262-480/AS

PRICE: \$5.50

TITLE: BUS PRIORITY SYSTEMS: SIMULATION AND ANALYSIS

AUTHOR: The Mitre Corporation
(John S. Ludwick, Jr.)

DATE: February 1976

PROJECT NO.: VA-06-0026

KEYWORDS:

1. Bus, Priorities	7. Time Costs
2. Transportation Systems Management	8. Traffic Analysis, Control
3. Algorithms	9. Models and Modeling
4. Intersections and Crossings	
5. Signs and Signals	
6. Headways	

Simulation runs have examined the effects of three types of Bus Priority System (BPS) algorithms on bus traffic and on other vehicle traffic with combinations of: local, limited, and express service; bus stops on the near- and far-side of intersections; bus headways varying from one-half to four minutes; streets with good and with fair signal coordination; and most signalized intersections instrumented for BPS.

The author concludes that an unconditional preemption algorithm, in which the signal is changed to a green and held green as long as the bus is within 200 feet upstream from the intersection, provides 25 percent travel time benefit to buses. However, the delay to cross-street traffic can be extreme, particularly at short bus headways. An algorithm limiting the preemption to a maximum of 10 seconds provides 20 percent bus travel time improvement with only 7 percent cross-street travel time increase, even at half-minute headways.

The large number of simulation runs performed has revealed factors important to the operation of such a bus priority system. Bus stops on the far-side of intersections are far superior to near-side bus stops. Buses with frequent stops have greater potential for improvement than express buses, especially if existing signal coordination is good. Instrumenting all signalized intersections is particularly important in improving express bus travel time.

The conclusions drawn from this simulation apply strictly to those cases simulated. However, it is felt that trends have been noted and used to project the results to other cases. Further simulation is required to confirm these projections.

NTIS ORDER NO.: PB 251-246/AS

PRICE: \$4.00

TITLE: SIMPLIFIED ESTIMATORS FOR BENEFIT ASSESSMENT OF
BUS PRIORITY SYSTEMS

AUTHOR: The MITRE Corporation
(John S. Ludwick, Jr.)

DATE: August 1975

PROJECT NO.: VA-06-0026

KEYWORDS: 1. Transportation Systems Management
2. Bus, Priorities
3. Intersections and Crossings
4. Traffic Analysis, Control
5. Signs and Signals
6. Algorithms
7. Models and Modeling

Simulation studies indicate that a Bus Priority System (BPS) that guarantees a green traffic signal to buses approaching an instrumented intersection provides substantial benefits to buses with little detriment to other traffic.

Simplified estimators that correlate well with many aspects of the simulation results provide a better understanding of the BPS process and a means of analyzing the effects of BPS in applications other than that simulated. A bus travel time estimator predicts values within 10 percent for local buses, although the accuracy is less for buses with less frequent stops. An intersection capacity estimator reflects how certain conditions lead to greatly increased travel times for other vehicles in the simulation network and how far-side bus stops are superior to near-side bus stops at short bus headways.

Chapters address estimator development and comparison of estimator and simulation results. Conclusions are presented. Appendices include the BPS algorithm network characteristics and space-time diagrams.

References are furnished.

Related reports are "Overview of Experimental Bus Priority Systems" (PB 247-742) and "Unconditionally Preemptive Bus Priority System: Summary of Simulation Results" (PB 247-976).

NTIS ORDER NO.: PB 247-795/AS

PRICE: \$4.00

TITLE: UNCONDITIONALLY PREEMPTIVE BUS PRIORITY SYSTEM: SUMMARY
OF SIMULATION RESULTS

AUTHOR: The MITRE Corporation
(John S. Ludwick, Jr.)

DATE: July 1975

PROJECT NO.: VA-06-0026

KEYWORDS:

1. Transportation Systems Management	6. Traffic Analysis, Control
2. Bus, Priorities	7. Signs and Signals
3. Models and Modeling	8. Headways
4. Algorithms	9. Time Costs
5. Intersections and Crossings	

A large number of simulation runs of an urban network traffic model have been used to evaluate a Bus Priority System (BSP) algorithm that automatically grants a green signal to buses as they approach an intersection.

BPS was found to provide substantial travel time improvements (20 to 30 percent) to buses in local service (frequent stops) at all headways, to buses in limited service (infrequent bus stops), and to express service (no bus stops) at headways of one minute and less.

The disrupting effect of BPS on cross-street traffic is much less when far-side bus stops instead of near-side bus stops are used. The use of BPS also reduced the delaying effect of buses on other bus-street traffic.

For all conditions tested, total passenger travel time per hour of system operation improved when BPS was used.

Definitions of terms are provided. The BPS algorithm, the model and network characteristics are discussed. Simulation results are presented in terms of mean travel time, bus traffic, other bus-street traffic, cross-street traffic, other travel time statistics, and overall passenger travel time.

The appendix contains figures which show the number of stops per vehicle mile for bus traffic, for all traffic on bus streets, and for all traffic on other streets, with and without BPS, for various values of bus headway. Related reports are "Overview of Experimental Bus Priority Systems" (PB 247-742) and "Simplified Estimators for Benefit Assessment of Bus Priority Systems" (PB 247-795).

NTIS ORDER NO.: PB 247-976/AS

PRICE: \$4.00

TITLE: AUTOMATIC VEHICLE MONITORING SYSTEMS

AUTHOR: The MITRE Corporation
(Walter C. Scales)

DATE: October 1974

PROJECT NO.: VA-06-0027

KEYWORDS:

1. Vehicle, Monitoring
 2. Routes and Routing
 3. Sensors
 4. Electronic Vehicle Guidance
 5. Research Activities
-

Automatic Vehicle Monitoring (AVM) Systems, which allow the automatic determination of the location of fleet vehicles, have been the subject of study for many years.

This report examines a variety of techniques proposed for AVM applications, as well as the efforts made in the related field of Automatic Vehicle Identification (AVI). Technologies for locating urban fleet vehicles are discussed and classified under four broad categories: dead-reckoning, radio time-of-arrival, proximity, and triangulation techniques. Earlier location techniques based on radio signal propagation time are discussed and divided into two groups: time-of-arrival (TOA), and time-difference-of-arrival (TDOA). Hybrid AVM systems and FCC regulations regarding the licensing of AVM systems on an operational basis are discussed briefly.

AVM offers the potential of increasing the efficiency of several types of fleet operation, including mass transit, police, taxi, and other fleet systems, while simultaneously improving the security on board these vehicles. AVM also offers a high potential for commercial users in urban areas, e.g., package delivery services, private maintenance services, and truck delivery systems.

NTIS ORDER NO.: PB 262-469/AS

PRICE: \$4.50

TITLE: OVERVIEW OF EXPERIMENTAL BUS PRIORITY SYSTEMS

AUTHOR: The MITRE Corporation
(C.D. Lovett)

DATE: March 1975

PROJECT NO.: VA-06-0027

KEYWORDS:

1. Transportation Systems Management
2. Bus, Priorities
3. Traffic Analysis, Control
4. Computer Applications
5. Intersections and Crossings
6. Time Costs

The bus priority strategies tested in eight different cities (Kent, Ohio; Washington, D.C.; Leicester, England; Derby, England; Louisville, Kentucky; Miami, Florida; Bern, Switzerland; Alkmaar, Netherlands) used a variety of signal control techniques to award priority to buses at traffic control intersections.

This report results range from seven seconds reduction in average bus delay at one intersection in Leicester, to 24 seconds reduction at an intersection in Bern. More importantly, the range of travel time through an intersection in Derby was reduced by more than one half. Such reduction in range of travel time has a significant impact on reducing run time variation along a bus route.

In Washington, 34 intersections were equipped with bus detectors which fed bus arrival information to the central Urban Traffic Control System/Bus Priority System computers. Whenever a bus was detected, this bus priority system (BPS) used either green signal extension or red signal truncation to reduce bus delay at the EPS intersection. In Bern, the normal one-green phase per cycle was split into two green phases of equal length, with the capability of extending either of the green phases whenever a tram was detected. This resulted in a 75 percent reduction in delay time for trams and a 50 percent reduction in delay time for buses.

The U.S. and European approaches to EPS demonstrations differ. U.S. demonstrations range in size from three to 34 intersections and emphasize hardware and software development. In contrast, demonstrations outside of the U.S. typically include one intersection and stress studies of how much the mean travel time and the range of travel time through the intersection have improved with priority as compared to buses operating without priority. References are furnished.

NTIS ORDER NO.: PB 247-742/AS

PRICE: \$4.50

TITLE: LIFE CYCLE COSTING FOR CURRENT ROHR AND AM GENERAL BUSES AND
GENERAL MOTORS RTS-II BUS

AUTHOR: Advanced Management Systems, Inc.
(H. R. Kain, G. J. Marks, and L. A. Staszak)

DATE: July 1976

PROJECT NO.: VA-06-0039

KEYWORDS: 1. Life Cycle Costing
2. Bus, Cost
3. Maintenance, Costs
4. Bus, Design
5. Fuel, Consumption
6. Bus, Intracity

UMTA is considering the use of the life cycle costing concept in the procurement procedures for intracity buses. It therefore becomes important to isolate the relevant factors to be used in the evaluation of bids which have an impact on follow-on costs and are influenced by the bus design. These relevant factors have been identified as the bus price, maintenance costs (including preventive maintenance), fuel costs, and tire costs. The notion of expanding the guidelines for evaluation of bids to include the relevant cost elements is new to bus users and manufacturers.

Evaluation of practices of bus operators and manufacturers indicates that they are in a position to agree mutually upon an evaluation process dependent upon: (1) maintenance cost data, (2) design related maintenance elements, (3) fuel and tire costs, (4) useful life of a bus for evaluation purposes, and (5) initial bus purchase price.

Inasmuch as the follow-on costs considered in the evaluation of bus bids exceed the cost of the bus itself, the life cycle costing approach highlights the follow-on costs. Of paramount importance is the flexibility to introduce design improvements that can result in savings during the life of the bus.

NTIS ORDER NO.: PB 255-091/AS

PRICE: \$4.00

TITLE: MORGANTOWN PERSONAL RAPID TRANSIT SYSTEM

AUTHOR: Boeing Aerospace Company
(Automated Transportation Systems)

DATE: November 1975

PROJECT NO.: WV-06-0005

KEYWORDS:

1. Automated Guideway Transit
2. Personal Rapid Transit
3. Universities
4. Guideways
5. Research, Activities
6. Transportation Systems Management

UMTA selected Morgantown, West Virginia as a site for a prototype personal rapid transit system demonstration because it presented the challenges that such a system must overcome to be successful in any location. This Morgantown Personal Rapid Transit (MPRT) system was funded by UMTA as a research and development task to provide a demonstration system with the following objectives: 1) demonstrate the feasibility of an automatic, personalized urban transit system; 2) demonstrate the applicability of the concept to national urban needs; and 3) qualify the concept for other locations using the UMTA capital grant funds. This MPRT system was accepted by UMTA on September 12, 1975, to be owned and operated by the West Virginia University.

This MPRT final report contains a description of the final delivered system and a summary of the activities undertaken in its development, including system and subsystem plans, specifications, drawings, test data, and test evaluation. The MPRT connects downtown Morgantown with two West Virginia University locations, and also provides passengers with non-stop direct-to-destination service between the central business district and the Evansdale and downtown campuses of the West Virginia University.

The MPRT system and stations operate automatically under a central computer control with functional monitoring by a system operator with manual override capability. The system comprises three major elements: a control and communications system, a vehicle system, and a structure and power distribution system. It has demonstrated the design control capability of operating the fleet of 45 electrically powered vehicles at 15-second headways, or a capacity of 5,040 passengers per lane per hour. Maximum vehicle speed is 30 mph. In its first year of operation, the vehicles are expected to travel approximately 930,000 miles and transport over 3,000,000 passengers.

The overall goal of MPRT is to demonstrate a viable attractive alternative to the use of private automobiles in congested urban areas. Compared to conventional transit, MPRT provides increased frequency of service and schedule flexibility, high quality transit service during both peak and low passenger demands at low operating costs, and service quality and frequency which distinguish MPRT from competing transportation forms. The technology and practical experience gained from its construction and operation are directly applicable to other urban areas.

NTIS ORDER NO.: PB 263-673/AS

PRICE: \$8.00

TITLE: MPRT O&M PHASE OPERATING, AVAILABILITY AND
MAINTENANCE HISTORY

AUTHOR: Boeing Aerospace Company
Surface Transportation Systems

DATE: January 1977

PROJECT NO.: WV-06-0005

KEYWORDS:

1. Automated Guideway Transit
 2. Management, Planning and Analysis
 3. Maintenance, Costs
 4. Personal Rapid Transit
 5. Information Aids
-

The first year's operation of the Morgantown Personal Rapid Transit (MPRT) system successfully demonstrated the concept of an automatically controlled transit system.

This document describes the operating and maintenance characteristics of the MPRT during the first year of passenger-carrying service starting September 15, 1975. The Morgantown project is an UMTA demonstration to provide personal rapid transit service between the central business district and the separated campuses of West Virginia University. There were 2.1 miles of two-lane guideway, 3 passenger stations, an integral maintenance facility, and 45 vehicles used during the first year of operation. West Virginia University operated the system with support from Boeing.

The purpose of this document is to provide a published account of the MPRT operating, availability, and maintenance history. Data was summarized from program reports compiled and published during the first year of MPRT operation and maintenance. Data included scheduled and actual operating hours; downtime, downtime events; mean downtime; daily passenger gate count; system availability; trip reliability; system dependability; daily fleet miles; daily fleet size; scheduled versus unscheduled maintenance actions; failures by part number; distribution of failures by time and subsystem; top 25 problem areas by number of occurrences, downtime and manpower; spare parts used by quantity, part number and month; ECP change implementation during the O&M phase; personnel involved in this phase, and a summary of the first year's O&M costs.

The intent in presenting this MPRT data is that future Automated Transportation Systems studies and designs will learn from the MPRT experience and make use of this data to optimize designs and systems.

NTIS ORDER NO.: PB 266-994/AS

PRICE: \$5.00

TITLE: FUTURE SCENARIOS FOR URBAN TRANSPORTATION

AUTHOR: Urban Mass Transportation Administration
Office of Research & Development
(Michael Patrick Leahy)

DATE: August 1975

PROJECT NO.: RDD-9

KEYWORDS:

1. Modal Split	6. Environment and Environmental Control
2. Private Transportation, Auto	7. Air Pollution
3. Bus	8. Urban Development and Planning
4. Rail	
5. Fuel, Consumption	

The author finds that, between 1972 and 1999, urban passenger miles will increase by a factor of 1.75, from 908×10^9 miles to 1600×10^9 miles. This increased demand will be met by a particular modal split.

Unless the internal combustion auto meets the statutory emission standards, it will cause more air pollution harm than the diesel bus and electrified modes. Even if the internal combustion auto meets the statutory standards, it will cause more harm than the electrified modes. Using total energy consumption comparisons, the internal combustion auto that meets DOT suggested fuel economy standards for 1980 (19.6 mpg) is twice as energy-intensive as the diesel bus, three times as energy-intensive as rapid rail and the electric bus, and five times as energy-intensive as the electric car and the advanced GRT. If 47 percent of all urban travel is made on electrified modes in 1990, 1.6 billion barrels of petroleum can be saved, at a cost of 1.7 percent increase in anticipated electricity demand.

The author concludes that to decrease energy consumption, improve urban air quality, and improve urban transportation, strategies should be aimed at achieving a transit and electric intensive modal split. Opportunities for action include 1) strongly supporting HR 8800, which, if passed, will appropriate \$160 million for five years to the Energy Research and Development Administration (ERDA) for Electric Vehicle R&D, 2) working in cooperation with ERDA to develop an urban private passenger electric vehicle and improved battery-powered electric bus.

NTIS ORDER NO.: PB 255-349/AS

PRICE: \$5.50

TITLE: URBAN MASS TRANSPORTATION ABSTRACTS
Volume No. 3

AUTHOR: Department of Transportation
Urban Mass Transportation Administration

DATE: July 1976

PROJECT NO.: TRIC-76-1

KEYWORDS:

1. Bibliographies
 2. Guides and Guidance
 3. Information Aids
-

This volume is a reference document prepared by the Urban Mass Transportation Administration (UMTA) of the U.S. Department of Transportation and serves as a guide to 298 reports generated under contract to UMTA. This document reflects UMTA's continuing commitment to the dissemination of technical report information to government, state, and local transportation planning bodies, private industry, and the general public.

The types of documents abstracted in this volume are, by section: I) Technical Studies; II) Research, Development and Demonstration Project reports; and III) University Research and Training reports. Section IV contains complete indexes to the volume by report title, personal author, corporate author, geographic location, and keywords.

All reports in this document are available for sale at the National Technical Information Service (NTIS), Springfield, Virginia 22161. Each abstract contains an NTIS order number and price for paper copy. Most documents are also available in microfiche.

Volumes I and II of the URBAN MASS TRANSPORTATION ABSTRACTS are also available at NTIS. The NTIS order number for Volume I (October 1972) is PB 213-212. The NTIS order number for Volume II (September 1973) is PB 225-368.

NTIS ORDER NO.: PB 264-905/AS

PRICE: \$10.50

TITLE: TRANSPORTATION SYSTEM MANAGEMENT
A Bibliography of Technical Reports

AUTHOR: Urban Mass Transportation Administration
(Richard L. Oram)

DATE: May 1976 **PROJECT NO.:** UPP-L

KEYWORDS: 1. Bibliographies
2. Transportation Systems Management

This document is a bibliography of readily obtainable technical reports on operational transportation improvements. It was prepared to assist in the development of Transportation Systems Management (TSM) plans as required by the Urban Mass Transportation Administration/Federal Highway Administration urban transportation planning regulations that were issued in Fall 1975, and in the implementation of TSM improvements. (TSM plans are intended to document the local strategy for improving air quality, conserving energy, and improving transportation efficiency and mobility through management of the existing transportation system).

Descriptions and availability information on over 150 reports dealing with low-capital, short-range, or policy oriented urban transportation improvements are included and classified into 9 sections. The first, General, includes transportation management overviews, survey reports on the various operational approaches and strategies for improved transportation efficiency, and demonstration program reports. The remaining sections contain more focused reports in the following areas: Preferential Treatment for High Occupancy Vehicles, Traffic Operations, Parking Management, Transit Improvements, Transit Management, Pooling and Paratransit, Pedestrians and Bicycles, and Transportation Demand Management.

NTIS ORDER NO.: PB 257-273/AS

PRICE: \$6.75

TITLE: INNOVATION IN PUBLIC TRANSPORTATION
A Directory of Research, Development and Demonstration Projects

AUTHOR: U.S. Department of Transportation
Urban Mass Transportation Administration

DATE: FY 1975 PROJECT NO.: N/A

KEYWORDS:

1. Bibliographies
 2. Government, Federal
-

This annual publication contains descriptions of current research, development and demonstration (RD&D) projects sponsored and funded by the U.S. Department of Transportation's Urban Mass Transportation Administration.

Research projects are intended to produce information about possible improvements in urban mass transportation. The products of research projects are reports or studies. Development projects involve fabrication, testing and evaluation of new equipment, facilities, systems or methods. The products of development projects include prototype hardware, test results, and reports. Demonstration projects introduce, on an experimental basis, new methods, equipment or systems of urban mass transportation into a representative urban environment. This permits measurement of passenger and community acceptance of the innovation, collection and evaluation of operating and financial statistics to ascertain economic viability, and an evaluation of the operational performance of new methods or equipment in daily public service.

The volume dated June 30, 1972 constituted an historical record of all projects funded under the Urban Mass Transportation Act of 1964, as amended, to that point, as well as projects funded earlier under authorization to the Housing Act of 1961. This volume is available from NTIS (PB 213-228).

Volumes of fiscal years 1973 and 1974 serve as supplements to the comprehensive 1972 volume since they contain only updated descriptions of those projects active in the fiscal year cited in addition to projects initiated or completed during that year. Copies of these volumes are available from the U.S. Superintendent of Documents.

Stock No. 050-014-00006-1

PRICE: \$1.80

TITLE: BART MULTIMODAL TERMINAL PLAN
City of Walnut Creek, California

AUTHOR: Duncan & Jones (prepared for City of Walnut Creek with Bay Area
Rapid Transit District, Metropolitan Transportation Commission)

DATE: March 1974

PROJECT NO.: CA-09-0025

KEYWORDS: 1. BART
2. Intermodal, Terminals
3. Rail, Stations and Terminals
4. Planning
5. Benefit-Cost Analysis

The purpose of this study is to develop specific plans for the multimodal transportation facilities at the BART station site in Walnut Creek, California, based on the functional requirements of the various transportation modes connecting with the station.

The study was divided into two phases. The first phase consisted of data collection and survey of present usage of the BART site by cars, bicycles, pedestrians, taxis, and buses in order to evaluate the efficiency of movement and space allocation on the site. Anticipated changes in existing transportation systems, highway improvement, street realignments and closures, and other changes were evaluated. Literature relating to multimode transportation terminals, the use of air rights, and innovative transportation linkages was reviewed.

The second phase defined the focus and function of the site, given the options and constraints identified in the first phase. Design alternatives were formulated to accommodate the various access modes. Costs and benefits of alternatives were analyzed and a development plan outlined, with implementation measures and time frames detailed.

