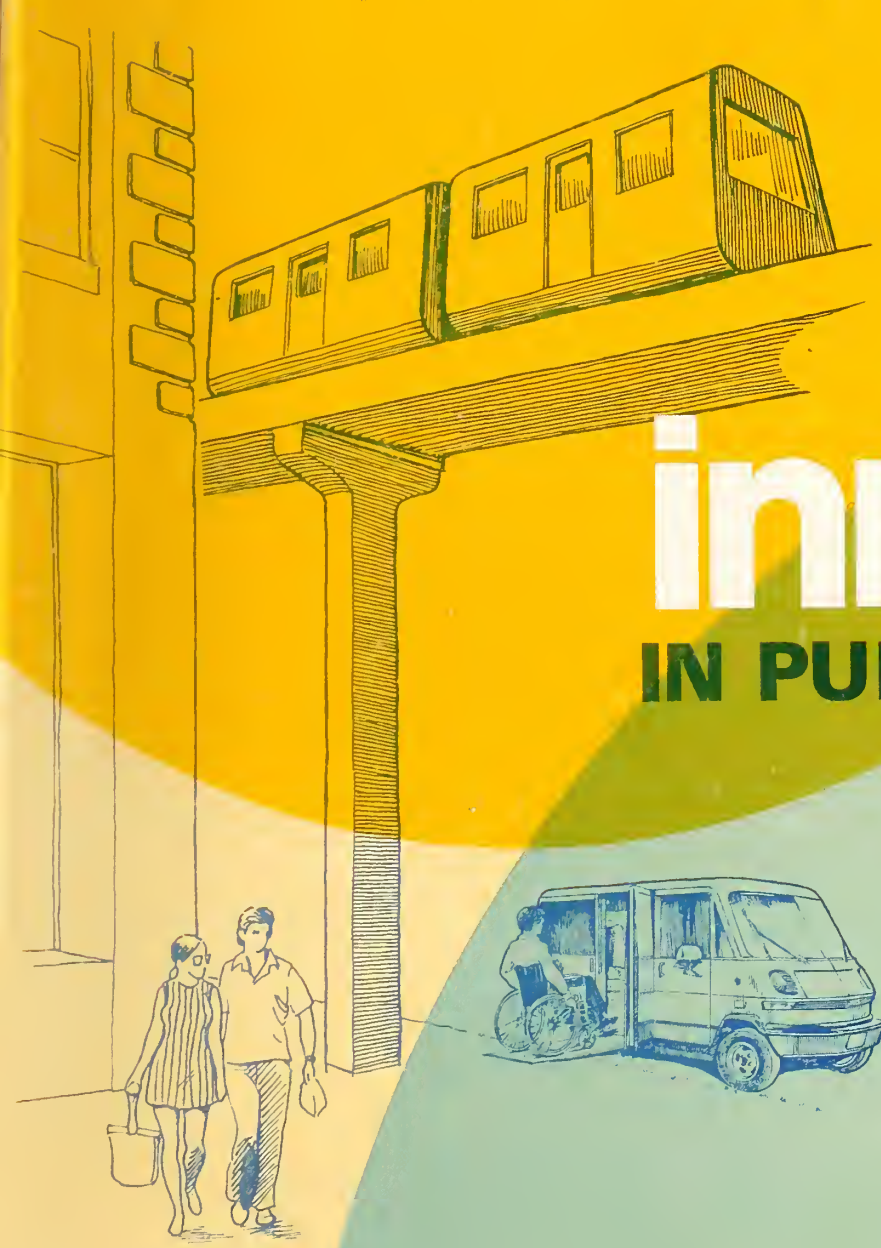

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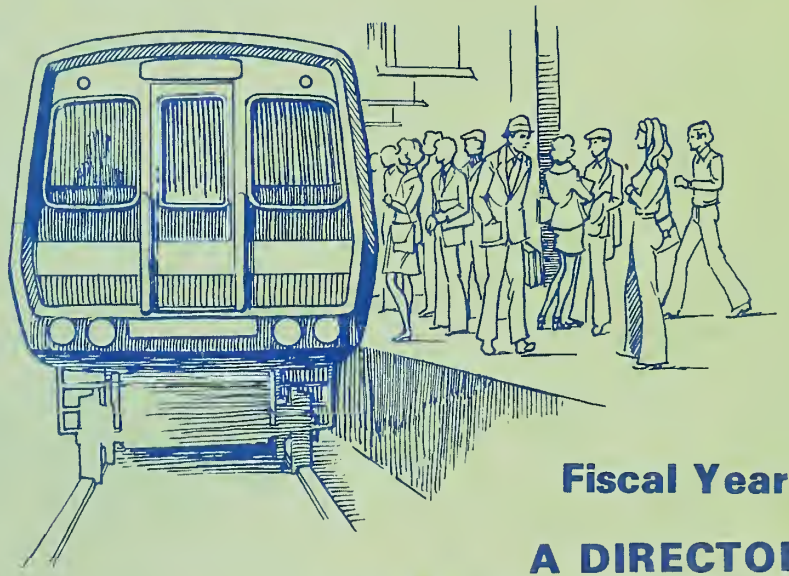

Fiscal Year 1977

A DIRECTORY of RESEARCH, DEVELOPMENT and DEMONSTRATION PROJECTS

U.S. DEPARTMENT OF TRANSPORTATION
Urban Mass Transportation Administration
Washington, D.C. 20590

innovation
IN PUBLIC TRANSPORTATION

A DIRECTORY OF
RESEARCH, DEVELOPMENT
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FISCAL YEAR 1977

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