This report contains a site plan showing the recommended schematic design in functional and spatial terms of the multimodal terminal and the movement systems which are determined to be feasible and desirable, and includes explanatory text and material describing the functions, operations, and spatial interrelationships of the various modes. It includes an evaluation of the financial feasibility of the plan recommendations and an estimate of the construction and development costs involved, as well as recommendations on the phasing of the plan.

TITLE: CITY OF NAPA LOCAL BUS NEEDS AND PLANNING STUDY

AUTHOR: Alan M. Voorhees & Associates, Inc.

DATE: May 1974

PROJECT NO.: CA-09-0025

KEYWORDS: 1. Planning
2. Bus
3. Demand Responsive Systems
4. Small Cities
5. Transportation Disadvantaged

The transit objectives of the City of Napa, California, as defined in this report are: 1) to increase the transit mobility of all persons, including those especially dependent on transit--the poor, the handicapped, the young, and the senior citizen; 2) to increase transit service particularly to the downtown area where most trips converge and to South Napa where many work and school trips converge; 3) to promote transit as a more important factor in achieving an improved environment, and a generally better community in which to live; and 4) to insure that Napa Transit System complements the transportation systems existing and envisioned for the County and the Region.

The primary goal of this particular study is to design a transit system which meets the transit goals and objectives stated above.

Chapters address data collection, the evaluation criteria, preliminary alternative, three alternatives (addition to existing system, fixed route alternative, dial-a-bus fixed route combination), evaluation and recommendations, and implementation. System requirements and phasing over 5 years are discussed.

NTIS ORDER NO.: PB 255-451/AS

PRICE: \$6.00

TITLE: CONTRA COSTA COUNTY TRANSPORTATION NEEDS STUDY

AUTHOR: DeLeuw, Cather and Company (in association with
Institute for Regional and Urban Studies)

DATE: December 1971

PROJECT NO.: CA-09-0025

KEYWORDS: 1. BART
2. Bus, Feeder
3. Benefit-Cost Analysis
4. Planning
5. Bus
6. Transportation Disadvantaged

This report describes and summarizes studies performed for the Contra Costa County Transportation Board to identify public transportation needs and to develop a program for public transportation services in that part of Contra Costa County, California, which is outside of the existing AC Transit service district.

The primary objective of this work was to develop a system that would 1) provide feeder service to the BART stations located in the study area, and 2) provide service for local trips within the study area.

The principal focus of the report is on the evaluation of conventional fixed-route, fixed-schedule systems for both the feeder and local services. Detailed analyses and projections to 1980 were made of future BART patronage from Contra Costa County to destinations in San Francisco and Alameda counties and of future origins and destinations within the County. Nine separate conventional bus systems were discussed, their capital and operating costs estimated, 1980 patronage projected, and an evaluation utilizing benefit-cost analysis procedures was made for each of the systems.

To the extent feasible, identification and evaluation of alternative forms of public transportation systems which would compete with the private auto and would meet travel demands of central County residents for trips to and from BART stations and for local travel were made.

Another part of the study was oriented toward the development of a public transportation system that would meet the travel needs of those County residents with limited or no access to private automobiles.

NTIS ORDER NO.: PB 244-518/AS

PRICE: \$9.00

TITLE: RAIL TRANSIT CAR COSTS
A Review, Analysis and Projections

AUTHOR: Southern California Association of Governments (SCAG)

DATE: May 1975

PROJECT NO.: CA-09-0035

KEYWORDS:

1. Rail, Commuter
2. Rail, Light
3. Rail, Cost
4. Planning
5. Rail, Rapid Transit
6. Rail, Rolling Stock

The purpose of this report is to provide those involved in transportation planning in Southern California with some essential background data for the planning efforts for rail transit in this region. It attempts to forecast car costs for rapid transit, commuter rail, and light rail vehicles. The information is provided as refinement to the commuter rail and light rail planning activities of SCAG and the multiagency effort relative to rapid transit planning in the Los Angeles Basin. The report covers rail vehicles ordered over the last 12-13 years.

The operational characteristics of each of the rail systems are discussed. This includes headways, speeds, power, etc., as well as a tabulation of the equipment used by each operator and a summarization of system characteristics.

The division of the rail car market by the manufacturers is examined. Also compared are the expenditures made for each of commuter rail, rapid transit, and light rail transit by City, by Transit Property and by Type of Equipment including a further breakdown for locomotive-hauled cars versus electrically-propelled cars. Rail car cost escalation by car order is discussed as well as the change in the cost per car per seat and per pound to attempt to better equate the diversity of cars being ordered over the past 12 years in the U.S. and Canada. An attempt is made to forecast what cars will cost between 1975 and 1980 and what such forecasts mean for Los Angeles in terms of a limited commuter rail service growing to a wider regional coverage and the possibility of some form of rail transit being instituted in Southern California.

Photographs and graphs complement the text of the report.

NTIS ORDER NO.: PB 255-835/AS

PRICE: \$6.75

TITLE: A TRANSIT CONCEPT FOR PINELLAS COUNTY

AUTHOR: Community Sciences, Inc.
(prepared for Tampa Bay Regional Planning Council)

DATE: April 1974

PROJECT NO.: FL-09-0009

KEYWORDS:

1. Planning
 2. Management, Operations and Techniques
 3. Transportation Systems Management
 4. Ridership, Volume
 5. Modal Choice
-

This study examines transit needs in Pinellas County, Florida, an area encompassing 280 square miles, with an estimated 1973 population of 648,000. This study is broad in scope, dealing with local and County-wide transit operating concepts, demand prediction, system sizing and costing, financing and system management. It is concerned with transit needs over the next five years, 1974 through 1978, and it defines the equipment and facilities that will be required during each of these years.

The focus of the study is on the definitions and evaluation of broad transit system concepts for Pinellas County, the outlining of a logical course evolution for transit throughout the county over the next five years, and the identification of important technical questions, policy issues and other areas of study that should be examined in greater depth in the future. Of necessity, many issues are dealt with in a very general way, and the development of basic transit operating concepts and generic system frameworks is emphasized.

Judgmental evaluation and parametric analysis are used where appropriate and necessary to achieve the desired study breadth within the available resources. Estimates are generated for the number and types of transit vehicles that will be required on a county-wide basis, the supporting facilities that will be needed, the total and equivalent annual capital investment and operating costs that will be incurred, and probable levels of transit revenue. The question of system management is also addressed. All of these estimates are finally brought together in the form of a well-defined, five-year transit improvement program for Pinellas County.

NTIS ORDER NO.: PB 255-640/AS

PRICE: \$6.00

TITLE: NEW YORK CITY TRANSIT AUTHORITY DESIGN GUIDELINES

AUTHOR: New York City Transit Authority
(In association with the Tri-State Regional Planning Commission)

DATE: March 1975

PROJECT NO.: IT-09-0014

KEYWORDS:

1. Rail, Systems and Planning Design	6. Guides and Guidance
2. Rail, Materials	7. Signs and Signals
3. Rail, Stations and Terminals	8. Communications
4. Tracks and Trackage	9. Hydraulics
5. Rail, Rapid Transit	10. Rail, Rolling Stock

This project was designed to develop a revised and updated series of handbooks covering various aspects of the design, construction, and equipment of a modern rail rapid transit system.

These twelve separate manuals are entitled:

1. "Transportation Planning and Environmental."
PB 251-642/AS Price: \$7.50
2. "Station Planning."
PB 251-643/AS Price: \$4.50
3. "Structural Design."
PB 251-644/AS Price: \$5.50
4. "Construction."
PB 251-645/AS Price: \$7.50
5. "Signals and Communications."
PB 251-646/AS Price: \$8.00
6. "Hydraulics, Electric Ducts and Plumbing."
PB 251-647/AS Price: \$4.50
7. "Tracks and Contact Rail."
PB 251-648/AS Price: \$4.50
8. "Equipment."
PB 251-649/AS Price: \$8.00
9. "Power."
PB 251-650/AS Price: \$4.00
10. "New Car Engineering."
PB 251-651/AS Price: \$9.00
11. "Materials Inspection."
PB 251-652/AS Price: \$9.75
12. "Materials Inspection."
PB 251-653/AS Price: \$11.00.

NTIS ORDER NO.: PB 251-641-SET

PRICE: \$70.00

TITLE: PLAINFIELD TRANSIT CENTER
Engineering Feasibility Study

AUTHOR: Edwards and Kelcey, Inc.
(for the City of Plainfield, Planning Division)

DATE: September 1973

PROJECT NO.: IT-09-0014

KEYWORDS:

1. Rail, Stations and
Terminals
2. Planning

The City of Plainfield is served by the main line of the Central Railroad of New Jersey. Four passenger stations, three of which are currently in operation, are located within the city limits. Presently, plans are being developed to replace the Central Railroad of New Jersey passenger service by an extension of the Port Authority of New York and New Jersey PATH services.

Plainfield is located southwest of Manhattan and Newark and serves as the center of activity of several municipalities in Union, Middlesex, and Somerset Counties. Many of the residents of this subregion utilize the Plainfield passenger stations to commute to Newark and Manhattan.

The purpose of this study was to develop a plan for the consolidation of transportation services in Plainfield, New Jersey, and to determine the engineering and economic feasibility of constructing a Transit Center in the future.

NTIS ORDER NO.: PB 255-491/AS

PRICE: \$4.50

TITLE: NEW JERSEY PUBLIC TRANSPORTATION STUDY
Phase A Immediate Action Plan

AUTHOR: Wilbur Smith and Associates with Ford, Bacon and Davis, Inc.
(Prepared for the New Jersey Department of Transportation)

DATE: March 1974

PROJECT NO.: IT-09-0023

KEYWORDS: 1. Bus
2. Planning
3. Rail, Rapid Transit
4. Intermodal, Integration
5. Government, State

The objective of this study is to provide an immediate action plan for improving public bus service in New Jersey to ensure greater response to public needs. The study examines existing transportation characteristics and, following extensive analysis, recommends appropriate action for the preservation and extension of public bus services.

The role of rail rapid transit is investigated as a component of the total public transportation system to provide recommendations for modal integration and intermodal transfer where appropriate.

The study recommendations will lead to improved coordination, operation and regulation of essential bus services and will guide the most effective use of state and Federal assistance.

Awareness of the State's official transit development program for fiscal year 1974, and possible programs for the next five years are reflected in the study.

This phase of the study is divided into four work tasks as follows: 1) an introductory overview statement dimensioning the transportation situation in the State of New Jersey and identifying governmental policy alternatives; 2) initiation of a detailed inventory of all present bus transportation operations in the State; and 3) development of recommendations for immediate action improvements making optimum use of existing equipment facilities.

NTIS ORDER NO.: PB 255-641/AS

PRICE: \$8.00

TITLE: TRANSPORTATION FOR SENIOR AND HANDICAPPED PERSONS
IN ROCKLAND COUNTY

AUTHOR: RRC International, Inc.
(For Rockland County, New York)

DATE: January 1974

PROJECT NO.: IT-09-0023

KEYWORDS:

1. Elderly
2. Handicapped
3. Planning
4. Transportation Systems Management

The objectives of this report are to develop a precise description of the transportation problems of the handicapped and elderly in Rockland County, New York, and to formulate operational solutions to these problems.

The essence of the statement of the work scope is that a joint Federal-local, multiagency approach should be used to develop the transportation facilities deemed necessary as a result of this planning study. Key elements of the work statement are the data gathering and analysis, system design sketch, support plan and implementation plan.

Research shows that the elderly/handicapped have major problems with existing transportation systems. Some of these include: of the 23,000 persons over age 60, about half require improved access to transit services for their most basic requirements; as many as 600 persons are restricted to wheelchairs and presently have little or no mobility. Some transit problems identified were in the areas of weekend service, frequency and punctuality of service, inconvenient routes, lack of shelters, and cost. Recommendations include improved accessibility trips for seniors and handicapped to meetings, shopping, recreation, health and social services, and provision of health services in Rockland County now available in New York City only.

The following are some of the key elements in the system design plan: establishment of a County office responsible for all transportation activities; development of a "Council of Agencies" to coordinate agency needs, including transportation; appointment of a Policy Advisory Committee drawn from the agencies, government, target groups and employers; "purchase of service" agreements between the agencies and the centralized transit operation to provide target group activities.

NTIS ORDER NO.: PB 244-469/AS

PRICE: \$5.50

TITLE: URBAN DENSITIES FOR PUBLIC TRANSPORTATION

AUTHOR: Regional Plan Association
(prepared for Tri-State Regional Planning Commission)

DATE: May 1976

PROJECT NO.: IT-09-0023

KEYWORDS:

- | | |
|---|------------------------|
| 1. Bus, Express | 5. Rail, Rapid Transit |
| 2. Financing Mass Trans-
portation, Requirements | 6. Rail, Light |
| 3. Planning, Tools | 7. Taxis |
| 4. Rail, Commuter | 8. Ridership, Volume |
-

This report develops relationships to show the suitability of different urban density arrangements to eight modes of public transportation: the taxicab, dial-a-bus, local bus, express bus, light rail, light guideway transit, rapid transit and commuter rail.

Differences in transit ridership among urban areas are largely explained by area-wide density, downtown size measured in non-residential floorspace and the existence of rail transit. Within urban areas, large differences in transit use are related to density; transit use is minimal below seven dwelling units per acre; at higher densities it rises sharply. Rising density results in greater transit use because it tends to cut auto ownership and improve transit service, and because more of the trips from higher density residential areas are destined for nonresidential places of high density which have a transit-attracting, auto-suppressing power of their own. Operating and capital costs of the eight modes are examined. Capital costs of building new guideways for systems which run on exclusive right-of-way are high; criteria are suggested to relate them to passenger use, and thereby to development density. The question "what density of service can be supported by what density of development" cannot be answered in any general way, but only in specific contexts. If sets of assumptions are made, it is possible to calculate what transit mode and what level of service fit what density. At any particular residential density, the demand level will vary depending on the area's distance from a nonresident concentration, and on the size and character of concentration.

NTIS ORDER NO.: PB 256-636/AS

PRICE: \$9.75

TITLE: THE SCHOOL BUS: A TRANSPORTATION RESOURCE
FOR NORTHEASTERN ILLINOIS

AUTHOR: W.C. Gilman & Company
(For the Northeastern Illinois Planning Commission)

DATE: January 1975

PROJECT NO.: IT-09-0026

KEYWORDS: 1. Bus, School
2. Planning
3. Bus
4. Surveys
5. Market Research

The purpose of this study was to explore the possibility of more extensive use of school buses as a transportation resource in Northeastern Illinois. The study area includes the six counties of Cook, DuPage, Kane, Lake, McHenry, and Will.

The report approached the subject of fuller utilization of school buses through four steps: 1) placing the school bus resource in the six-county area into perspective; 2) examining the potential market or demand for additional transit service in the region; 3) identifying the principal constraints in using school buses for nonstudent transportation purposes; and 4) developing conclusions regarding areas of opportunity for the broader use of school bus equipment and suggesting strategies that could lead to such broader use.

Three basic research elements were used in the study. The first employed surveys to collect basic data from school districts and contract operators. The second was a forum of contract operators and other interested officials to get their views on increased utilization of school buses. Finally, data were analyzed and recommendations provided.

The extent of the school bus industry was quantified in term of: school district boundaries; hours of classes; enrollment; service areas; service responsibility; costs, payments, and/or public subsidies involved in school bus program; and an inventory of school bus equipment and facilities by school jurisdiction and contract operator.

It was concluded that a vast resource of underutilized school bus equipment does exist in the region and that potential markets for additional services which could be provided by that equipment do exist.

NTIS ORDER NO.: PB 255-544/AS

PRICE: \$5.00

TITLE: TRANSPORTATION FOR SENIORS AND HANDICAPPED PERSONS IN ST. LOUIS
Volume I : Main Report
Volume II: Appendices

AUTHOR: Crain & Associates

DATE: January 1974

PROJECT NO.: IT-09-0028

KEYWORDS:

- | | |
|--|---|
| 1. Financing Mass Transportation,
Sources | 5. Transportation Disadvantaged |
| 2. Elderly | 6. Demand Responsive Systems,
Dial-A-Ride |
| 3. Handicapped | 7. Government, Intergovernmental
Relations |
| 4. Fare, Reductions | |
-

The objectives of this report are to develop a precise description of the transportation problems of the handicapped and older persons of the St. Louis, Missouri, and to formulate operational solutions to these problems.

The prime solution proposed is an approach entitled the St. Louis Plan. The features of this plan are: 1) contracts between the Bi-State Development Agency and health/welfare agencies for purchased transit services; 2) reductions in fares for all persons over 65, and further reductions, through a specific agency contract, for seniors and handicapped who are poor; 3) a special demand actuated subsidiary of the Bi-State system providing door-to-door service for handicapped persons and for the elderly who do not live near the present bus routes; and 4) an accountability system that assures payment for all trips under the various agency contracts. A two-year demonstration of the plan is proposed.

This report represents the culmination of the study effort and includes a quantitative assessment of the problem, the master plan solution, and some alternative plans for a demonstration project that would be a first step in carrying out this plan. According to the authors, a joint Federal-local multiagency approach would be used for implementation of the planning study.

Volume II contains the appendices to the main report. They are: survey findings and methodology; determination of ambulatory-handicapped demand levels; Federal fund/programs for the elderly and handicapped; agency survey, methodology and results; standard error formulas for common sampling procedures; analysis of fare reduction plans; survey of equipment requirements for demand-actuated service; and operations and costs for demand-actuated service.

NTIS ORDER NO.: PB 250-789-ENTIRE SET

PRICE: \$10.00

Volume I : PB 250-791/AS

\$ 5.00

Volume II: PB 250-790/AS

\$ 6.00

TITLE: DIRECTORY OF SPECIAL TRANSPORTATION SERVICES IN THE
METROPOLITAN WASHINGTON AREA

AUTHOR: Metropolitan Washington Council of Governments

DATE: June 1975

PROJECT NO.: IT-09-0033

KEYWORDS:

1. Elderly
 2. Handicapped
 3. Transportation Disadvantaged
 4. Information Aids
-

This directory has been prepared to help the elderly, handicapped, and other persons with special needs to find the agency best able to provide the transportation services they require. It presents an overview of services available throughout the Washington Metropolitan Area and serves as an information source for agencies or researchers engaged in various forms of transportation planning, particularly transportation planning for the elderly and handicapped and others without access to automobiles.

Tax-supported agencies, voluntary organizations, health service providers, non-profit and profit making agencies have been included. Distinctions have been made between organizations with volunteers and those with paid drivers. Inclusion of an agency does not imply endorsement; omission of an agency does not imply disapproval.

The information contained in this directory is current as of June 1, 1975. It will be periodically updated as time and resources allow. Additions and/or corrections are welcomed.

For each organization, the following information is provided: contact person; telephone number; eligibility requirements; geographic area served (description of routes and schedules); operating hours; trip purposes; fare; service type; number of vehicles; type of vehicles; capacity of vehicles; number of persons served; percentage characteristics; length of time providing service; and, whether it is a profit or non-profit organization.

NTIS ORDER NO.: PB 250-689/AS

PRICE: \$4.50

TITLE: SCHEDULE CONTROL AND MANAGEMENT INFORMATION SYSTEM STUDY
Final Report

AUTHOR: International Business Machines Corporation
(prepared for the Chicago Transit Authority)

DATE: November 1974

PROJECT NO.: IT-09-0040

KEYWORDS:

1. Schedules and Scheduling
 2. Management, Operations and Techniques
 3. Vehicle, Monitoring
 4. Information Aids
 5. Communications
-

This report culminates a study performed for the Chicago Transit Authority (CTA) to develop recommendations and plans for a Schedule Control and Management Information System. This system would be a further improvement upon and an extension of the Automatic Vehicle/Bus Monitoring (AVM) System which was installed by the CTA in 1970 and which was the first of its kind in the United States.

Sections 1, 2, and 4 of this report constitute the equivalent of an executive summary. Section 1 presents an overview of the system, giving the purpose, background data, and scope of the study. Section 2 gives system requirements, functional information flow, and a brief system description. Section 4 details the implementation plan with a breakdown of functions and task objectives, including a discussion of schedules and personnel organization and responsibilities, and a detailed discussion of potential benefits.

Section 3 comprises a comprehensive system description, by subsystem, including bus control, communications, communications processing, main processing, operations control center, route control, street displays, customer information system, and radio maintenance.

The appendices contain detailed data in support of the analysis tasks described in the body of the report. A list of references cited is also included in each section.

NTIS ORDER NO.: PB 250-986/AS

PRICE: \$13.50

TITLE: STANDARD FOR BUS SERVICE CONTRACT PAYMENTS
AND A SYSTEM OF INCENTIVES

AUTHOR: Simpson & Curtin

DATE: December 1976

PROJECT NO.: IT-09-0058

KEYWORDS:

1. Bus, Cost
 2. Financing Mass Transportation, Sources
 3. Government, State
-

The authorization for the existing New Jersey Department of Transportation (NJ DOT) motor bus carrier subsidy program stems from a 1969 amendment to the Transportation Act of 1966 and forms the basis for the current subsidy program which remains in effect until such time as a new and permanent subsidy program is defined and acted upon through legislation.

The purpose of this report is to describe in detail the results of a study which has laid the foundation for a new and permanent bus service contract program in the State of New Jersey. This report presents a recommended new and permanent bus service contract program for the State of New Jersey. Under this proposed program the State would purchase stipulated quantities of service, on the basis of fixed price contracts, from carriers with legitimate need for financial assistance. The use of fixed prices, utilizing standard costs and projected revenues rather than actual costs and revenues, lies at the foundation of this program. Statistical and financial data of existing subsidized carriers were collected from two sources: the NJ DOT and the subsidized operating companies.

This report suggests that the newly proposed, permanent bus service contract program has many advantages such as: 1) the State will be able to exert fiscal control over the program; 2) the administrative process will be simplified greatly; and 3) the carriers will be assured of equitable treatment. Other benefits of this new program are also listed in this report, which contains many tables that chart out Incentive Programs, Standard Cost Formulas, Bus Service Contract Payments, and Examples of Revenue Projection Calculation.

NTIS ORDER NO.: PB 269-054/AS

PRICE: \$5.50

TITLE: LOUISVILLE MEDICAL CENTER TRANSPORTATION STUDY

AUTHOR: Schimpeler-Corradino Associates
(Prepared for Louisville Medical Center, Inc. and Kentuckiana
Regional Planning and Development Agency)

DATE: March 1974

PROJECT NO.: KY-09-0004

KEYWORDS: 1. Medical Center 6. Emergency Vehicles and Services
 2. Pedestrians 7. Freight Movement
 3. Quantitative Analysis 8. Transportation Systems Management
 4. Bus, Shuttle 9. Financing Mass Transportation, Sources
 5. Handicapped

The Louisville (Kentucky) Medical Center is a closely-knit neighborhood of similar land usages with several interacting institutions of the region's health service delivery system. In the past, measures designed to integrate facilities and eliminate duplication of services have been implemented by area institutions and further steps are planned. In order to fully unify the area both physically and functionally, a transportation system to facilitate movement of persons and goods is deemed necessary.

Principal arteries carrying high volumes of vehicular traffic through the area impede the movement of nonvehicular traffic. Provision for pedestrian movement in the Medical Center is obviously important.

The growing population of the Medical Center and surrounding areas will generate increases in the volume of both vehicular and pedestrian movements. The purpose of this study is to quantify the growth of the Center area and to recommend a system to satisfy its transportation demands.

In summary, the recommendations are: construction of a climate-controlled 3,200 feet pedestrian corridor connecting thirteen buildings; additional parking restrictions on several arterial streets to increase vehicular capacity; a "neighborhood" bus shuttle service within the Medical Center area; improved bus service to the CBD and Village West; additional bus shelters within the Medical Center area; additional wheelchair ramps at all intersections; additional outdoor lighting within the area; and a trial program equipping emergency vehicles with traffic signal override systems. Potential funding sources for these programs have been explored and are presented.

NTIS ORDER NO.: PB 244-487/AS

PRICE: \$5.50

TITLE: UNIVERSITY AREA TRANSIT STUDY
A Preliminary Design

AUTHOR: Bather-Ringrose-Wolsfeld, Inc.

DATE: December 1974

PROJECT NO.: MN-09-0010

KEYWORDS:

1. Universities
 2. Planning
 3. Distribution Systems
 4. Bus
 5. Management, Planning and Analysis
-

Situations and events of the past ten years in the University Area of the West Bank, East Bank and St. Paul Campuses of the University of Minnesota generated discussions of the need for a transit circulation and distribution system and the need to define the relationship between the circulation system and the regional transit system.

The goals of this study are as follows: 1) the provision of optimum movement of people and goods by public transit vehicles between the West Bank, East Bank, and St. Paul Campuses of the University of Minnesota; 2) the provision of optimum movement of people and goods by public transit vehicles between the residential, commercial, industrial, and institutional concentrations in the University Study Area; 3) the provision of a circulation and distribution system that maximizes the accessibility of the Twin Cities Campus and surrounding communities to the regional transit system; 4) the provision of a circulation and distribution system coupled with a parking policy that relieves the need for auto travel and parking within the University Study Area, especially in residential neighborhoods; and 5) the provision of a circulation and distribution system that maximizes the opportunity to improve the environment and minimizes the negative impact on the environment.

The University Area Study was conducted in two parts: PART I SYSTEM SELECTION--the work completed resulted in the definition of a conceptual transit system for the University Area; and PART II PRELIMINARY DESIGN--this work refines the conceptual transit system, defines system performance specifications, estimates capital and operating costs, and includes an implementation schedule. A flow chart illustrates the major work tasks completed during the study.

NTIS ORDER NO.: PB 260-688/AS

PRICE: \$6.75

TITLE: SCHOOL/REGULAR ROUTE COORDINATION SERVICE

AUTHOR: Simpson & Curtin
(Prepared for Erie Metropolitan Transit Authority)

DATE: August 1974

PROJECT NO.: PA-09-0016

KEYWORDS:

1. Bus, School
2. Routes and Routing
3. Bus
4. Planning
5. Corridors

This study demonstrates, both operationally and financially, the feasibility of expanding routes in suburban regions of Erie County, Pennsylvania, through coordinated school/regular route service.

The initial phase of this report contains a review of school transportation laws and the existing transportation services in the County including those provided by the Erie Metropolitan Transit Authority (EMTA), the school districts and private carriers. This review indicates the feasibility of the school/regular route coordinated service concept.

Five corridors in Erie County were identified as having potential for this service. However, through detailed examinations, three of these corridors were eliminated. In the two remaining corridors, three joint routes were defined which expand EMTA regular route service to about 20,000 residents in Erie County who at the present time had no transit service available.

About 430 students from three school districts would be served by the coordinated transit routes. These students along with regular route patrons would result in a net annual increase in ridership by over 100,000.

A summary of the project financial results of each proposed route compared to the average performance of existing EMTA's operation is presented.

Recommended service implementation would be completed by early January 1975.

NTIS ORDER NO.: PB 255-961/AS

PRICE: \$4.50

TITLE: COMPREHENSIVE TRANSIT STUDY
The University of South Carolina

AUTHOR: Wilbur Smith and Associates
(prepared for Central Midlands Regional Planning Council)

DATE: 1974

PROJECT NO.: SC-09-0002

KEYWORDS:

1. Planning
 2. Universities
-

The purpose of this study was to formulate and evaluate alternative transportation concepts which would provide internal circulation within the University of South Carolina complex. Such a system would serve both university and nonuniversity persons. The planning efforts made in this study will relate to overall transportation system planning for the Columbia, South Carolina area.

An outline of the scope of work presented in this report is as follows:

Short-range: Perform feasibility analysis and make appropriate recommendations concerning a transit development program for the University of South Carolina area. Analysis will be based on an inventory of the existing situation projected to future conditions, and several surveys to derive demand estimates; and

Long-range: Supply development guidelines for a possible innovative people mover system as a normal continuation of the short-range plan. Functional, operational and placement concepts will be delineated.

NTIS ORDER NO.: PB 256-833/AS

PRICE: \$6.75

TITLE: 1974 TEXAS TRANSIT OPERATIONS (STATISTICS AND ANALYSIS)

AUTHOR: Texas Mass Transportation Commission

DATE: May 1975

PROJECT NO.: TX-09-8001

KEYWORDS:

1. Ridership
 2. Planning
 3. Financing Mass Transportation
 4. Government, State
 5. Urban Development and Planning
-

Charged with the responsibility to develop and plan for urban transit in Texas, the Texas Mass Transportation Commission (TMTTC) began gathering operational information early in 1974. Having no authority to require reports, the voluntary assistance of city and transit officials throughout the state was solicited. This cooperative effort resulted in monthly reports to the TMTTC on patronage and other operational statistics which have formed the basis for this annual report on transit activity in Texas.

Tables present data on the number of transit passengers in 1975, statewide operating statistics, finances, calculated indicators for transit, financial assistance to Texas from UMTA, estimated effect of employee strikes on transit, statewide transit ridership for 1973 and 1974, estimated growth of statewide transit ridership, calculated transit indicators for urbanized areas in Texas, and transit passengers and vehicle miles per capita in Texas urbanized areas (1974). The distribution of statewide transit characteristics, 1974 transit patronage by quarter and city category, and the effect of 1974 strikes on statewide transit ridership trends are represented by graphs.

NTIS ORDER NO.: PB 256-308/AS

PRICE: \$4.00

TITLE: TEXAS MASS TRANSPORTATION COMMISSION
Final Report

AUTHOR: Texas Mass Transportation Commission

DATE: June 1975

PROJECT NO.: TX-09-8001

KEYWORDS: 1. Government, State
2. Planning

In 1969, the 61st Texas Legislature passed the Texas Transportation Act which established the Texas Mass Transportation Commission (TMTc). The Agency's principal mandate was to "...encourage, foster, and assist in the development of public mass transportation, both intra-city and inter-city, in this state...".

The 64th Legislature has merged this Agency, its personnel and programs, into the Highway Department under its new name, the State Department of Highways and Public Transportation. The abolition of the Mass Transportation Commission has made this Annual Report the final one.

In addition to the general directive of the Legislature, TMTc had been specifically directed to develop and maintain a master plan for mass transportation development in Texas, and to provide assistance in transit development. Three programs of TMTc were organized to accomplish these directives: Administration, Planning and Development. Each program is explained in this report and the accomplishments of the TMTc are delineated.

NTIS ORDER NO.: PB 256-285/AS

PRICE: \$3.50

TITLE: TEXAS TRANSIT DEVELOPMENT PLAN, 1975-1990

AUTHOR: Texas Mass Transportation Commission (with Texas
Transportation Institute and Wilbur Smith & Associates, Inc.)

DATE: December 1974

PROJECT NO.: TX-09-8001

KEYWORDS:

1. Planning
 2. Government, State
 3. Financing Mass Transportation,
Requirements
-

Under the legislation which created the Texas Mass Transportation Commission (House Bill 738, 61st Legislature) the Commission is directed to "develop and maintain a comprehensive master plan for public mass transportation development in the state" and to "correlate the master plan with plans of the Texas Railroad Commission and other agencies or departments concerned with public transportation." (V.A.T.S. 4413 (34)).

This report reviews urban transportation development in the U.S. and the State of Texas, lists goals and objectives adopted by the Texas Mass Transportation Commission as guidelines for implementation of mass transportation development policies established by the Texas Legislature, projects mass transportation requirements in Texas for 1975 to 1980, and from 1975 to 1990, and examines financial implications for meeting these projected mass transportation requirements.

Related documents are "Texas Mass Transportation Commission, Final Report" (PB 256-285) and "1974 Texas Transit Operations (Statistics and Analysis)" (PB 256-308).

NTIS ORDER NO.: PB 256-116/AS

PRICE: \$7.75

TITLE: TRANSIT DEVELOPMENT PROGRAM FOR THE LOWER PENINSULA AREA OF VIRGINIA
Volume I: Main Report
Volume II: Appendix

AUTHOR: Simpson & Curtin
(prepared for the Peninsula Planning District Commission)

DATE: May 1974

PROJECT NO.: VA-09-0007

KEYWORDS: 1. Planning
2. Bus, Intercity
3. Community Response
4. Marketing
5. Routes and Routing
6. Surveys
7. Financing Mass Transportation

This Transit Development Program is a detailed analysis and five-year operations plan for mass transit in the Lower Peninsula Area of Virginia, which includes James City County, York County, Williamsburg, Newport News, Poquoson, and Hampton.

This report examines in depth the characteristics and adequacy of the existing transit service and community attitudes toward public transportation. A recommended transit system is outlined, describing route alignments and frequency of service; the capital investment needed to sustain the system is defined; and the five-year revenue/cost implications of the program are described. In addition, a marketing program aimed at making transit more attractive to all residents is described. Finally, a plan for activities required to monitor, maintain and update the Transit Development Program is set forth.

The Appendix volume contains route profiles, the resident attitude survey, and research review.

The order number for the Main Report and the Appendix is PB 258-200-SET.

Volume I: Main Report PB 258-201/AS, \$6.75.
Volume II: Appendix PB 258-202/AS, \$5.00.

NTIS ORDER NO.: PB 258-200-SET/AS

PRICE: \$10.75

TITLE: EVALUATING TRANSIT SERVICE TO MINORITIES

AUTHOR: Virginia Polytechnic Institute and State University
(Robert Jay Popper and Michael David Connelly)

DATE: September 1975

PROJECT NO.: VA-09-0013

KEYWORDS:

1. Minorities
 2. Planning
 3. Computer Applications
 4. Socioeconomic Analyses
-

This report describes a computerized evaluation methodology for analyzing the fair distribution of transit services. The report is of specific interest to the Office of Civil Rights, Urban Mass Transportation Administration, which is charged with evaluating compliance with Civil Rights standards during a review prior to the awarding of a capital grant in Urban Mass Transportation. It may be used to analyze the fairness of transit services provided to the elderly, to females, or to any desired interest group. The report is also of interest to transit planning agencies, and is useful in analyzing the geographic and socio-economic distribution of transit services in a metropolitan area.

A model is formulated upon the concept of accessibility to opportunities, and produces accessibility indices of transit service for small geographic zones. The indices measure the percentage of opportunities available to residents of each zone via the transit system. A computer model is produced that is compatible with current U.T.P.S. programs and it uses these programs to develop input data.

Capabilities of the model to analyze accessibility conditions and produce output reports are illustrated by data from the City of Richmond, Virginia. The computer program is included in the appendix and it is thoroughly described in the User's Manual.

NTIS ORDER NO.: PB 253-041/AS

PRICE: \$5.50

TITLE: SEATTLE PRT STUDY
Interim Report
Summary Volume 1

AUTHOR: The City of Seattle
(H. Basmaciyen and R.F. Stappler)

DATE: March 1974

PROJECT NO.: WA-09-0006

KEYWORDS:

- | | |
|-------------------------------|---------------------------|
| 1. People Movers | 5. Site Selection |
| 2. Personal Rapid Transit | 6. Transportation Systems |
| 3. Automated Guideway Transit | Management |
| 4. Planning, Tools | |
-

PRT/People-mover technology is being used as a circulation system in various settings such as airports (Seattle-Tacoma) as well as activity centers (downtown Morgantown, WV). In 1969 and 1970, the City of Seattle became one of five selected medium-sized cities to be included in the Center Cities Transportation Project (CCTP), a study sponsored and funded by UMTA. Increased interest in PRT/People-mover technology culminated in a three-party agreement and ultimately led to the current investigation and analysis of automated transit technology. This PRT Feasibility Study, which began in April 1973 is jointly sponsored by the City of Seattle, the Washington State Legislative Transportation Committee, and the Puget Sound Governmental Conference.

The feasibility of a PRT or people-mover system application in the City of Seattle is being evaluated in a two-phase study: Phase 1 - site selection for a PRT or people-mover system; and Phase 2 - system implementation for the areas selected in Phase 1. This interim report for Phase 1 of the PRT Study is presented in two volumes: 1) A Summary Volume and 2) A Technical Supplement Volume. The Technical Supplement Volume consists of ten individually self-contained Appendices that document a specific study task or feature. The Summary Volume, on the other hand, consists of a general overview of the total Phase 1 study.

The key policy question addressed in this Interim Report/Phase 1 is whether or not the community should invest resources in a PRT development program. This key question operates within the framework of two interrelated issues: site selection and system implementability. Primary emphasis in this Phase 1 feasibility study has been on site selection, and secondarily, on gathering data for system implementability. Phase 1 analyses and evaluations indicate that the Downtown-First Hill and the University areas are the most appropriate sites for the initial installation of a PRT/People-mover system in Seattle. Phase 1 also indicates that a PRT/People-mover system can help solve many transportation related problems, generate significant levels of ridership, and be a positive influence in achieving goals and objectives for the community.

NTIS ORDER NO.: PB 264-298/AS

PRICE: \$5.50

TITLE: TRANSPORTATION FOR THE ELDERLY AND THE HANDICAPPED IN WISCONSIN:
SUMMARY REPORT

AUTHOR: Wisconsin Department of Transportation
(Division of Planning)

DATE: October 1976

PROJECT NO.: WI-09-8001

KEYWORDS:

1. Elderly
 2. Handicapped
 3. Bibliographies
 4. Surveys
 5. Paratransit
-

The Wisconsin Department of Transportation has completed a statewide study of transportation for the elderly and the handicapped. This report summarizes the findings and conclusions presented in seven study reports as follows:

Report 1 Analysis of Specialized Transportation Services. This report analyzes the data obtained from the statewide survey of specialized transportation service providers serving the elderly and the handicapped.

Report 2 Statewide Service Directory. This is a directory of the specialized transportation service providers.

Report 3 Study Methodology. The methodology used in conducting this study is documented here.

Report 4 Bibliography. This contains a bibliography of publications on the subject of mobility of the elderly and the handicapped.

Report 5 Survey of Nursing Homes and Residential Care Facilities. This report presents the findings of a statewide transportation-oriented survey of nursing homes and residential care facilities.

Report 6 Potential Demand for Services. Here the potential elderly and handicapped demand for transportation services is identified. This report documents and explains the demand model and its output as it is applied to each county in Wisconsin.

Report 7 Mobility Barriers to the Elderly and the Handicapped. The existing barriers which limit the mobility of Wisconsin's elderly and handicapped citizens are identified. Barriers discussed in this report are as follows: educational, economic, physical, psychological, operational, institutional, and service availability.

Set of 8 reports: PB 264-372-SET/AS, \$25.00.

NTIS ORDER NO.: PB 264-373/AS

PRICE: \$3.50

TITLE: COMPUTER GRAPHICS APPLICATION IN TRANSPORTATION
INFORMATION SYSTEMS

AUTHOR: Stanford University
(Frank B. Wingate)

DATE: August 1975

PROJECT NO.: CA-11-0008

KEYWORDS:

1. Information Aids
 2. Computer Applications
 3. Manpower and Personnel
-

This document reports on the results of the application of interactive computer graphics to those public transportation information systems which answer inquiries from the general public. Primary emphasis was placed on development of a graphics application package to control the existing Transit Information System developed by the Stanford/UMTA research group in the Stanford Industrial Engineering Department.

Other areas of investigation included operator interaction with the computer display; sorting and searching a large geographic data base; and the practical limitations of geographic displays on a CRT. The U.S. Census Bureau's DIME data base was analyzed, and an interactive graphics map editor was developed.

NTIS ORDER NO.: PB 254-795/AS

PRICE: \$4.00

TITLE: EVALUATING REVENUE SOURCES FOR PUBLIC TRANSIT: A NEW FRONTIER
FOR ENVIRONMENTAL PLANNERS

AUTHOR: University of California at Los Angeles
(Robert Shinn and W. David Conn)

DATE: October 1975

PROJECT NO.: CA-11-0009

KEYWORDS: 1. Financing Mass Transportation, Sources
2. Planning
3. Environment and Environmental Control

This report identifies alternative sources of revenue for the support of public transportation and suggests a comprehensive framework within which these alternative revenue sources may be evaluated. Particular attention is devoted to those sources of revenue (gasoline taxes, parking surcharges, congestion tolls, etc.) which positively impact on regional environmental and transportation planning objectives at the same time that they provide new revenue for transit support.

The report draws on a limited number of existing studies to identify: 1) the potential range of future revenue deficits facing U.S. transit operations; 2) the sources, amounts, and distribution of existing revenues going to support transit in the largest U.S. metropolitan areas; 3) alternative financing mechanisms available; 4) evaluation criteria which have previously been employed to select revenue sources for transit support; and 5) new criteria which could be employed to provide a more complete evaluation.

NTIS ORDER NO.: PB 256-225/AS

PRICE: \$4.00

TITLE: THE HELICOPTER AIR SERVICE PASSENGER PROGRAM: A RETROSPECT

AUTHOR: University of California at Los Angeles
(Tim Yoemans and Frank G. Mittelbach)

DATE: September 1975

PROJECT NO.: CA-11-0009

KEYWORDS:

1. Helicopters
 2. Ridership, Profiles
-

In the late 1940's the helicopter was being hailed as a revolutionary new air vehicle with exciting potentials. Many new operational uses were evolving. This report examines whether or not the helicopter industry fulfilled its anticipated role in the U.S. urban passenger transportation system.

Among the many important projected uses was the helicopter's potential for public transit and commuting. The initial expectations for helicopter development and the reasons behind the helicopter's ability or inability to fulfill its predicted role in moving large numbers of people in cities and between cities and outlying areas are discussed. Attention is directed to basic helicopter characteristics and capabilities, the rationale behind the helicopter experiment, the effects of a Federal subsidy granted to the industry, and an analysis of four certified helicopter carrier operations--New York Airways (NYA), Los Angeles Airways (LAA), Chicago Helicopter Airways (CHA), and San Francisco-Oakland Helicopter Airlines (SFO).

NTIS ORDER NO.: PB 254-830/AS

PRICE: \$4.50

TITLE: LIFESTYLES AND TRANSPORTATION NEEDS AMONG THE ELDERLY
OF LOS ANGELES COUNTY

AUTHOR: University of California - Los Angeles
School of Architecture and Urban Planning
(Jacqueline Gillan and Martin Wachs)

DATE: February 1975

PROJECT NO.: CA-11-0009

KEYWORDS: 1. Elderly
2. Trip Generation
3. Socio-Economic Analysis
4. Taxis
5. Paratransit
6. Transportation Disadvantaged

The contents of this report address the trip-making behavior of persons over 65 years of age residing in Los Angeles County, California. The authors feel that the major shortcoming of most research to date concerned with transportation needs of the elderly is that the aged have been treated as homogeneous group without recognizing the various lifestyles of the senior population. The most easily distinguishable groups of elderly persons within the county are those residing in the inner-city and those around the urban fringe.

Four areas were selected within the county that reflect these two living patterns of the elderly. A comparative analysis of trip patterns and socio-economic data was completed. It was found that elderly suburbanites are characterized by higher incomes, reside predominantly in single-family units, and rely principally on the automobile for their transportation needs. As is typical of a large proportion of those over 65, many of the suburban elderly cannot drive. Studies of the transportation needs of this group indicate that without transit alternatives they may well become society's most transit-deprived segment.

In addition to investigating travel patterns, a survey of taxicab use on weekends and weekdays was undertaken. The elderly represent a substantial proportion of taxicab patrons. Their use of taxis is further evidence of the changes which occur in mobility patterns upon reaching retirement. This mode of transportation is presently the only type of demand-responsive service available to the senior population in some parts of the county.

Tables present data collected in the study.

NTIS ORDER NO.: PB 243-631/AS

PRICE: \$4.00

TITLE: LIFESTYLES AND TRANSPORTATION NEEDS OF THE ELDERLY
IN THE FUTURE

AUTHOR: University of California at Los Angeles
(Martin Wachs and Robert D. Blanchard)

DATE: July 1975

PROJECT NO.: CA-11-0009

KEYWORDS:

1. Elderly
 2. Handicapped
 3. Transportation Disadvantaged
 4. Planning
-

In this report, several common views of the transportation requirements of elderly Americans are reviewed, and conclusions are reached regarding the elderly population of the next two decades.

While the elderly today are found to be relatively dependent upon public transportation, living at higher densities, having lower incomes, and traveling relatively little compared with other groups, it is not expected that the elderly of the future will be similar. It is argued by the authors that planners are incorrect when they assume that a decline in mobility occurs with aging. Rather, people bring certain life styles into their old age. The mobility patterns of today's seniors reflect life styles which were developed decades ago, when mobility was limited to all citizens regardless of age. Similarly, the elderly of the next twenty years will include many suburbanites, many drivers, and many elderly who travel a great deal.

The authors feel that planning and forecasting methods for the future transportation needs of the elderly should not be based upon the transportation patterns and needs of those who are currently elderly, but rather should focus more upon those who are now in their thirties and forties and who will become the elderly of the future.

NTIS ORDER NO.: PB 249-523/AS

PRICE: \$3.50

TITLE: SELLING RAPID TRANSIT TO THE VOTERS
The Los Angeles Experience

AUTHOR: University of California, Los Angeles
(Glenn Erikson)

DATE: August 1974

PROJECT NO.: CA-11-0009

KEYWORDS: 1. Advertising and Promotion
2. Community Response
3. Marketing

In 1968, an attempt was made to sell a sales tax and bond issue proposal to the voters of Los Angeles, California, for an 89-mile rapid transit system (Proposition A). The attempt failed to reach the required voter approval of 60% and even failed to achieve a simple majority. This report is an examination of that effort to learn what can be gained from the experience of the failure.

The report includes a brief overview of the various groups that preceded the final citizens group which undertook the sales program on behalf of Proposition A.

It focuses on efforts to publicize the issue, including actual sales techniques, fundraising, the separate roles of the transit district and the citizen group, the opposition encountered and efforts to counteract the opposition, and some retrospective insights as to why the issue ultimately lost at the ballot.

Tentative conclusions are reached. The Appendix contains examples of the marketing techniques used.

TITLE: A FEASIBILITY STUDY MODEL FOR PEDESTRIAN MALLS

AUTHOR: University of Colorado at Denver
(Thomas J. Stone and Vasant H. Surti)

DATE: September 1974

PROJECT NO.: CO-11-0001

KEYWORDS: 1. Pedestrians
2. Models and Modeling
3. Benefit-Cost Analysis
4. Center City

A model for performing feasibility studies of pedestrian mall proposals is presented and demonstrated by application of the model to a case study. The model is based upon the systems approach to solving large-scale decision problems. It is designed to determine which, if any, of a set of possible mall configurations is the most feasible alternative, based upon the results of a comprehensive cost-benefit analysis.

The cost-benefit analysis procedure involves several steps. First, a direct benefit-to-cost ratio is calculated for each of the alternatives. This ratio is based only upon those direct costs and benefits which can be converted into dollars. Direct costs include construction costs and other costs such as design fees, expenses for traffic rerouting, and side-street improvements. Direct benefits are comprised of increased sales tax and property tax revenues which will result from the mall. If this direct benefit-to-cost ratio is greater than unity for any proposed alternative, then the model has provisions to modify this direct ratio based upon the indirect factors which will affect the overall desirability of the project.

The method which is presented is designed to evaluate the relative impact of such factors as noise, pollution, impact on public transit, and so forth. First, a summary of background information on these factors and their relationship to malls is provided, then the evaluation problem is presented. This technique assigns a weighting factor to the indirect cost and benefit areas and modifies the direct dollar costs and benefits as a result of these weighting factors.

The case study was chosen to demonstrate the feasibility study model with a real-world decision problem, the proposed Sixteenth Street mall for Denver, Colorado's Central Business District. This case study illustrates all of the facets of the model, and the pedestrian-only alternative is shown to be slightly more desirable than the transit mall.

NTIS ORDER NO.: PB 248-908/AS

PRICE: \$4.50

TITLE: URBAN TRANSPORTATION INFORMATION HANDBOOK

AUTHOR: Atlanta University
School of Business Administration
(William S. Fletcher and Sid Davis)

DATE: October 1975

PROJECT NO.: GA-11-0003

KEYWORDS: 1. Information Aids
2. Bibliographies
3. Government, Federal
4. Research, Activities
5. Urban Development and Planning

This handbook is intended to provide a ready reference tool which offers an initial orientation to sources of information in the field of urban mass transportation.

It differs from conventional bibliographies in that it concentrates on SOURCES of information rather than a listing of published research. These sources include: 1) basic books and reports; 2) bibliography, directories and services; 3) statistics and fact books; 4) periodicals; 5) research organizations, university programs and transportation libraries; 6) industry and professional organizations; 7) conferences; and 8) the government role - a section which contains an overview of the structure and organization of the U.S. Department of Transportation as well as a review of key legislation and legislative processes that operate to develop national transportation policy.

A glossary of acronyms is provided. The appendix section on "Legal Requirements," contains short discussions of selected Federal laws and directives affecting the consideration of social and environmental effects in the highway planning and decision-making process. Indexes are included.

NTIS ORDER NO.: PB 248-591/AS

PRICE: \$7.75

TITLE: GUIDELINES AND CONSIDERATIONS IN PLANNING AND OPERATING
TRANSPORTATION SYSTEMS FOR OLDER AMERICANS

AUTHOR: University of Iowa
(Douglas J. McKelvey)

DATE: May 1975

PROJECT NO.: IA-11-0002

KEYWORDS:

- | | |
|-----------------|---|
| 1. Elderly | 6. Demand Responsive Systems, Dial-A-Ride |
| 2. Handicapped | 7. Management, Operations and Techniques |
| 3. Rural Areas | 8. Financing Mass Transportation, Sources |
| 4. Small Cities | 9. Guides and Guidance |
| 5. Planning | 10. Transportation Systems Management |

This report offers a perspective on, and suggestions for, planning and operating transit systems which provide special service to such groups as the elderly and handicapped and to small urban or rural areas. Many of the statements, in fact, are questions which should be asked whether one is in the process of planning a new system or evaluating an existing system.

In general, the author recommends that State Commissions and Area Agencies on Aging should do everything in their power to improve transportation services for the elderly. Where possible, this should be brought about through support of existing transportation planning processes at the local, regional, and state levels. The Area Agencies on Aging should not provide transportation services unless needed and unavailable. If such agencies must provide the service, the following points are relevant. Generally, the transportation service which is provided: 1) should be regional (city and county or multicounty); 2) should not be specialized, i.e., limited only to the elderly; and 3) should have the approval of local political bodies and social agencies as well as existing transportation operators. Approval should come prior to grant writing and implementation. Lastly, such systems should be planned in cooperation with system users.

This report is divided into three major sections. The sections are: 1) considerations in planning transportation services for the elderly; 2) operation, management, and promotion; and 3) funding.

NTIS ORDER NO.: PB 254-756/AS

PRICE: \$4.50

TITLE: THEORY, METHODOLOGY, AND FINDINGS IN MODE CHOICE BEHAVIOR

AUTHOR: University of Iowa
Institute of Urban and Regional Research
(Jordan J. Louviere, Lynn Beavers, Kent L. Norman, and F.C. Stetzer)

DATE: July 1973 PROJECT NO.: IA-11-0002

KEYWORDS: 1. Models and Modeling
2. Modal Choice

This report represents an exploration into the modeling of mode choice from a strictly psychological theoretic standpoint. As such, previous references to the mode choice literature are felt to be inappropriate because: 1) there are no standards for comparison with the present work; 2) this research has not dealt with the real-world prediction of mode choice; and 3) results are too preliminary to base comparisons upon. Nonetheless, the research reported here is within the domain termed "behavioral modal split models" but is clearly different in its psychological orientation and experimental methodology.

This research was designed: 1) to test the feasibility of laboratory type experiments for transportation research, specifically, mode choice; 2) to test the applicability of methodology developed in experimental judgment studies to such experiments; and 3) to draw conclusions based on 1) and 2) which would lead to recommendations for further research.

The results reported in this document prompt a recommendation for further consideration both by persons interested in so-called "behavioral modeling" in transportation and by social scientists working in similar problems. Further, the authors urge that the study be replicated and compared with a set of real-world data. Several modifications and improvements are suggested which it is believed would have substantial positive benefit on future research and would also permit far more realistic appraisal of the applicability of the methodology and results to the study of real-world, mode-choice behavior.

NTIS ORDER NO.: PB 251-185/AS

PRICE: \$4.50

TITLE: TRANSPORTATION PLANNING: THE URBAN AND RURAL INTERFACE AND
TRANSIT NEEDS OF THE RURAL ELDERLY

AUTHOR: University of Iowa
Institute of Urban and Regional Research
(Douglas J. McKelvey and Kenneth J. Dueker)

DATE: April 1974

PROJECT NO.: IA-11-0002

KEYWORDS:

1. Elderly
2. Handicapped
3. Transportation Disadvantaged
4. Rural Areas
5. Planning
6. Interfaces

The three objectives of this report were to: 1) identify and assess rural transportation problems, especially those affecting the elderly; 2) identify specific problems and actions taken during the planning and implementation phases of a seven-county rural transportation system in southeastern Iowa; and 3) suggest research questions that could be addressed to evolve more comprehensive and effective transportation planning programs.

In July 1973, the Area Agency on Aging in the study area received a grant funded by Title III of the Older American Act to initiate a demonstration transportation program to help solve the transportation needs of 45,000 elderly in the 4,000-square-mile area. A feasibility study was conducted to identify the major problems of the existing transportation systems and make general recommendations regarding subsequent planning, promotion and implementation.

This report documents recommendations made during the feasibility study. The following observations are emphasized by the authors: 1) planning needs should be as coordinated and comprehensive as possible at the regional (rural-urban) level; 2) planning may not require extensive surveys to initiate a satisfactory system; 3) door-to-door service is required for most elderly; 4) the process should involve the users, transportation operator, political leaders, and social agencies; 5) promotion of the system is critical and should emphasize identity with and use of the system through memberships, reasonable fares, and availability of all trip types for both elderly and nonelderly; 6) some level of continued funds from state, county or Federal sources should be assured prior to system implementation; and 7) extensive monitoring and evaluation of demonstration systems need to be undertaken to develop operating, cost and ridership experience to facilitate planning of future systems.

NTIS ORDER NO.: PB 249-084/AS

PRICE: \$4.00

TITLE: THE EFFECTS OF THE 1972 TRENTON, NEW JERSEY BUS STRIKE ON THE MODAL CHOICE OF THE COMMUTERS

AUTHOR: Northwestern University
(Andrew F. Bata)

DATE: February 1974

PROJECT NO.: IL-11-0005

KEYWORDS:

1. Manpower and Personnel
2. Labor Relations
3. Modal Choice
4. Bus, Commuter
5. Ridership, Attraction

The drivers of Transport of New Jersey (TNJ) Bus Company declared a strike against their employer in 1972 for seventy-five days, leaving about 350,000 daily riders with the problem of finding alternate modes of transportation.

The objectives of this report are to establish "what happened" in modal use during the strike-related periods and to attempt to identify how location and passenger characteristics may or may not affect such strike-related modal use changes.

The major elements of the investigation were: (1) to identify any differences between prestrike and poststrike modal choices by commuters of the area; (2) to establish whether the usage of the available modes during the strike had any significant deviant usage from what was calculated as "expected"; (3) to learn whether certain modes were more successful in attracting and/or retaining in-strike ridership than others; (4) to learn whether different operating companies of the same mode were similarly successful in attracting and/or retaining commuters; (5) to learn whether any conclusions could be made on the modal choice of the people after the strike, based on the attributes of available transportation alternatives, age and sex of commuters, number of automobiles and drivers in a household, and drivers in relation to "available" automobiles in the household; and (6) to analyze the TNJ "switcher" group using the criteria in 5 (above).

Chapters of the report address the definition of the problem, objectives, survey alternatives, methodology and results, the mode choice analysis, summary and conclusions and recommendations.

NTIS ORDER NO.: PB 253-411/AS

PRICE: \$5.50

TITLE: DATA MANAGEMENT METHODS FOR URBAN MASS TRANSPORTATION SYSTEMS

AUTHOR: University of Illinois at Chicago Circle
Departments of Materials Engineering and Information Engineering
(Priemer, R. and Silver, M.L.)

DATE: September 1975

PROJECT NO.: IL-11-0007

KEYWORDS:

1. Data Management
 2. Data Retrieval
 3. Information Aids
 4. Computer, Optimization
 5. Noise
 6. Mass Transit
-

This report describes a computer based Data Management and Retrieval System for the Urban Mass Transportation Industry.

The system is designed to aid the transportation planner, engineer, and manager in solving recurring problems associated with collection, categorization and synthesis, storage; and retrieval of urban mass transportation information. This system is designed to be used by personnel without formal computer training with the everyday vocabulary associated with many classes of rapid transit operation, evaluation, and studies.

The features and use of an example system is described for rail rapid transit noise abatement studies. The example system combines 1) physical data describing the system and 2) measured noise levels as an aid in evaluating cost effective acoustic treatments for lowering rail rapid transit noise.

NTIS ORDER NO.: PB 254-798/AS

PRICE: \$5.00

TITLE: DESIGN FOR THE HANDICAPPED IN ELEVATED TRANSPORTATION SYSTEMS

AUTHOR: University of Illinois at Chicago Circle
Department of Materials Engineering and Architecture
(Michael S. Gelick and Marshall L. Silver)

DATE: January 1975

PROJECT NO.: IL-11-0024

KEYWORDS:

1. Handicapped
2. Stations and Terminals
3. Rail, Rapid Transit
4. Elevators
5. Access, Planning and Control

This report deals with the mobility of the physically disabled, utilizing the facilities of elevated transportation systems. It identifies architectural barriers faced by the handicapped in relation to rapid transit, establishes design standards, and shows ways these standards may be incorporated in prototypical and existing stations.

The type of architectural barriers addressed in this report are directly related to elevated transportation systems. An evaluation of the Howard Street line of the Chicago Transit Authority (CTA) is presented.

Standards are established to aid designers in making elevated transportation systems accessible to the handicapped. Various architectural elements, including doors, entry and exit controls, stairs, and elevators are diagrammed and discussed. The design standards established are for minimal tolerances and may be exceeded wherever it is felt necessary. Prototypical station designs are presented to demonstrate ways in which design criteria may be applied to hypothetical situations. The two basic types of platforms presently being used in rapid transit systems, the midplatform and the split-platform, are analyzed with particular interest towards providing access to the handicapped. Representative station types presently being used in elevated transportation systems are explained by diagrams and text. A parallel mid-station and perpendicular mid-station are presented as prototypical station designs.

Ways of making an elevated transit station accessible to the handicapped, given the constraints of existing conditions are discussed. The Wilson Street station along the Howard Street Line of the CTA is analyzed for its architectural barriers and then presented as a prototypical renovation, applying the design criteria established herein.

NTIS ORDER NO.: PB 243-650/AS

PRICE: \$4.50

TITLE: ATTITUDES AND ATTITUDE CHANGE TOWARD BUS TRANSIT SYSTEMS

AUTHOR: Purdue University
School of Civil Engineering
(Thomas Ferdinandus Dietvorst)

DATE: May 1974

PROJECT NO.: IN-11-0001

KEYWORDS:

1. Bus
 2. Surveys
 3. Quantitative Analysis
 4. Community Response
-

The purpose of this report is to show that attitude measurement can provide meaningful information and should be a basic part of the periodic evaluation of bus transit systems.

Data for the study were accumulated by two attitude surveys conducted for the Greater Lafayette (Indiana) Transportation Corporation: one was conducted before system changes were made and the other after changes were completed.

It was hypothesized that: 1) attitudes of the bus riding public would be significantly more favorable after changes in the bus system were made as compared to before changes were made; and 2) differences in attitudes would be related specifically to those parts of the system that had been changed.

Five hundred and sixty six bus riders were surveyed during the first part of the study on Tuesday, March 20, 1973, and 704 riders took part in the second half of the study on Tuesday, October 23, 1973. The questionnaires were presented to the riders by the bus operators during the afternoon of the survey days.

It was found that attitudes did change significantly in a favorable direction between the first and second surveys. The data showed significant change even when the demographic characteristics of the population, which had also changed, were held constant. Greater change was shown for those indirectly affected by system change. The use of the questionnaire results in providing information for future planning is also discussed in this report.

NTIS ORDER-NO.: PB 238-918/AS

PRICE: \$4.25

TITLE: THE EFFECT OF IMPROVED SERVICE ON THE BUS TRANSIT RIDERSHIP IN THE
GREATER LAFAYETTE AREA

AUTHOR: Purdue University
School of Civil Engineering
(John C. Merritt)

DATE: December 1973

PROJECT NO.: IN-11-0001

KEYWORDS:

1. Bus
 2. Ridership, Profiles
 3. Ridership, Attraction
 4. Qualitative Analysis
 5. Trip Generation
-

This report studied the effects of new equipment and improved routing on the types of riders and their attitudes toward the Greater Lafayette (Indiana) transit system. The report analyzed the change in characteristics and attitudes of the riders of the old and new systems.

Two on-board surveys were conducted - one before the initiation of the new system (March 20, 1973), and one after (October 23, 1973). The surveys showed a trend change in public transportation for the Greater Lafayette area. Daily ridership more than doubled after the new system was initiated and was still increasing. In areas where other improvements in service were made, rider attitudes also improved. Attitudes toward the driver showed the most positive change of any area. Also, the rider expressed a more positive attitude toward service dependability. Riders indicated that the system was performing well in terms of efficiency and convenience of service.

The type of rider changed with increased ridership. New riders drawn to the system were, for the most part, younger, better educated, and had a higher family income than those who had been riding for more than a year. Furthermore, a higher percentage of new riders had other means of transportation.

Appendices include the questionnaire and results of the administration of the questionnaire.

NTIS ORDER NO.: PB 238-939/AS

PRICE: \$3.75

TITLE: THE EFFECTS OF LABOR STRIKES ON BUS TRANSIT USE

AUTHOR: Purdue University
(M.E. Brachman, K.C. Sinha, and M.W. Pustay)

DATE: December 1976

PROJECT NO.: IN-11-0001

KEYWORDS:

1. Labor Relations
2. Surveys
3. Management, Planning and Analysis
4. Travel Demand
5. Ridership, Attraction

Strikes have become a major concern in the effort to reverse the long-term deterioration of public transportation services in this country. This study addresses the effect of strike-induced transit shutdowns on the short and long-run demand for mass transportation services. To shed light on the problem of poststrike passenger diversion, a nationwide analysis of transit strike impacts is presented. The findings herein should prove useful to both transportation planners and transit management.

This report addresses several problem areas. It reviews the present day labor-management relationship and the collective bargaining process in the urban transit industry. Several case studies of urban transit strikes are examined with the intent to establish the effects of the strike on the public and its future travel patterns. The major effort involves analyzing a questionnaire sent to selected transit companies across the U.S. The intent of this survey is to investigate the impact of a work stoppage on six variables: average adult fare, total route length, total vehicle-hours of operation, average daily ridership, and two derived indices. Change of ridership as a function of the other five variables, effect of strike duration, and the influence of service area population size and management type is examined using analysis of variance (ANOVA) techniques.

This study shows that service changes have a more damaging effect on long-term patronage than a fare increase. The case studies and questionnaire analysis discussed herein point out that the people most affected by a strike are the transit "captives" such as the elderly, the young, the poor, and the handicapped. Future research needs are suggested such as an expanded data base to quantify more effectively strike effects and complete case histories of several transit properties in order to account for the company trends and the other variables involved.

NTIS ORDER NO.: PB 267-077/AS

PRICE: \$6.00

TITLE: ANALYSIS AND DESIGN OF STEERING CONTROLLERS FOR
AUTOMATED GUIDEWAY TRANSIT VEHICLES

AUTHOR: Massachusetts Institute of Technology
(S. Shladover, et al.)

DATE: September 1976

PROJECT NO.: MA-11-0023

KEYWORDS: 1. Automated Guideway Transit 6. Research Activities
2. Electronic Vehicle Guidance 7. Vehicle, Design
3. Guideways
4. Models and Modeling
5. Planning, Tools

This is a study of steering control systems for Automated Guideway Transit Systems (AGT) that includes a state-of-the-art survey of steering control and an evaluation of vehicle dynamic models for steering controller design. Also included are a summary report of the results of the first year of a two year study and a designation of further work planned for the next phase of this investigation, namely, (1) modifications to the control strategy to include curving and wind gust loading, and (2) practical implementation methods leading to simple and reliable steering control for AGT vehicles. The performance of a typical AGT vehicle using a mechanical reference steering system has been determined for direct proportional, partial state feedback and full state feedback steering controllers. RMS tracking errors and RMS vehicle acceleration levels are computed for selected vehicle controllers with the vehicle travelling on a mainline track described in terms of its random irregularity properties.

The overall objective of this study is to establish performance limits and tradeoffs, design criteria, and implementation methods for controllers which are as simple, inexpensive, and reliable as possible while achieving near optimal performance. A specific objective of this program is to recommend controller configurations which will lead to improved ride comfort levels compared to those achieved in Morgantown and AIRTRANS systems without major increases in control system complexity or cost.

This study deals with lateral plane vehicle-guideway dynamics, specifically, vehicle steering, and establishes fundamental tradeoffs between lateral guideway roughness, tracking errors, and passenger ride comfort. The results suggest that good lateral ride quality can be achieved for AGT vehicles without requiring unreasonable control system sophistication and guiderail alignment tolerances.

Conclusions are presented.

NTIS ORDER NO.: PB 261-327/AS

PRICE: \$6.00

TITLE: AUTOMATED GUIDEWAY TRANSIT SYSTEMS VEHICLE-ELEVATED GUIDEWAY
DYNAMICS: MULTIPLE-VEHICLE SINGLE SPAN SYSTEMS

AUTHOR: Massachusetts Institute of Technology
(J.E. Snyder, III, D.N. Wormley, and H.H. Richardson)

DATE: October 1975

PROJECT NO.: MA-11-0023

KEYWORDS:

1. Automated Guideway Transit
 2. Computer Applications
 3. Vehicle, Design
-

The principal objective of this study is to evaluate the constraints placed upon Automated Guideway Transit (AGT) system vehicle-guideway design by passenger safety (vehicle and guideway loads and stresses) and comfort (vehicle passenger compartment acceleration and motion). These requirements often provide stringent constraints in AGT system vehicle-guideway design, therefore vehicle-guideway interaction models are required which can determine vehicle passenger compartment accelerations and motions and vehicle-guideway dynamic loads due to both guideway dynamic deflections and guideway irregularities. With the models developed in this study, it is possible to determine the levels of flexibility and construction tolerances required to achieve a given level of passenger safety and comfort. Using this work as a basis, minimum cost guideways which are capable of meeting system performance specifications may be identified.

Analysis and design techniques are described for synchronously controlled AGT vehicles crossing elevated span structures. Computer simulation programs have been developed to determine time histories of guideway deflections, moments and stresses and vehicle accelerations (peak, total rms and rms in one-third octave bands) for a string of multiple AGT vehicles crossing flexible spans with random vertical, angular, camber and surface roughness irregularities. Specific data has been developed to identify operating conditions corresponding to potential span resonant conditions. A computer-aided design program has also been developed to determine span structural requirements needed to meet stress and passenger comfort conditions. Span designs for both large and small headway operation of 4, 6 and 12 passenger AGT vehicles have been determined.

Conclusions are presented.

NTIS ORDER NO.: PB 249-353/AS

PRICE: \$8.00

TITLE: ADVANCED DIAL-A-RIDE ALGORITHMS: INTERIM REPORT

AUTHOR: Massachusetts Institute of Technology
Department of Civil Engineering
(N.H.M. Wilson, R.W. Weissberg, B.T. Higonnet, and J. Hauser)

DATE: July 1975

PROJECT NO.: MA-11-0024

KEYWORDS:

1. Algorithms
 2. Demand Responsive Systems,
Dial-A-Ride
 3. Computer Applications
 4. Models and Modeling
-

The purposes of this report were to develop advanced dial-a-ride control procedures based on the experience gained in Haddonfield, New Jersey, and to explicitly investigate the problem of controlling integrated dial-a-ride, fixed-route transit services.

The objectives of the Advanced Dial-A-Ride Algorithms Research Project can be subdivided into four tasks: 1) evaluation of simulation effectiveness and upgrading of simulation capabilities so as to ensure the availability of an effective method of assessing the likely effects of changes to dial-a-ride control techniques or operating environment prior to, or in lieu of, field testing; 2) evaluation of the present dial-a-ride control algorithm (used in Haddonfield, New Jersey), and identification of shortcomings and areas for improvement; 3) development of advanced computer control algorithms in the context of single module dial-a-ride systems incorporating better use of constraints, control of service extremes to individual passengers, and scheduling of deferred and periodic demands; 4) definition, description, and evaluation of roles for computer scheduling in the context of coordinated dial-a-ride systems which incorporate interfaces to each other and to existing conventional modes of transportation.

This report describes work accomplished to date on these tasks. It is comprised of observations, and new work based on the Haddonfield demonstration project, as well as more abstract research and improvements which are logical continuation of prior work not directly connected with Haddonfield.

Work on Tasks 1 and 2 has essentially been completed. Chapters address the verification of the simulation model, the assignment algorithm, improving existing computer control techniques, the control of integrated dial-a-ride, fixed-route systems, and summary of future research.

NTIS ORDER NO.: PB 244-496/AS

PRICE: \$4.75

TITLE: ADVANCED DIAL-A-RIDE ALGORITHMS RESEARCH PROJECT
Final Report

AUTHOR: Massachusetts Institute of Technology
(Nigel H.M. Wilson, Richard W. Weissberg and J. Hauser)

DATE: March 1976

PROJECT NO.: MA-11-0024

KEYWORDS: 1. Demand Responsive Systems, Dial-A-Ride
2. Algorithms
3. Routes and Routing
4. Planning, Tools
5. Computer Applications

This document reports the work of the M.I.T. Advanced Dial-A-Ride Research (ADAR) Project from April 1, 1974 to December 31, 1975. The work builds upon the algorithms and the computer control procedures developed under the CARS Project at M.I.T. between 1967 and 1971, and upon the findings of the Haddonfield, New Jersey dial-a-ride demonstration project which ran from February, 1972 to October, 1974.

The purpose of the ADAR Project was to develop advanced dial-a-ride control procedures based on the experience gained in Haddonfield, and to investigate the problem of controlling integrated dial-a-ride/fixed route services. Another demonstration project in Rochester, New York, which began in April, 1975, also provided significant input to the ADAR Project research.

This document is structured so as to be readable by nontechnical persons not familiar with dial-a-ride algorithms research, as well as by more technically-oriented transportation planners. The first chapters contain background material---what a control algorithm does, who it serves, and various general elements of algorithms planning. Later chapters describe the new work performed under the ADAR Project, and lessons learned from the demonstrations.

The "Advanced Dial-A-Ride Algorithms: Interim Report" is also available through NTIS (PB 244-496).

NTIS ORDER NO.: PB 254-752/AS

PRICE: \$6.00

TITLE: IMPROVING URBAN MASS TRANSPORTATION PRODUCTIVITY
Final Report

AUTHOR: Harvard University
(John R. Meyer and Jose A. Gomez-Ibanez)

DATE: February 1977

PROJECT NO.: MA-11-0026

KEYWORDS:

1. Labor Relations
 2. Management, Planning and Analysis
 3. Marketing
 4. Ridership, Attraction
-

The purpose of this analysis is to assess the importance of productivity improvement to the transit industry and to identify opportunities to enhance the industry's productivity record.

This report discusses the steady decline in transit ridership during the postwar period and the industry's deficits and growing dependence on public subsidies. The postwar problems of industry are partly attributed to the failure of productivity growth in transit to keep pace with that in other industries. It is suggested that an improved productivity record would probably be necessary, although not sufficient, to reverse the industry's ridership decline and its growing dependence on public subsidies.

This report discusses a variety of opportunities to improve transit productivity that are possible by changing current industry practices in such areas as marketing, labor relations, and work rules. These opportunities to improve transit productivity are sorted into three groups, each incorporating a distinct strategy for productivity gain. The first of these strategies is to alleviate the productivity problems associated with the peaking of transit use during weekday rush hours. Discontinuing less productive services is a second strategy for productivity growth. The third strategy to improve productivity involves specialization, that is, the tailoring of equipment, fares, and other practices to the peculiar needs of different transit services and situations.

NTIS ORDER NO.: PB 266-920/AS

PRICE: \$8.00

TITLE: ANALYSIS OF URBAN TRANSPORTATION NEEDS
With Implications for AGT Systems

AUTHOR: The Johns Hopkins University
(The Center for Metropolitan Planning
and Research)

DATE: July 1975

PROJECT NO.: MD-11-0001

KEYWORDS:

1. Automated Guideway Transit
 2. Urban Development and Planning
 3. Planning, Tools
 4. Research Activities
 5. Travel Demand
-

This study reflects the view that the formulation of urban transportation solutions is dependent upon an adequate awareness of the urban form and its evolution in response to macro processes in an affluent society. In this report, the current and future development of urban form is illustrated and analyzed in terms of its specific implications for automated guideway transit (AGT) systems. Five cities that are representative of the range of urban attributes in the nation are examined: Chicago, Baltimore, Kansas City, Phoenix, and Grand Rapids. Key urban submarkets are identified and described. 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, dial-a-ride, and auto.

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 coverage. Illustrative examples are presented.

Conclusions as to the ability of AGT, as well as various other possible systems of transportation, to satisfy the predicted future needs of multinucleated 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.

NTIS ORDER NO.: PB 267-006/AS

PRICE: \$11.75

TITLE: VEHICLE FOLLOWER LONGITUDINAL CONTROL FOR
AUTOMATED GUIDEWAY TRANSIT VEHICLES

AUTHOR: University of Minnesota, Department of Aerospace Engineering
and Mechanics (R.J. Caudill and W.L. Garrard)

DATE: February 1977

PROJECT NO.: MN-11-0002

KEYWORDS: 1. Automated Guideway Transit
2. Propulsion Systems, Linear Induction
3. Headways

Continuing interest in the use of public transit to help solve problems related to urban transportation has pointed to the use of relatively small automated transit vehicles as a method for providing expanded transit service without the labor costs and reliability problems associated the bus and without the high capital costs associated with rapid rail systems. Two philosophies for longitudinal control for short headway automated guideway transit (AGT) systems have evolved: 1) the vehicle follower concept; and 2) the point-following concept. This study is concerned with vehicle-follower control at relatively short headways.

The objective of this research is to examine basic considerations in vehicle-follower longitudinal control for small, automated transit vehicles operating at moderate speeds and short headways. The relationship between spacing policy, system nonlinearities, and dynamic response of strings of vehicles is discussed. Vehicles propelled by linear induction motors are used to evaluate control system designs. Evaluation is based on vehicular dynamic response during nominal and emergency operations. Transient and steady-state response of vehicle strings is examined both analytically and by means of computer simulations for constant separation, constant time-headway, and constant safety-factor spacing policy.

NTIS ORDER NO.: PB 264-554/AS

PRICE: \$9.25

TITLE: LONGITUDINAL CONTROL AND CRASHWORTHINESS FOR SMALL AUTOMATED
TRANSIT VEHICLES

AUTHOR: University of Minnesota
(W.L. Garrard, R.J. Caudill and W.B. Reed)

DATE: January 1976

PROJECT NO.: MN-11-0037

KEYWORDS:

1. Crashworthiness
 2. Automated Guideway Transit
 3. Safety
 4. Headways
 5. Quantitative Analysis
-

This study is concerned with longitudinal control and crashworthiness for small, automated transit vehicles.

Control system designs and hardware options for relatively short headway operation at moderate speeds are evaluated. Evaluation is based on performance during normal and emergency operations, sensing and communication requirements, and simplicity of design as a measure of cost and reliability. The study is restricted to the vehicle-follower control concept. Controllers are successfully designed for a variety of data sensing and transmission requirements and no problems are encountered in realizing constant safety factor, constant time headway, and constant spacing operational policies.

Fundamental analytical results on collision dynamics and the effectiveness of passenger protective devices, shock absorbers, and interior configurations on occupant protection during fore and aft collisions are derived.

NTIS ORDER NO.: PB 251-295/AS

PRICE: \$9.00

TITLE: VISUAL IMPACT OF PERSONAL RAPID TRANSIT

AUTHOR: University of Minnesota
Department of Mechanical and Aerospace Engineering
(L. LaVine, R. Peterson, and F. Bulbulian)

DATE: November 1974

PROJECT NO.: MN-11-0037

KEYWORDS:

1. Personal Rapid Transit
 2. Vehicle, Design
 3. Guideways
 4. Environment and Environmental Control
 5. Community Response
-

Personal rapid transit (PRT) systems offer on-demand, nonstop service from origin to destination over extensive networks of guideways. To date, these guideways have been portrayed as being elevated above grade to minimize network costs and interference with other circulation systems. Yet, the visual impact that these guideways have on neighborhoods they pass through is maximized.

This study proposes to lay a foundation for developing PRT visual impact design criteria upon which future design decisions can be predicated. The key to developing these criteria lies in finding effective communication media through which the visual impact of PRT can be conveyed to the public at large so that public response may become an integral part of the PRT planning process.

This study focuses on the portrayal of an elevated PRT guideway and station in an urban environment. The environment selected lies on a PRT network configuration and is typical of older, decaying, but still viable, residential-commercial neighborhoods common to most U.S. cities. The neighborhood was modeled on a scale of $1/8" = 1.0'$ and an elevated PRT guideway and station were incorporated into the redesign of the major commercial artery of the neighborhood. Results were portrayed in an architectural rendering, a photo montage and an 8mm movie. The three graphic portrayal techniques will be exhibited at the Minnesota Science Museum where public response to each will be monitored.

Data collected from these tests will be analyzed to determine the effectiveness of communication in conveying PRT concepts to the public. Photographs and figures accompany the text.

NTIS ORDER NO.: PB 244-459/AS

PRICE: \$3.75

TITLE: TAXICAB USER CHARACTERISTICS IN SMALL AND MEDIUM-SIZE CITIES

AUTHOR: University of North Carolina
(Gorman Gilbert, et al.)

DATE: January 1976

PROJECT NO.: NC-11-0003

KEYWORDS:

1. Surveys
 2. Taxis
 3. Small Cities
 4. Ridership, Profiles
-

This report addressed the need for reliable taxi user data in small and medium-size cities. Interviewers were hired to ride in taxis in a sample of eight North Carolina cities. The cities were chosen to represent a range of cities from 10,000 to 200,000 population. Four of the cities also had transit service. To control for early-month taxi usage peaks, interviews were conducted three days early in the month and again for three days late in the month. A total of 6176 passengers were interviewed with each interview including such information as trip purpose, age, sex, race, income, car availability, taxi usage, and transit usage.

The data were used to test twelve hypotheses regarding the variation of taxi usage with user characteristics, time of the month, and transit.

Compared to their large city counterparts, small city taxi users are significantly more likely to be poor, black, and autoless. In fact, about 54% of the taxi trips in the sample cities are made by persons from households which earn less than \$5,000 annually. Over 60% of the taxi users are nonwhite, and approximately 58% are from autoless households. Small city taxi users are also more homogeneous; few small city taxi users have high incomes.

The overriding implication of the research results is that small and large city taxi operations differ substantially. Because of the more extensive usage of small-city taxis by the poor and because of the greater taxi availability in smaller cities, one must distinguish carefully between small and large city taxi operations.

NTIS ORDER NO.: PB 251-984/AS

PRICE: \$4.50

TITLE: ASSUMING RESPONSIBILITY FOR MOBILITY OF ELDERLY AND HANDICAPPED
The Roles of Transit Properties, Transit Planners, and
Social Service Agencies in Small Cities

AUTHOR: The Transportation Institute of
North Carolina A&T State University
(A.E. Kidder and G. Amedee)

DATE: July 1976

PROJECT NO.: NC-11-0004

KEYWORDS:

- | | |
|-----------------|---------------------------------|
| 1. Elderly | 5. Planning |
| 2. Handicapped | 6. Transportation Disadvantaged |
| 3. Small Cities | 7. Management, Planning and |
| 4. Surveys | Analysis |

This study is part of a program of Research Training in Urban Transportation sponsored by UMTA, whose purpose is to explore the degree of harmony in actions between transit operators, social service agency personnel, and local transportation planners in small and midsize cities (50,000 to 500,000 population) with emphasis placed upon the perceptions of actors in the system (planners, social workers, and transit operators) about their roles in providing transportation services to the elderly and handicapped. This study also purports to test the underlying assumption of revenue sharing advocates that, left to themselves, local agencies will allocate resources efficiently at the local level. Public policy currently promotes the proliferation of small, uncoordinated programs aimed at agency clients rather than broader transportation services to the community. This report discusses the rewards of cooperative approaches and may be useful to other cities of comparable size and population densities.

This report cites examples of successful interactions between transit planners, social service agency staffs, and transit properties in enhancing consolidated transportation services to the elderly and handicapped.. It also documents the more usual pattern of non-interaction which seriously impairs the efficiency of transportation services to this group. Data was obtained from three sources: 1) the set of 89 questionnaires from members of the American Public Transportation Association; 2) the set of case studies of ten localities representing a geographic cross-section and range of population densities; and 3) the two volumes of written submissions made to the Chief Counsel of UMTA pursuant to the public hearings on UMTA's proposed "Elderly and Handicapped Regulations" held in 1975.

The findings herein have policy implications for improving elderly and handicapped services. It is recommended that transit planners act as catalysts for introducing consolidated solutions at local level.

NTIS ORDER NO.: PB 267-231/AS

PRICE: \$4.50

TITLE: FACTORS INFLUENCING THE SUCCESS OF COMPANY-BASED CARPOOLING PROGRAMS

AUTHOR: North Carolina Agricultural and Technical State University
(Chi Fai Pun and Alice E. Kidder)

DATE: May 1976

PROJECT NO.: NC-11-0004

KEYWORDS:

1. Carpools/Buspools
 2. Socioeconomic Analysis
 3. Social Benefits and Costs
 4. Ridership, Profiles
-

This study reports the results of two successive interviews with selected companies in Greensboro, North Carolina which undertook to review workers' interest in carpooling before, during and after the energy crisis. Companies are compared for extent of carpool formation. It is observed that companies which actively encouraged participation in carpool matching programs ended up with higher rates of carpool formation than companies which maintained a passive stance on carpooling. Carpooling appears slightly more prevalent among older workers, and among white collar workers. However, the sample of companies is biased in favor of white collar companies, therefore the relationship between occupation and carpooling remains unsettled. No difference appeared by sex. Social segregation in carpools is indicated by the relatively few (11% of total) carpools which carry both blue and white collar workers.

Corporate executives in some of the larger manufacturing concerns in Greensboro were unwilling to promote carpool matching efforts by the firm, because they do not want to invade workers' privacy, because they felt the majority did not want to carpool, and because they did not wish to interfere in the workers' mode choices. Of interest is the fact that in four out of the five companies studied, the percentage of workers carpooling rose after the end of the energy crisis. New patterns of commuting by ride-sharing evolved during the days of the gasoline lines, and continued thereafter, spreading to other workers over time. Companies reported with satisfaction the increased availability of parking spaces, and the continued good environment effects of increased carpooling.

NTIS ORDER NO: PB 259-434/AS

PRICE: \$4.50

TITLE: TAXICAB UTILIZATION BY LOWER INCOME GROUPS
Final Report

AUTHOR: The Transportation Institute of North Carolina
A&T State University
(J. Allred and A. Saltzman)

DATE: October 1976

PROJECT NO.: NC-11-0004

KEYWORDS:

1. Paratransit
 2. Taxis
 3. Transportation Disadvantaged
 4. Trip Generation
 5. Small Cities
-

The Transportation Institute of the North Carolina A&T State University undertook a two-year study of taxicab utilization among low-income groups as part of its on-going paratransit project. The low-income population was chosen because studies indicate that the poor are among the most severely transportation disadvantaged and, as such, should be a focus of concern for transportation planners. An analysis of the reasons why the poor so often choose this relatively expensive mode of transportation should prove useful to an evaluation of the potentials of paratransit.

This study investigates the propensity of poor persons to use the taxicab. Data from previous studies are used to analyze the relative use of taxicabs by different income groups. It is shown that lower-income groups, particularly in small and medium size urban areas, display a relatively high rate of taxi utilization. A survey of taxi drivers in Greensboro, North Carolina, and an analysis of the origins of taxi trips is used to support this conclusion.

Factors which cause this utilization behavior are also scrutinized in this report. Results of a survey among low-income persons is used with secondary data to test hypotheses. This report concludes that: 1) taxicabs provide the principal transportation option for many of the poor; 2) taxicabs best meet the flexibility and convenience demands of the poor; and 3) taxicabs best meet the security demands of the poor. This report also notes that taxicabs operate at costs per hour which are two to three times less than various dial-a-ride systems.

NTIS ORDER NG.: PB 269-581/AS

PRICE: \$4.00

TITLE: A COMPUTERIZED BUS TRANSIT MANAGEMENT INFORMATION SYSTEM
USING CREDIT CARD FARE COLLECTION DATA

AUTHOR: Rensselaer Polytechnic Institute
(Frank DiCesare and Gary Sullo)

DATE: April 1976

PROJECT NO.: NY-11-0001

KEYWORDS:

1. Computer Applications
 2. Management, Operations and Techniques
 3. Fare, Collection
 4. Ridership
 5. Guides and Guidance
-

This research has shown that the development of a bus transit management information system that uses data from a bus credit card fare collection system is feasible from a hardware and software standpoint. An assessment of the data available from the credit card system shows that valuable and timely ridership and revenue information, which would not be readily available otherwise, can be provided to assist in management decisions regarding changes in service, i.e., adding or abandoning service, changing service modes, changing level of service and changing fare levels and/or structures.

To match the large amount of available information to the transit manager's needs a two level form of presentation is proposed with daily indicators for monitoring transit system performance and detailed reports available on demand. The proposed system has three basic components: 1) a set of programs which read and edit the raw data; 2) the online data base which consists of the permanent files created and updated from the raw data; and 3) the output programs which respond to simple commands to generate indicator displays and print reports.

A transit manager's user guide with a description of the system and illustrations of the types and forms of information available is presented. The results of a survey conducted to determine potential vendors of a credit card fare collection system is appended.

NTIS ORDER NO.: PB 255-982/AS

PRICE: \$5.50

TITLE: ALLOCATION OF RESOURCES FOR TERMINAL IMPROVEMENT

AUTHOR: Polytechnic Institute of New York
(Edmund J. Cantilli)

DATE: December 1975

PROJECT NO.: NY-11-0009

KEYWORDS:

1. Rail, Stations and Terminals
 2. Transit User Comfort
 3. Qualitative Analysis
 4. Models and Modeling
 5. Quantitative Analysis
-

This paper describes a means of distributing funds in which public opinion plays an integral role in the development of an allocation index. In addition, the following factors have been taken into account: (1) the need to quantify the "intangibles" of everyday amenities; (2) the necessity of relating improvement to meaningful degrees of change; and (3) the existence of cost-utility methodology.

The last consideration is one which has been of greatest importance to those who have found it difficult to allocate funds for the improvement of amenities in transportation facilities.

The problem of resource allocation in general is fraught with the difficulty of relating cost-benefit techniques to the "intangibles" of benefit, or disbenefit, to some consumers of services. The problem of resource allocation as related specifically to transportation facilities will therefore come down to those intangible aspects of the transportation service provided, beyond the basic and time-related aspects of people-movement, which are known as "qualities" of the system. Such qualities are translated, usually, into a scale of values which can be summarized into levels of "good", "bad", or "indifferent", with attempts at intermediate levels of subjective rating.

But the requirements of cost-benefit analysis are such as to require translation of subjective evaluation into the hard facts of quantitative values. The values which might be considered must eventually be capable of a relationship with monetary values for ultimate comparability to costs. This is one major problem area.

In this study, previous attempts at solution of this problem were considered, and a methodology has been developed which will serve as a model in the ultimate hope of bringing the patron's desires to bear in some way in the apportionment of funds for the planning, construction, or maintenance and improvement, of public modes of transportation. This participation of the user in decisions concerning his health, safety, and well-being while using a transportation facility is one of the novel aspects of this study.

NTIS ORDER NO.: PB 254-811/AS

PRICE: \$5.50

TITLE: AN ECONOMIC ANALYSIS OF TRAIN CONTROL

AUTHOR: Polytechnic Institute of New York
(Leonard Goldstein)

DATE: May 1974

PROJECT NO.: NY-11-0009

KEYWORDS:

1. Economics
 2. Rail, Automatic Control
 3. Computer Applications
 4. Benefit-Cost Analysis
-

This report represents the completion of a project which deals with the economics of rapid transit train control. Information dealing with rapid transit control systems from all parts of the world is used for the development of a computer program to analyze costs of an automatic vs. manual train control system.

The Train Control Analysis Program (TCAP) utilizes actual data from a rapid transit operator. This data can be from an existing manual system which is considering automation, or it may be a system in the planning phases, which is trying to determine the proper transit control to utilize. Once the data has been entered through the computer terminal keyboard, an analysis is made. The program operates in a time-sharing mode so that it is very convenient to change certain input parameters and observe the corresponding analysis immediately. This program can be used to determine what the above benefits may cost in relation to a less sophisticated system.

The results of this analysis may be used in the decision-making process of selecting an adequate control system.

NTIS ORDER NO.: PB 254-226/AS

PRICE: \$7.50

TITLE: ECONOMICS OF PUBLIC TRANSIT OPERATION

AUTHOR: Polytechnic Institute of New York
(R. Roess, et al.)

DATE: August 1975

PROJECT NO.: NY-11-0009

KEYWORDS:

- | | |
|--------------------------|-------------------------------|
| 1. Benefit-Cost Analysis | 6. Economics |
| 2. Bus, Cost | 7. Management, Operations and |
| 3. Rail, Cost | Techniques |
| 4. Models and Modeling | |
| 5. Planning, Tools | |
-

This report has presented various methods for the prediction of rail transit and bus transit operating costs for use in benefit-cost comparisons. Because of their intended use in benefit-cost analysis, they are based upon a few relatively straightforward operating parameters which are easily estimated by the planner in the early stages of alternative development. Because of this, however, the procedures are not detailed enough for use in making dollar-cost estimates for use in actual fiscal planning.

The relationship of labor and labor costs to overall operating economy has been discussed and illustrated, and several avenues for future analysis using labor parameters as a base have been presented. These, however, may not be of great help to planners in the early evaluation of alternatives, as labor-oriented parameters may not be known or easily estimated.

According to the authors, it is primarily the unit-cost and regression models presented herein which will be of utility in the conducting of benefit-cost analyses using transit alternatives. These models may be used to estimate operating costs for system additions or new systems. In the latter case, an average model, or one representing a system similar to that proposed would be used in analysis.

Tables are numerous. Appendices include an operating cost questionnaire distributed in 1973. References are furnished.

NTIS ORDER NO.: PB 251-560/AS

PRICE: \$4.50

TITLE: THE EFFECT OF FARE REDUCTIONS ON PUBLIC TRANSIT RIDERSHIP

AUTHOR: Polytechnic Institute of New York
(John R. Caruolo and Roger P. Roess)

DATE: May 1974

PROJECT NO.: NY-11-0009

KEYWORDS:

1. Fare, Reductions
 2. Travel Demand
 3. Financing Mass Transportation
 4. Ridership, Attraction
 5. Fare, Free
-

This report investigates the experience of reduced fare programs in North America. It was limited to an analysis of the demand aspect of these programs.

The majority of reduced fare programs in North America were identified. Information regarding the nature and the objectives of each program was given. The following programs were included: Senior citizen programs in Los Angeles, New York City, Baltimore, Chicago, Philadelphia, Miami, Milwaukee, Madison, Pittsburgh, Minneapolis, Detroit, Washington, Honolulu, Des Moines, and other cities; Reduced base fare programs in Atlanta, San Diego, Cincinnati, Boston, Denver, Louisville, Kansas City, Tulsa, Haddonfield (NJ), St. Louis, and New Castle (PA); Free fare programs in Commerce (CA), Raleigh County (WV), Seattle, and Amherst (MA); and, the Promotional reduced fare programs of Boston "Dime Time" and the New York City Sunday Half Fare Program.

The state-of-the-art in transit demand analysis and the formulation and applicability of fare elasticities are among topics discussed.

Each reduced fare program was analyzed. The effect of fare reduction on transit ridership was determined. Shrinkage ratio and arc elasticity formulation were attempted for each program. From this empirical data, general trends as to the change in ridership due to these programs were examined. Also discussed was the question of whether the objectives of each program were satisfied.

A bibliography is included in this report.

NTIS ORDER NO.: PB 244-578/AS

PRICE: \$5.00

TITLE: MANAGEMENT OF VEHICULAR TRAFFIC FACILITIES FOR
BETTER TRANSIT MOVEMENT: SOME ASPECTS

AUTHOR: Polytechnic Institute of New York
Department of Transportation Planning and Engineering
(W.R. McShane, K.W. Crowley, and L. Shaw)

DATE: December 1976

PROJECT NO.: NY-11-0009

KEYWORDS:

1. Models and Modeling
 2. Bus, Stations and Shelters
 3. Traffic Analysis, Control
 4. Transportation Systems Management
-

This report represents the completion of a project which deals with the analysis and management of transportation facilities. The purpose herein is to contribute to the management of transportation systems and to provide a better environment for people movement via transit and paratransit.

This report addresses aspects of the transportation system management problem such as: 1) bus stop utilization and impact of bus stop location; 2) the conflict between user and system-oriented assignments of traffic to a network; 3) the Expected Travel Time Assignment (ETTA) Model; 4) the importance of freeway incidents in shifting traffic assignments; and 5) the response to incidents on limited access facilities. The method of study for this report is the limited case study. Data in some cases is collected by time lapse photography and then further processed by computer programs.

The case study of a bus stop located at the northwest corner of Church Avenue at East 18th Street in Brooklyn, New York, indicated that the multiple uses of a bus stop do not necessarily harm either bus operations or the general traffic stream in any significant way. Another case study, K Street between 17th and 20th Streets in Washington, D.C., demonstrated the effects of bus stop location on urban traffic flow. Other case studies include a series of tests and comparisons performed on a hypothesized transportation network. Formulations such as the ETTA Model can be used to investigate the effectiveness of advising motorists by radio, citizens band, or some other means.

NTIS ORDER NO.: PB 267-942/AS

PRICE: \$5.00

TITLE: OPERATING COSTS OF RAIL RAPID TRANSIT

AUTHOR: Polytechnic Institute of New York
(Claire Stacia Kwicklis and Roger P. Roess)

DATE: May 1974

PROJECT NO.: NY-11-0009

KEYWORDS: 1. Maintenance, Equipment 7. Manpower and Personnel
 2. Maintenance, Facilities 8. Models and Modeling
 3. Maintenance, Costs
 4. Management, Operations and
 Techniques
 5. Rail, Costs

As the transportation systems within the urban centers become more congested, the expansion of rail rapid transit facilities and the efficient operation of existing facilities become matters of some concern to both the public and the transit operators.

This report examines the cost of operation of rail rapid transit systems, and the prediction of such costs for future systems, based on data obtained from the following operators in the U.S. and Canada: Chicago Transit Authority, Cleveland Transit Authority, Massachusetts Bay Transportation Authority, Montreal Urban Community Transit Commission, New York City Transit Authority, Port Authority Trans-Hudson, Port Authority Transit Corporation, Southeastern Pennsylvania Transportation Authority, and the Toronto Transit Commission.

Existing cost-prediction models, based on the division of operating costs into maintenance of way and structures, maintenance of equipment, power, conducting transportation, administrative expenses, and miscellaneous expenses, are updated according to the most recent data available. In addition, those transit systems for which information is available are examined for division of costs into nonlabor, direct labor, and indirect labor categories; for the degree of utilization of personnel and facilities; for the relation of unit costs in the six categories to system characteristics; and for their relative scales of wages and benefits.

The survey questionnaire is included in this report.

NTIS ORDER NO.: PB 251-970/AS

PRICE: \$4.50

TITLE: A PROCEDURE FOR OPTIMIZING RAPID TRANSIT CAR DESIGN

AUTHOR: Polytechnic Institute of New York
(Martin F. Huss)

DATE: May 1975

PROJECT NO.: NY-11-0009

KEYWORDS: 1. Economics 6. Quantitative Analysis
2. Rail, Systems and Planning Design 7. Vehicle, Design
3. Rail, Cost
4. Rail, Rolling Stock
5. Rail, Rapid Transit

This report provides a methodology for creating an initial rough design of a rail rapid transit car, or for evaluating an existing design. It is based on optimizing the design features by minimizing the sum of the annual costs of purchasing, power consumption, maintenance, and on-board operating labor for a fleet of such vehicles.

Linear programming is used to arrive at a solution based on the interaction of several hundred equations which describe the complex interrelationships among the elements of car design, dimensions, and performance, and the various components and subassemblies which comprise the vehicle, and the associated costs.

NTIS ORDER NO.: PB 255-048/AS

PRICE: \$8.00

TITLE: URBAN DESIGN AND USAGE FACTORS OF
PARATRANSIT VEHICLES AND FACILITIES

AUTHOR: Pratt Institute
(Ronald Adams and George Hildebrand)

DATE: April 1976

PROJECT NO.: NY-11-0011

KEYWORDS:

- | | |
|------------------------------|---------------------------|
| 1. Paratransit | 6. Stations and Terminals |
| 2. Elderly | 7. Urban Development and |
| 3. Handicapped | Planning |
| 4. Vehicle, Design | |
| 5. Demand Responsive Systems | |
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The literature has focused on economic, institutional, communications and control of paratransit services. This study explores the history and future of equipment and facilities for paratransit usage. It examines historical, institutional and physical aspects of transport technology compatibility with the urban environment, focusing particularly on facilities for demand responsive services. Relevant technology development programs are discussed along with safety, human factors, and operators' concerns, with special attention to boarding considerations of the elderly and handicapped.

A spectrum of vehicles is conceptualized for single and multi-party service in both near and midterm time frames, and in specialized versions to accommodate elderly/handicapped and general population. Local, line-haul and terminal facilities for paratransit vehicles are examined, including ubiquitous treatments to support elderly/handicapped access, integration in high traffic, multimodal terminal facilities; priority and exclusive rights-of-way with the long-term prospect of wayside power to overcome limitations of chemical battery storage; introduction of electric-powered vehicles.

NTIS ORDER NO.: PB 255-541/AS

PRICE: \$6.00

TITLE: ESTIMATION OF THE OPERATING COST OF MASS TRANSIT SYSTEMS

AUTHOR: State University of New York
(L.D. Bodin and D. Rosenfield)

DATE: September 1976

PROJECT NO.: NY-11-0012

KEYWORDS:

- | | |
|--------------------------------------|-----------------------------|
| 1. Planning, Tools | 6. Computer Programming |
| 2. Urban Development and Planning | 7. Models and Modeling |
| 3. Transportation Systems Management | 8. Schedules and Scheduling |
| 4. Algorithms | 9. Manpower and Personnel |
| 5. Maintenance, Costs | |
-

The Planning Methodology and Technical Support Division of the Urban Mass Transportation Administration (UMTA) has been developing Urban Transportation Planning System (UTPS) over the past years. The goal in the design of UTPS has been the availability of a computer system that allows the user to study and analyze multimodal transportation systems in an intermediate to long range planning environment. In this report a new model has been presented for estimating the operating cost of a proposed mass transit system in an intermediate-to-long-range planning environment.

This document is the final report on the development and implementation of scheduling, estimation and costing procedures for transportation planning. This UMTA-sponsored project has been closely related to UTPS and is an outgrowth of the building of a cost model for UTPS based on actual vehicle schedules and estimates of manpower requirements. It includes a new cost model, procedures to form line schedules from UTPS input, vehicle schedules, and manpower estimates, and the development of computer program UCOST which is implemented within UTPS.

The major goal of this project is the development of a cost model appropriate for long-range planning. The approach developed in the report led to the determination of manpower estimates and vehicle schedules for a proposed transit system as well as a cost model. This approach is broken down into four components: line scheduling, vehicle scheduling, crew estimation, and the cost estimation component. The authors believe that the program UCOST and its underlying procedures will be valuable tools to transit planners in the future.

NTIS ORDER NO: PB 262-729/AS

PRICE: \$6.75

TITLE: MODELING THE URBAN GOODS CONSOLIDATION TERMINAL SITE SELECTION DECISION
Part III

AUTHOR: Ohio State University
(James F. Robeson and Andrew Lai)

DATE: November 1974

PROJECT NO.: OH-11-0001

KEYWORDS:

1. Freight Movement	6. Models and Modeling
2. Bus, Stations and Shelters	7. Center City
3. Rail, Stations and Terminals	
4. Algorithms	8. Quantitative Analysis
5. Computer Applications	9. Site Selections

This report investigates the economic feasibility of implementing the concept of a consolidated terminal for small shipments destined to or originating in the central business district (CBD) of an urban area. More specifically, this involves the determination of the number and location (s) of hypothetical consolidation terminal (s) within the greater Columbus, Ohio, metropolitan area, and the assignation of shipments to each terminal in terms of CBD zones and clusters of truck operators.

The consolidation terminal site selection problem is formulated as a linear integer programming model which takes into consideration the various characteristics of the CBD small shipment. Shipment sizes of 5000 pounds or less, and 1000 pounds or less were investigated. The solution technique developed for the model utilizes a linear programming computer algorithm for the initial solution; an iterative heuristic solution approach follows which provides for only integer values of the binary variables and for the nonlinear nature of the operating cost function. The heuristic solution converges rapidly and can be adopted wherever linear computer programming is available.

Also see "The Economic Feasibility and Social Desirability of an Urban Goods Consolidation Terminal: Part I" (PB 239-853) and "An Analysis of the Economic Costs of Constructing and Operating an Urban Goods Consolidation Terminal: Part II" (PB 239-854).

NTIS ORDER NO.: PB 249-529/AS

PRICE: \$6.00

TITLE: GRAVITY ASSISTED MASS TRANSIT

AUTHOR: University of Dayton
(Arthur Z. Kovacs, et al.)

DATE: June 1975

PROJECT NO.: OH-11-0002

KEYWORDS: 1. Guideways 7. Stations and Terminals
2. Propulsion Systems
3. Models and Modeling
4. Construction, Cost
5. Energy
6. Brakes and Braking

In fixed guideway transit with established station stops, the propulsion energy can be reduced by grading the guideway downward on leaving the station (using gravity to assist in the acceleration) and grading upward on arrival at the next station (again using gravity, but this time to assist in the braking).

A computerized conceptual cost model has been developed incorporating parameters relating to required elevated structures and required dynamical considerations. Construction costs are calculated in a fashion similar to that used to determine a contractor's bid price. The increase in total cost required to construct a station stop at a given elevation above the guideway level between stops is calculated by the computer program to be compared with the resultant decrease in energy consumed in acceleration and deceleration. Because today's costs are extremely uncertain, unit costs are input by the user to determine the increased construction and operating costs and the resultant energy savings. The program outputs suggestions for structural design and associated cost data. These outputs can be compared to resultant energy savings in a particular environment and thus can be used to make a judgement regarding the feasibility of gravity assisted mass transit subject to costs associated with a given geographic area at a given point in time.

NTIS ORDER NO.: PB 253-416/AS

PRICE: \$5.50

TITLE: A PARAMETRIC ACCESS NETWORK MODEL

AUTHOR: University of Oklahoma
(Antti Talvitie and Tom Leung)

DATE: October 1974

PROJECT NO.: OK-11-0016

KEYWORDS:

1. Access, Planning and Control
2. Models and Modeling
3. Time Costs
4. Quantitative Analysis

In this report, supply models are estimated for the access portions of rail and bus trips. The models are designed to predict aggregate zonal travel times as a function of the transportation system, zone size, and volume-related characteristics of a zone.

Three models that deal with a rail trip are estimated. These are: access walking time, access driving time, and access riding time on a bus. The walking time to a bus stop is modeled for the bus trip. Corresponding models are developed for the within-zone variance of the access times.

One purpose of these models is to provide an input to existing travel demand forecasting processes by systematizing the way in which the access times are currently obtained for network coding. The importance of these values for travel forecasting has been demonstrated. Another purpose of the models is to provide for the reduction of bias if disaggregate (logit) models are used in forecasting travel. The method involved in this process is briefly reviewed in the text.

A simulation approach has been employed to develop the data for developing multiple regression equations for the access models.

NTIS ORDER NO.: PB 248-958/AS

PRICE: \$4.50

TITLE: STATE-OF-THE-ART OF ENVIRONMENTAL IMPACT STATEMENTS
IN TRANSPORTATION

AUTHOR: University of Oklahoma
Department of Civil Engineering and Environmental Science
(James Johanning and Antti Talvitie)

DATE: November 1974 PROJECT NO.: OK-11-0016

KEYWORDS: 1. Government, Federal
2. Environment and
Environmental Control

The National Environmental Policy Act of 1969 (NEPA) is a direct outgrowth of the significance Congress has attached to environmental impact of government actions and policies. The NEPA established the Council on Environmental Quality (CEQ) which has written guidelines for Federal agencies to follow when establishing policies concerning the environment. These guidelines also instruct agencies as to the content of impact statements.

According to the authors, impact statements have a wide variation of content, and in order to determine how well transportation impact statements conform to NEPA, forty statements were randomly selected, reviewed and summarized in this report. Sites chosen were both urban and rural, magnitudes ranged from statewide to local, modes included highway and mass transit, and report sizes were from a few pages to a few hundred.

Serious deficiencies were pointed out regarding the types of alternatives presented, and the means by which primary impacts of these alternatives are predicted. Most statements were found by the authors to be too narrow in scope to show the total impact of a given project, especially if it was part of a proposed network.

The authors conclude, among other things, that the consideration and evaluation of the secondary impact of transportation upon the environment needs to be improved. Incorporation of citizen opinion and environmental considerations early in the transportation planning process would help to avoid problems at later stages. Any procedures which enhance relationships between planners, environmentalists, designers and citizens is encouraged.

NTIS ORDER NO.: PB 244-539/AS

PRICE: \$4.50

TITLE: DESIGN FOR A NATIONAL URBAN TRANSPORTATION REPORTING SYSTEM
Final Report

AUTHOR: University of Pennsylvania
Department of Civil and Urban Engineering
(Vukan R. Vuchic, et al.)

DATE: Fall 1976

PROJECT NO.: PA-11-0002

KEYWORDS:

1. Accounts and Accounting
 2. Financing Mass Transportation
 3. Management, Operations and Techniques
 4. Research, Operations
-

This report analyzes the contents and uses of a National Urban Transportation Reporting System. The study was performed to assist UMTA in the implementation of Section 15 of the National Mass Transportation Act of 1974.

A review of the PennDOT transit reporting system, its implementation and results are presented. A recommended set of data items and indicators is defined and analyzed. Another section of the report contains detailed information on a subgroup of the data items and indicators felt to provide a minimal, yet comprehensive, base for comparison of transit agencies.

The last section of this report gives a recommended set of data items and indicators to be included in an annual report and the format for their presentation.

NTIS ORDER NO.: PB 258-000/AS

PRICE: \$5.00

TITLE: A STRATEGY FOR THE EVALUATION OF ALTERNATIVE URBAN
TRANSPORTATION SYSTEMS WITH MULTIDIMENSIONAL CONSEQUENCES

AUTHOR: Carnegie Mellon University
(Feng-Bor Lin)

DATE: September 1974

PROJECT NO.: PA-11-0007

KEYWORDS: 1. Models and Modeling
2. Planning, Tools
3. Urban Development and Planning

This report undertakes two interrelated efforts: 1) the examination of the validity of existing evaluation techniques potentially suitable for dealing with the problems involving multidimensional consequences of urban transportation systems; and, 2) the development of the evaluation model in the context of additive utilities for unifying value judgements in search of the best alternative transportation plan.

Four basic evaluation models are identified for comparative analysis. The focus of the analysis is on the theoretical soundness of the models and on the sensitivities of the models with respect to the number of alternatives encountered, to the distribution of outcome states, and to the addition or the reduction of the number of alternatives from the original set. The analysis reveals, according to the author, that the existing techniques are unreliable due to the lack of a valid value transformation mechanism. In this study, a derived rather than an intuitive value transformation mechanism is employed for the development of a generalized evaluation model.

According to the author, the model developed provides planners with a flexible, informative, and effective tool to deal with evaluation problems involving either deterministic or probabilistic value judgements. It recognizes the fact that consensus on value judgements cannot always be reached and, accordingly, suggests an analytical framework to deal with the problem. The model can be readily implemented by using the existing rating method, with minor revisions, to collect value judgements.

NTIS ORDER NO.: PB 251-179/AS

PRICE: \$6.75

TITLE: AN EQUITY EVALUATION MODEL FOR URBAN MASS TRANSPORTATION: AN ASSESSMENT OF THE SPATIAL AND SOCIAL DISTRIBUTION OF BENEFITS AND COSTS

AUTHOR: Pennsylvania State University
Pennsylvania Transportation Institute
(David C. Hodge)

DATE: November 1974

PROJECT NO.: PA-11-0010

KEYWORDS:

1. Models and Modeling
2. Benefit-Cost Analysis

This report deals with the distribution question, i.e., the distribution of resources among members of society.

Public investment decision-making in the provision of impure goods (those public goods which intrinsically incorporate a spatial dimension) is discussed and a public investment model which describes investment issues as both a production and a distribution question is presented. Then, an alternative public investment model, the Equity Evaluation Model (EEM) which examines public investment as a distribution question, is examined. The mathematical foundation of distributional analysis, particularly the link between aggregate and distributional analysis, is discussed. The three stages of the EEM are detailed with special attention to the selection of a proper equity criterion by which competing public projects are to be evaluated.

A case study application of the EEM is presented through the examination of the geographic setting of Pittsburgh and the alternative public projects, three mass transit proposals. The social and economic environment of Pittsburgh region is described and the results of conventional benefit-cost evaluations of the projects are presented. The distribution of benefits and costs is determined for each of the three proposals using the EEM. Net change in the distribution of real income is calculated and evaluated in terms of equity. The projects are compared and the most equitable project, according to the author, is chosen.

Finally, the concepts of the report are integrated with an emphasis on an understanding of the key role played by spatial forces in the distribution of real income. Future applicability of the model is discussed.

NTIS ORDER NO.: PB 251-205/AS

PRICE: \$7.75

TITLE: FORECASTING BUS TRANSIT OPERATING COSTS

AUTHOR: The Pennsylvania State University
(Hoyt G. Wilson)

DATE: November 1975

PROJECT NO.: PA-11-0010

KEYWORDS:

- | | |
|--|---------------------------|
| 1. Bus, Cost | 6. Maintenance, Personnel |
| 2. Planning, Tools | 7. Manpower and Personnel |
| 3. Maintenance, Costs | 8. Fuel, Consumption |
| 4. Management, Operations and Techniques | |
| 5. Models and Modeling | |
-

This study deals with forecasting the costs of operating bus transit systems in U.S. cities. The scope of the study is limited to the transit bus mode, and is concerned with operating costs as opposed to capital costs. The primary objective is to develop a practical forecasting model for use by transit planners, i.e., a tool that will provide quantitative estimates (forecasts) of operating costs for any proposed bus transit system. The final product is a composite of several models, each of which forecasts a different component of operating cost. Total operating cost is found by simply summing the component forecasts. These models are based on data supplied by the American Public Transit Association, plus a direct industry survey, undertaken as part of the research effort.

The approach is to model real resource usage - not dollar expenditures - and then apply the appropriate price or rate to the forecasted quantity of resource. Such models have the advantage of being insensitive to price fluctuations, and hence are expected to remain valid over a longer period of time than direct dollar forecasts. The four resource categories for which models are developed are driver labor, bus repair labor, fuel consumption, and oil consumption. A single model is developed for all other operating costs.

NTIS ORDER NO.: PB 262-634/AS

PRICE: \$6.75

TITLE: TRANSIT AUTHORITY BOARDS OF DIRECTORS:
MEMBERSHIP, ORGANIZATION, FUNCTIONS, AND PERFORMANCE

AUTHOR: The Pennsylvania State University
(Kevin H. Horn)

DATE: October 1976

PROJECT NO.: PA-11-0010

KEYWORDS:

1. Management, Operations and
Techniques
2. Surveys

This report is a field study of 37 transit policy-making bodies that was conducted by the Pennsylvania Transportation Institute and funded by UMTA. The document can be a useful tool for those responsible for setting up new authorities and for those helping older ones evolve into efficient groups.

This field study was designed to investigate the composition and function of boards of directors of public transit authorities. The objective was not only to identify the sources, education, and experience of transit directors and record the tasks that were within the purview of the board under its policy-making and overseeing roles, but also to compare the boards of directors of different sized transit properties and determine the degree to which the role of the board was altered under different forms of management input. The research tools consisted of structured interviews with the chairman of the board and questionnaires completed by individual directors. Statistical tests consisted of Chi-square measures of association between the questionnaire responses of directors from transit authorities of different sizes and types of management input.

The principal findings documented the differences between the duties and activities of board members from authorities utilizing a management contract firm versus those authorities having internally developed management. This data revealed weak but inconclusive relationships between the type of management input and such activities as establishing capital budgets, approving labor contracts, etc. The attempt to identify the degree of similarity between transit boards and corporate boards of directors indicated that transit boards resembled corporate with respect to the internal organization and functions. This study reports that the main difference between transit and private sector boards lay in the manner and criteria in which transit directors were selected and the duration for which they served.

NTIS ORDER NO.: PB 265-744/AS

PRICE: \$10.75

TITLE: TRANSPORTATION SYSTEM ASSURANCE: TERMINOLOGY, PERFORMANCE INDICES,
FAILURE ASSESSMENT AND MAINTENANCE MANAGEMENT

AUTHOR: Carnegie Mellon University
(Richard A. Uher)

DATE: August 1975

PROJECT NO.: PA-11-0013

KEYWORDS:

- | | |
|---|---------------------------|
| 1. Life Cycle Costing | 6. Maintenance, Equipment |
| 2. Management, Operations and
Techniques | 7. Computer Applications |
| 3. Rail | 8. Maintenance, Personnel |
| 4. Bus | |
| 5. People Movers | |
-

Transportation system assurance is the study, development, and application of the methods by which the mission (fast, convenient, comfortable, safe and low-price service) of the transportation property is achieved reliably. Application of this science to transportation systems in a selected manner is expected to improve service dependability at lower life cycle costs. A program for improvement would proceed in several steps, the first of which is a consistent assessment of reliability on present properties.

This report addresses the need for and reports on the development of a methodology for consistent measurement of reliable performance in transportation operations which include intercity rail, urban commuter rail, rapid transit, bus and streetcar, light rail and small people movers. Performance indices and formulae for their computation are developed as a compromise between industry tradition and modern assurance science techniques. Definitions of terms and of the role of the operations, maintenance and management organizations are also included.

Equipment availability, a generic reference to the reliability, maintainability, and availability of the equipment to transport passengers is discussed as it relates to both service dependability (the reliability of the service as seen by the passengers) and the cost of the maintenance operation.

A comprehensive Failure Assessment and Maintenance Management System (FAMMS) which is directly applicable to transportation properties and which evolved from similar systems used on properties over the past five years is described in detail. The system can either be batch or on-line processed.

NTIS ORDER NO.: PB 254-837/AS

PRICE: \$5.50

TITLE: RAPID COMMUTER TRANSIT FOR MEDIUM SIZED URBAN AREAS

AUTHOR: University of South Carolina, Traffic and Transportation Center
(Hatim M. Hajj)

DATE: January 1975

PROJECT NO.: SC-11-0002

KEYWORDS:

1. Bus, Commuter
 2. Planning
 3. Travel Demand
 4. Models and Modeling
 5. Urban Development and Planning
 6. Bus, Rapid Transit
-

This report documents the procedures and results of a comprehensive study designed to investigate the feasibility of utilizing state-of-the-art rapid transit equipment and available facilities to avoid future commuter transportation problems in middle-sized urban areas.

The Dutch Fork Corridor in the city of Columbia, South Carolina, was chosen as a case study. According to the 1970 Census, the Columbia SMSA had a population of approximately 323,000. It was felt that a unique opportunity existed to test the feasibility of implementing rapid commuter transit within the Corridor before the commuter problems reached critical proportions.

The approach to the problem took into account present and future travel, public attitudes and preferences, available onsite facilities and state-of-the-art equipment, and the interest of local businessmen, financial agencies, and government officials in solving the problem prior to its continued development.

Chapters include: an inventory of existing conditions in the Corridor; models and forecasts (1995) of planning and travel data; alternative transit concepts, including priority lanes and ramp metering, that could serve the needs of the Corridor; detailed analyses of the most promising transit alternatives; recommendations for the provision of high quality transit service in medium-sized urban areas; and, the extent of applicability of these recommendations to medium-sized urban areas throughout the United States.

NTIS ORDER NO.: PB 245-625/AS

PRICE: \$9.75

TITLE: ANALYTICAL MODELS FOR GUIDEWAY SURFACE IRREGULARITIES
AND TERRAIN SMOOTHING

AUTHOR: University of Texas at Arlington
(David A. Hullender, Thomas M. Bartley, M. Bala Krishna)

DATE: January 1976

PROJECT NO.: TX-11-0001

KEYWORDS:

1. Models and Modeling
 2. Guideways
 3. Quantitative Analysis
 4. Topography
-

This report relates to the analytical modeling of guideway irregularities.

A design criteria for determining the degree of leveling and filling of the natural terrain in order to achieve a particular PSD of short-wave-length, surface-roughness-type irregularities is derived and interpreted in terms of familiar surface roughness measurement techniques.

The procedure for relating a PSD design specification to an equivalent California profile index is presented, in addition to the procedure for interpreting measurements of guideway profile deviations from a straight edge. Examples are presented demonstrating typical applications of the results. Numerical simulations incorporating random numbers for formulating typical guideway profiles are used to verify the analytical model. Excellent agreement between the analytical and numerical results are demonstrated.

NTIS ORDER NO.: PB 256-847/AS

PRICE: \$4.50

TITLE: DEVELOPMENT AND OPERATIONAL VALIDATION OF A TRANSIT BUS SIMULATION

AUTHOR: University of Texas at Arlington
(James E. Fairchild, et al.)

DATE: November 1975

PROJECT NO.: TX-11-0001

KEYWORDS:

- | | |
|--|--------------------------|
| 1. Propulsion Systems | 5. Computer Applications |
| 2. Bus | 6. Instrumentation |
| 3. Fuel, Consumption | 7. Models and Modeling |
| 4. Environment and Environmental Control | |

A survey of the technical literature has identified the major factors affecting bus propulsion system efficiency and emissions. A computer simulation incorporating the significant operational factors and transit bus characteristics has been developed to compute power, fuel consumption, and emissions over an arbitrarily prescribed mission profile. Factors considered include roadway grade, air density, aerodynamic drag, bus center-of-gravity location, front and rear tire inflation pressures, acceleration, weight, and torque converter characteristics.

Because of the scarcity of operational data, an experimental program was conducted. A portable instrumentation package was designed, constructed, and installed on a bus from the Dallas Transit System. Operational tests were conducted for a variety of velocity-time profiles for three gross weights. Continuous data recorded included engine speed, torque-converter output shaft speed, fuel flow, electrical load, wind speed and direction, and atmospheric data.

Typical mission profiles for an urban transit bus were established by shadowing buses on two "most typical" routes in the system with an instrumented automobile. Instrumentation allowed the recording of the time history of bus velocity and passenger loading.

The results of the experimental program and mission profile analysis have been used to validate the computer simulation previously developed and to allow the determination of the relative importance of operational and design features on the fuel economy and emission characteristics of a transit bus operating on a realistic mission profile.

NTIS ORDER NO.: PB 254-891/AS

PRICE: \$5.00

TITLE: GUIDEWAY ROUGHNESS AS RELATED TO DESIGN TOLERANCES AND PROFILE CONSTRAINTS

AUTHOR: University of Texas at Arlington
(David A. Hullender and Thomas M. Bartley)

DATE: September 1974

PROJECT NO.: TX-11-0001

KEYWORDS:

1. Guideways
2. Construction, Cost
3. Planning, Tools
4. Time Costs
5. Transit User Comfort
6. Topography

The design and construction of a guideway for ground transportation involves compromise between desired smoothness and necessary sacrifices in regard to expense and time. The degree of natural terrain alteration by means of filling or leveling must be considered during the design of the desired profile in addition to necessary layout and alignment accuracy of the guideway during actual construction.

This report addresses the subject of guideway roughness as related to design and construction tolerances and constraints. The approach is to calculate the power spectral densities (PSD) associated with constrained natural terrain irregularities and construction inaccuracies.

Both an analytical approach resulting in equations for PSD and a numerical approach calculating PSD based on the fast Fourier transform are used. Guidelines are established for constraining the profile relative elevation variations during the initial planning and layout of the desired profile. The degree of degradation in smoothness resulting from random surveying, measurement, and alignment errors during the actual construction is determined.

Chapters present the nomenclature used in the report and discuss analytical formulation, numerical simulation, ride comfort analysis and conclusions.

The appendix provides the step-by-step derivations for two analytical guideway irregularity models. References are furnished.

NTIS ORDER NO.: PB 244-073/AS

PRICE: \$4.25

TITLE: LINE PRINTER PLOTTING

AUTHOR: University of Texas at Arlington
Public Transportation Center
(John R. Rumsey and Roger S. Walker)

DATE: August 1975

PROJECT NO.: TX-11-0001

KEYWORDS:

1. Computer Applications

This report describes a collection of subroutines that provide the FORTRAN user the capability of plotting data on a line printer.

The subroutines were developed primarily to provide an efficient plot capability for the user who does not have an incremental pen plotter immediately available. The subroutines are compatible with the calling procedures for the basic Calcomp plotter subroutines (PLOT, PLOTS, FACTOR, WHERE, NEWPEN, LINE, SCALE, NUMBER, SYMBOL, and AXIS) that are currently implemented on many systems. The capabilities of these subroutines allow the user the choice of plotting data on a line printer or an x-y incremental plotter. The user's choice will depend upon which subroutine library is specified with the compiler. The set of subroutines, therefore, will be available at load time for linkage to the main program. The user is only required to reference the necessary subroutine and supply a Calcomp compatible argument list in his/her FORTRAN program.

An additional feature of these Calcomp compatible line printer subroutines permits the user to select the plot size. Thus, the subroutines can be used in interactive graphics, particularly for devices with only character capability.

NTIS ORDER NO.: PB 248-996/AS

PRICE: \$9.00

TITLE: PROCEEDINGS OF THE SYMPOSIUM ON REGIONAL PUBLIC TRANSPORTATION

AUTHOR: University of Texas at Arlington
Public Transportation Center
(Edited by John N. Fox)

DATE: July 1974

PROJECT NO.: TX-11-0001

KEYWORDS:

1. Planning
2. Highway
3. Surveys
4. Rail, Commuter
5. Bus, Express
6. Financing Mass Transportation

This report contains the proceedings of the Regional Public Transportation Symposium presented by the Public Transportation Center, the University of Texas at Arlington, on July 26, 1974.

Papers presented in this report are as follows: 1) "Integrating Highway and Transit Plans for the Region" by John J. Roark, Director of Transportation, North Central Texas Council of Governments; 2) "Dallas Area Transit Plan" by Rodney W. Kelley, Director of Mass Transit Technical Studies and Assistant Director of Traffic Control, City of Dallas; 3) "Fort Worth Transit Plan" by James R. McMeans, Transportation Planning Engineer, City of Fort Worth; 4) "Research Results on Metro Area Public Attitudes" by John N. Fox, Ph.D., Associate Professor of Industrial Engineering, University of Texas at Arlington; 5) "Evaluation of Rail Rapid Transit and Express Bus Service in the Urban Commuter Market" by J. Hayden Boyd, Ph. D., Director, Economics Division, Motor Vehicle Manufacturing Association, Detroit, Michigan; and 6) "Financing Alternatives for Urban Public Transit" by David R. Miller, Ph.D., Barton-Aschman Associates, Chicago, Illinois.

NTIS ORDER NO.: PB 243-654/AS

PRICE: \$4.75

TITLE: ACCESSIBILITY APPLICATIONS IN URBAN TRANSPORTATION
Final Report

AUTHOR: Virginia Polytechnic Institute and State University
(R.J. Popper and M.D. Connelly)

DATE: January 1977

PROJECT NO.: VA-11-0002

KEYWORDS:

1. Access, Planning and Control
 2. Employment
 3. Computer Applications
 4. Planning
-

Accessibility models are used to measure the level and spatial distribution of transportation service. Indices of accessibility may, therefore, be used to evaluate the impact of changes in accessibility to opportunities relative to transportation network modifications.

The purpose of this report is to define precise roles that accessibility analyses can play in providing input to transportation evaluation and decision-making processes. These roles include system level analyses of transportation service, corridor level studies, comparative analyses of existing and proposed systems, and transportation service comparisons stratified by socioeconomic groups and geographic districts.

This report outlines the theory and methodology for developing accessibility studies to evaluate transportation service impacts at the corridor, subarea or metropolitan levels. A computer program (Metropolitan Accessibility Program or MAP) is described that will facilitate such an analysis. In addition a typical case study application is presented illustrating how employment accessibility is modified in a corridor after the building of a high-speed transit line. Data indicates the relative degree to which the black population subgroup in the corridor benefits from the accessibility improvements. The program is suggested for use in planning and evaluation studies.

A companion report is "User Documentation for the Metropolitan Accessibility Program (MAP), January 1977 (PB 269-239).

NTIS ORDER NO.: PB 269-240/AS

PRICE: \$4.50

TITLE: USER DOCUMENTATION FOR THE METROPOLITAN ACCESSIBILITY PROGRAM (MAP)
Final Report

AUTHOR: Virginia Polytechnic Institute and State University
(R.J. Popper and M.D. Connelly)

DATE: January 1977

PROJECT NO.: VA-11-0002

KEYWORDS:

- | | |
|---------------------------------|------------------------|
| 1. Access, Planning and Control | 5. Planning, Tools |
| 2. Employment | 6. Models and Modeling |
| 3. Guides and Guidance | |
| 4. Computer Applications | |

The Metropolitan Accessibility Program (MAP) is a computerized tool that facilitates analyses of transportation access to employment, commercial activities, hospitals, and other desired destination opportunities. This program is capable of producing output records that are interpreted by a special plotting program, MAPLOT. MAPLOT is capable of producing graphic displays of spatial variations in accessibility levels throughout an urban area, sector, or corridor. The MAP program and all subsequent modifications, including the plotting features, is housed within the U.T.P.S. Program, UMODEL.

In this report the computer program, MAP, is presented through various User's materials including program documentation and five illustrative case study applications. The five case studies have been developed to aid the programmer in applying MAP and MAPLOT.

This report is designed specifically as a User's guide to MAP and should be read in conjunction with the companion report which explains and illustrates the theory and methodology of transportation accessibility studies: "Accessibility Applications in Urban Transportation," by R.J. Popper and M.D. Connelly (PB 269-240). The MAP Program is used to facilitate accessibility analyses and to produce graphic maps of the spatial distribution of accessibility to jobs, shopping activities, and other destination opportunities. The program is suggested for use in planning and evaluation studies.

NTIS ORDER NO.: PB 269-239/AS

PRICE: \$5.50

TITLE: THE CENSUS AND TRANSPORTATION PLANNING: Survey of Evaluations and Recommendations as to the Usefulness of 1970 Census Data in Urban Transportation Planning

AUTHOR: Virginia Polytechnic Institute and State University
(Robert C. Stuart and Michael Hauck)

DATE: January 1976

PROJECT NO.: VA-11-0003

KEYWORDS:

1. Planning, Tools
2. Surveys
3. Urban Development and Planning

The Urban Transportation Planning Package (UTPP), a special product of the 1970 Census designed cooperatively by FHWA and the Bureau of the Census especially for transportation planning, has undergone a series of criticism and evaluations. In addition, the utility of Census data in general has recently come under closer scrutiny by transportation planners.

The purpose of this project is to evaluate the usefulness of 1970 Census data for urban transportation planning with special emphasis placed on evaluating the 1970 UTPP. The project seeks to: 1) identify urban transportation planning-related data from the 1970 Census; 2) evaluate the uses of those data in urban transportation planning; 3) identify user problems; 4) identify alternative sources of these data products; and 5) develop a series of recommendations for the 1980 Census.

Personal and telephone interviews with ten state, and twenty-five sub-state regional agencies and three university and private consultants were used to generate the desired information. The experiences and opinions of the interviewees were compiled and summarized into a series of recommendations for the 1980 Census. Recommendations of the Contractor are also included.

NTIS ORDER NO.: PB 254-802/AS

PRICE: \$4.50

TITLE: ASSESSING THE RELATIONSHIP BETWEEN URBAN FORM AND TRAVEL REQUIREMENTS: A LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

AUTHOR: University of Washington (Seattle)
(James W. Clark)

DATE: August 1975

PROJECT NO.: WA-11-0003

KEYWORDS:

1. Travel Demand
 2. Urban Development and Planning
-

An interest in the development of long-range policy for energy conservation motivates the investigation into the relationship between urban form and transportation energy consumption.

The report reviews previous studies which have attempted, either directly or indirectly, to cast some light on this relationship. A thesis of the paper is that study of the relationship has been hampered by a lack of an operational definition for the concept of urban form. Addressing itself to this need, it is proposed that urban spatial structure be measured in terms of size, shape, and activity distribution of the urbanized area.

The review of literature classifies previous studies according to the aspect of urban form which was investigated. Travel requirements appear to increase as urban area population increases, but beyond this finding, no clear relationship between urban form and total urban travel requirements has yet been established in the literature.

NTIS ORDER NO.: PB 254-988/AS

PRICE: \$4.00

TITLE: DEFINING AN URBAN GROWTH STRATEGY WHICH WILL ACHIEVE MAXIMUM TRAVEL DEMAND REDUCTION AND ACCESS OPPORTUNITY ENHANCEMENT

AUTHOR: University of Washington
Urban Transportation Program
(James W. Clark)

DATE: June 1974

PROJECT NO.: WA-11-0003

KEYWORDS:

1. Computer Applications
 2. Access, Planning and Control
 3. Travel Demand
 4. Urban Development and Planning
 5. Land, Use
-

This report investigated the potential for directing the growth of an urban region so that the evolving urban form contributes to high levels of access opportunity with minimum travel requirements.

Measures of total travel, accessibility, and spatial equity were defined for use in the evaluation of alternative urban spatial patterns. A computer-aided investigation determined optimum locations within the urban region for expected growth. Repeated application of a technique for assigning small increments of growth resulted in the definition of a high performance growth path for a 10-to-20-year period.

As a case study, the population and employment growth forecast for the 1970-1990 period for the Puget Sound region in Washington state was assigned to subregions. Contrast of study results with present growth trends revealed that new travel requirements could be reduced by two-thirds, access levels could be improved four times, and distributional equity could be improved three times.

These results were judged by the author to be significant enough to warrant further intensive investigation into the feasibility and desirability of actually trying to achieve an urban form which could produce such improvements in transportation system performance without further substantial investments in capital-intensive transportation facilities or highly subsidized transportation services.

NTIS ORDER NO.: PB 244-498/AS

PRICE: \$5.25

TITLE: TRANSPORTATION FOR THE ELDERLY AND HANDICAPPED
A Prototype Case Study of New York State Experience in
Activating an Element of a Federal Grant Program

AUTHOR: University of Washington
Urban Transportation Program
(Joanna M. Brunso)

DATE: August 1975

PROJECT NO.: WA-11-0003

KEYWORDS:

1. Financing Mass Transportation
 2. Government, Federal
 3. Elderly
 4. Handicapped
 5. Transportation Disadvantaged
-

During the past few years there has been an increasing awareness of the mobility problems faced by those who cannot drive and, in particular, those who are elderly and handicapped. As a result, in 1970, Section 16 was added to the Urban Mass Transportation Act of 1964 declaring it to be "national policy that elderly and handicapped have the same right as other persons to utilize mass transportation facilities and services..." and providing grants and loans to states and local public bodies and agencies to assist them in providing mass transportation systems to meet the special needs of the elderly and handicapped. This act was further amended in 1973, Section 16 (b) (2), when the same assistance was extended to private nonprofit corporations and associations.

This report attempts to look at this program from the viewpoint of its administration in New York State. The author traced the development of this program from the rules and regulations provided by the Urban Mass Transportation Administration, examined the proposals of the private nonprofit organizations and determined both the problems involved in the administration of the program and the ways in which these proposals would meet the transportation needs of the elderly and handicapped.

A more detailed look at the applications submitted by agencies in the Capital District of New York will pinpoint, according to the author, some of the implications this program will have for the agencies themselves as well as the elderly and handicapped as a group.

Recommendations are suggested to increase the effectiveness of these transportation services to the elderly and handicapped. A selected bibliography is included. The appendices contain the "Summary of New York State Applicants for Section 16 (b) (2) Funding," and the "New York State Department of Transportation Applicants Information Guide for Capital Assistance to Private Nonprofit Corporations to Provide Transportation to the Elderly and Handicapped."

NTIS ORDER NO.: PB 249-105/AS

PRICE: \$6.00

TITLE: EYEWITNESS TESTIMONY

AUTHOR: University of Washington
(Elizabeth F. Loftus)

DATE: September 1975

PROJECT NO.: WA-11-0004

KEYWORDS:

1. Safety
 2. Surveys
-

This report has dealt 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 she/he has experienced. A major conclusion is that questions asked subsequent 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.

In many of the experiments described, subjects viewed a film or a video tape depicting a complex event like a traffic accident. After the event, the subjects were asked either neutral or biased questions. The former produced more accurate answers. In other experiments, after being asked either neutral or biased questions, the subject waited a period of time, and was then retested to assess the effects of the initial questions. Again, a person who is asked biased questions initially, gives biased answers to questions that are asked of him later on. 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.

NTIS ORDER NO.: PB 253-985/AS

PRICE: \$3.50

TITLE: A PRELIMINARY SYSTEMS DESIGN FOR A MULTI-PURPOSE
TRANSIT AND MANAGEMENT INFORMATION SYSTEM

AUTHOR: University of Washington
(Thomas Walter Friedman)

DATE: March 1976

PROJECT NO.: WA-11-0005

KEYWORDS:

1. Management, Operations and Techniques
 2. Information Aids
 3. Schedules and Scheduling
 4. Planning
-

This report presents a preliminary systems design for a multipurpose transit planning and management information system. It conceptualizes two such information systems: one for the automation of transit schedule data and street network data for a general transit information system. While the former system is designed to produce the types of reports currently manually produced and in use by the transit industry, the latter system is intended to provide an automated data base for the planning and marketing of transit services.

The purpose of the report is to provide transit properties and others with an efficient file structure for organizing schedule data for the production of various types of output based on the concept of random access search. Much of the report is highly technical in nature and an understanding of automated data structuring techniques is useful, although not absolutely necessary, to its understanding.

NTIS ORDER NO.: PB 255-178/AS

PRICE: \$5.50

TITLE: EFFECT OF ENERGY SHORTAGE AND LAND USE
ON AUTOMOBILE OCCUPANCY RATE

AUTHOR: Marquette University
(Robert E. Beglinger and Jahanbakhsh Behnam)

DATE: June 1975

PROJECT NO.: WI-11-0002

KEYWORDS:

- | | |
|------------------------------------|----------------------|
| 1. Traffic Analysis,
Congestion | 5. Energy, Crisis |
| 2. Private Transportation,
Auto | 6. Ridership, Volume |
| 3. Land, Use | |
| 4. Fuel, Storage and Supply | |
-

The problem of congested freeways and the low levels of service during the rush hour period is one of the prime concerns in urban transportation. In recent years considerable attention has been directed toward increasing the occupancy rate of automobiles on the freeway system in an effort to reduce the freeway congestion.

This report attempts to investigate the characteristics of the automobile occupancy rates in the Milwaukee metropolitan area by analyzing data for a four year period to determine the effects of gasoline shortage, land use characteristics, and peak-hour periods on occupancy rates. The fluctuation in the occupancy rates was statistically examined by segregating the land use characteristics of the area into two classifications of low and high intensity areas. Furthermore, the statistical analyses were extended to examine the effects of price increases and unavailability of gasoline on the occupancy rates during the conduct of the study.

The results indicated that the unavailability of gasoline is the most influential factor in increasing occupancy rates while the higher prices of gasoline induced a temporary increase in occupancy rates. The study revealed that the areas with a high intensity of land use are generally associated with high occupancy rate. It was also determined that the occupancy rates are independent of time and no significant trends were established.

NTIS ORDER NO.: PB 254-921/AS

PRICE: \$4.00

TITLE: FACTORS INFLUENCING THE ADOPTION OF
MANAGEMENT INNOVATION IN THE CTA

AUTHOR: Marquette University
(Daniel Robey and M.M. Bakr)

DATE: July 1976

PROJECT NO.: WI-11-0002

KEYWORDS:

1. Management, Operations and Techniques
2. Research Activities
3. Transportation Systems Management
4. Computer Applications
5. Information Aids

This study reflects the view that management's primary responsibility is decision-making, and among the most significant management innovations are the computer and information systems which support decision-making. The basic assumption is that better transportation services can be provided if transit management adopts modern decision tools and successfully manages needed organizational change. The focus herein is on the management of transit operations, not the planning commissions.

This study examines the process of management innovation in one transit property, the Chicago Transit Authority (CTA). The purpose of this study is to identify those factors of greatest relevance to innovation in organizations and to describe the extent to which those factors have helped the CTA to innovate successfully. Specifically, this research effort is designed to assess the environmental, organizational, linking, and attitudinal factors related to the recent adoption by the CTA of two management innovations: 1) Bus Utilization System--an on-line, real-time information system to monitor the maintenance status of buses and assist in maintenance decisions; and 2) Microfiche Viewers in the Travel Information Center--an information retrieval device to assist operators giving travel information to calling patrons of the CTA. Both innovations significantly affect decision processes and have present and potential advantages for transit management. Along with institutional data, data were collected from structured interviews and questionnaires administered to persons closely involved with the development and use of the two CTA innovations. (Data collection tools are contained in Appendix of this report.) Results show that organizational structure of the CTA had a positive influence of the adoption of both innovations.

In this report, a broad overview of the history of mass transportation, the general climate for innovation in the transit industry, and the historical roles of the CTA in transit innovation are presented. Areas proposed for further research are longitudinal research designs, measurements of variables across many transit properties so that results would be more general, and the proposal that intensive case study methods be abandoned and standardized questionnaires be used more in data collection.

NTIS ORDER NO.: PB 266-154/AS

PRICE: \$5.50

TITLE: OBTAINING TRANSPORTATION MODE UTILITIES USING THE
ELIMINATION BY ASPECTS MODEL

AUTHOR: Marquette University
(G.G. Makowski, M.M. Bakr, and K.C. Sinha)

DATE: October 1975

PROJECT NO.: WI-11-0002

KEYWORDS:

1. Models and Modeling
2. Planning, Tools
3. Modal Choice

Estimates for the utility parameters of the Elimination by Aspects (EBA) probabilistic model of human choice are obtained using a least squares fit to the observed probabilities. These heuristic estimators are considerably easier to obtain than the usual maximum likelihood estimators of the EBA parameters.

The estimators and their usefulness to transportation planners are presented via a survey of transportation preferences conducted in the Milwaukee County.

NTIS ORDER NO.: PB 254-638/AS

PRICE: \$4.00

TITLE: A STUDY OF THE EFFECTS OF EARTHEN ATTENUATION DEVICE IN REDUCING NOISE AND IMPROVING PRIVACY IN NEIGHBORHOODS ADJACENT TO URBAN FREEWAYS

AUTHOR: Neil R. Wienser (Wisconsin Department of Transportation)
Kumares C. Sinha (Marquette University)

DATE: May 1974

PROJECT NO.: WI-11-0002

KEYWORDS:

1. Noise and Noise Control
 2. Highway
 3. Topography
-

The use of earth berms as a method of attenuating highway noise pollution into adjacent residential neighborhoods has, according to the authors, become more prevalent throughout the U.S.

In the summer of 1972, the Division of Highways of the Wisconsin Department of Transportation constructed earth berms for sound attenuation along I-94 in Milwaukee and Waukesha Counties. The purpose of this report was to compare and assess the measured and calculated attenuations obtained from these sound berms, and to assess the perceived effects of selected berms on adjacent residential neighborhoods by means of an attitude survey.

The study concluded that even minor attenuations of freeway noise of 5dBA or less are discernible within adjacent neighborhoods, and based upon the subjective responses to the attitude survey, are perceived to be greater than actually measured.

Recommendations for the future development of sound attenuation devices are made. These include: public information and local participation, attention to adjacent land drainage, dissemination of landscaping/maintenance policies, and investigations into locating berms on limited highway easements, right-of-way fence placement on the berm, and the use of combination earth berm-solid wall attenuation barriers.

NTIS ORDER NO.: PB 244-053/AS

PRICE: \$7.50

TITLE: A SYSTEMS APPROACH OF OPTIMAL BUS NETWORK DESIGN

AUTHOR: Center for Urban Transportation Studies
(Jen-de Hsu and Vasant H. Surti)

DATE: September 1975

PROJECT NO.: WI-11-0002

KEYWORDS:

- | | |
|---|-----------------------------|
| 1. Bus, Busway | 5. Routes and Routing |
| 2. Management, Planning and
Analysis | 6. Models and Modeling |
| 3. Planning, Tools | 7. Schedules and Scheduling |
| 4. Research, Activities | |
-

This report is presented as part of a program of Research and Training in Urban Transportation at Marquette University sponsored by UMTA. It reflects the view that one possible way to improve planning efficiency is to provide the transit planner with better coordination with decision makers and a systematic framework for the bus network design.

The purpose of this research is to present a new approach for bus network design. The proposed framework is composed of four submodels: attitude model network generating model, prediction model, and evaluation model. The attitude model aims to assist the planner in understanding the decision maker's attitudes toward various planning goals. Based on each set of weighted objectives, a transit network is then developed by the alternative-generating model. Transit usage of this network is predicted and operating performance are evaluated in the remaining two models.

This proposed framework is implemented on a macromodeling basis, i.e., a systems approach of bus network design in which a city is first modeled and bus routes are then fitted into this urban network of nodes and links. This macromodeling approach is contrary to the street-by-street modeling of bus routes. Development priorities for various types of bus routes are derived from the socioeconomic characteristics of nodes along the route. Sample applications of this new approach to bus network design are presented using both theoretical viewpoints and empirical analyses. An example of the application of the proposed methodology to the Denver area is given to illustrate the operational characteristics of the framework.

This study concludes that the proposed approach is a workable one, and will be a help to planners in improving the efficiency of transit planning.

NTIS ORDER NO.: PB 266-661/AS

PRICE: \$5.50

TITLE: AN ANALYSIS OF SYSTEM TRADEOFFS TO IMPROVE ACCESS TO
SPECIAL GENERATORS

AUTHOR: University of Wisconsin
Department of Systems Design
(Frederick J. Wegmann, et al.)

DATE: August 1973

PROJECT NO.: WI-11-0003

KEYWORDS:

- | | |
|----------------------------------|---------------------------|
| 1. Access, Planning and Control | 6. Airports, Access |
| 2. Bus, Shuttle | 7. Carpools/Buspools |
| 3. Parking, Capacity and Demands | 8. Models and Modeling |
| 4. Universities | 9. Traffic Analysis, Flow |
| 5. Medical Centers | 10. Computer Applications |
-

Traffic congestion and extensive parking needs for the immediate area of special traffic generators (airports, universities, shopping centers, hospitals) create access and egress problems of major proportions. Difficulties are compounded by the fact that these generators are often located in established residential areas which preclude the securing of additional land to handle increased spatial demands for parking. A review of literature is offered to demonstrate the need for research in this area.

The objective of this study is to identify the role of alternative transportation systems in providing access to special generators. The alternatives under study include: 1) highway-oriented travel on freeways and arterial streets; 2) transit service operating within a transit service area; 3) provision of remote parking lots and express shuttle service directly to the special generator; and 4) encouragement of car pooling.

A computerized model was developed to test alternative access systems. This model was applied to a sample special generator, and urban university, located within a hypothetical city. Traffic flows were simulated and quantitative analysis was used to determine the level of demand and service at which one alternative dominated the others. Topics discussed include alternative system configurations, preliminary tests of the alternatives, costs and benefits at peak hours, changes in value of time, offpeak hours, variable generator size and institutional and operating considerations.

Results indicate that efficient, frequent and low cost service will encourage increased patronage by the model university community. To alleviate the expense of providing costly service additions to the entire regional transit system, specialized transit services might be instituted. An example of such specialized service would be the provision of express shuttle bus service directly to a generator from outlying parking lots.

NTIS ORDER NO.: PB 228-349/AS

PRICE: \$5.00

TITLE: BUS ACTUATED SIGNAL PREEMPTION SYSTEMS
A Planning Methodology

AUTHOR: University of Wisconsin-Milwaukee
(Robert N. Taube)

DATE: May 1976

PROJECT NO.: WI-11-0003

KEYWORDS:

- | | |
|---|-----------------------------------|
| 1. Bus, Priorities | 4. Planning, Tools |
| 2. Management, Planning
and Analysis | 5. Signs and Signals |
| 3. Research Activities | 6. Intersections and
Crossings |

Although bus preemption systems have been tested and proven feasible, no generalizations have been drawn from these experiments which have prevented planners from applying this innovation to their particular problems or geographic locations with any assurance it would be economically desirable. The overall purpose of this study is to generalize the results of previous research, experimentation, and demonstration and to derive design guides and warrants for the installation of bus-actuated, signal-preemption equipment.

In particular, this report examines the conditions under which a green extension signal-preemption can be operated, and constructs equations which describe its behavior in terms of costs and revenues generated to the bus, its passengers, and other traffic. These equations are then used to compute a revenue-cost ratio which may be used for evaluating the economic desirability of installing this type of preemption system at a particular intersection.

This report concludes that bus priority at controlled intersections by means of bus-actuated, signal-preemption systems is a productive use of technology. This report's methodology can be useful to traffic engineers and transit planners for designing and proposing workable preemption systems to improve transit operations.

The Appendices contain charts/tables that illustrate a comparison of Bus Priority Strategies in seven cities; UTCS-BPS simulation results; and computer results that reflect dollars saved or lost per preemption used.

NTIS ORDER NO.: PB 265-797/AS

PRICE: \$6.00

TITLE: THE LEGAL FRAMEWORK FOR COLLECTIVE BARGAINING
IN THE URBAN TRANSIT INDUSTRY

AUTHOR: University of Wisconsin-Madison
Industrial Relations Research Institute
(James L. Stern, et al.)

DATE: November 1976

PROJECT NO.: WI-11-0004

KEYWORDS:

1. Labor Relations
 2. Employment
-

This report is but one part of a more general study of Labor Relations in Urban Transit financed by UMTA. The general study, "Labor Relations Problems, Practices and Policies in the Transit Industry," will be submitted to UMTA as four separate reports. The purpose of this general study is to analyze labor relations trends in municipal bus systems, to identify determinants of wage rates and labor costs, and to examine the impact of governmental assistance programs on the collective process and outcomes of collective negotiations.

This report analyzes the legal framework of collective bargaining in local transit within the private-public transition period of transit systems. It is organized in six chapters. The introductory first chapter presents a historical perspective of the problem. Chapter 2 reviews the legislative history of Section 13 (c) of the UMTA Act of 1964, as amended, and examines the origin and evolution of the Memphis formula (a mechanism that Congress relied upon as the means of preserving existing private sector bargaining rights when Federal funds are used by local public authorities to purchase private transit systems). Chapter 3 reviews the regional transit authorities and the legal labor relations framework in which they operate. Chapter 4 discusses the role of the National Labor Relations Board in local transit. Chapter 5 contains a survey of state regulations including court decisions and attorney general opinions by which labor relations can be affected for the 50 states and the District of Columbia. Chapter 6 summarizes the findings and contains recommendations for consideration in framing future public policy, as well as an outline of several public options that may be exercised to resolve problems discussed in this report.

NTIS ORDER NO.: PB 266-110/AS

PRICE: \$7.50

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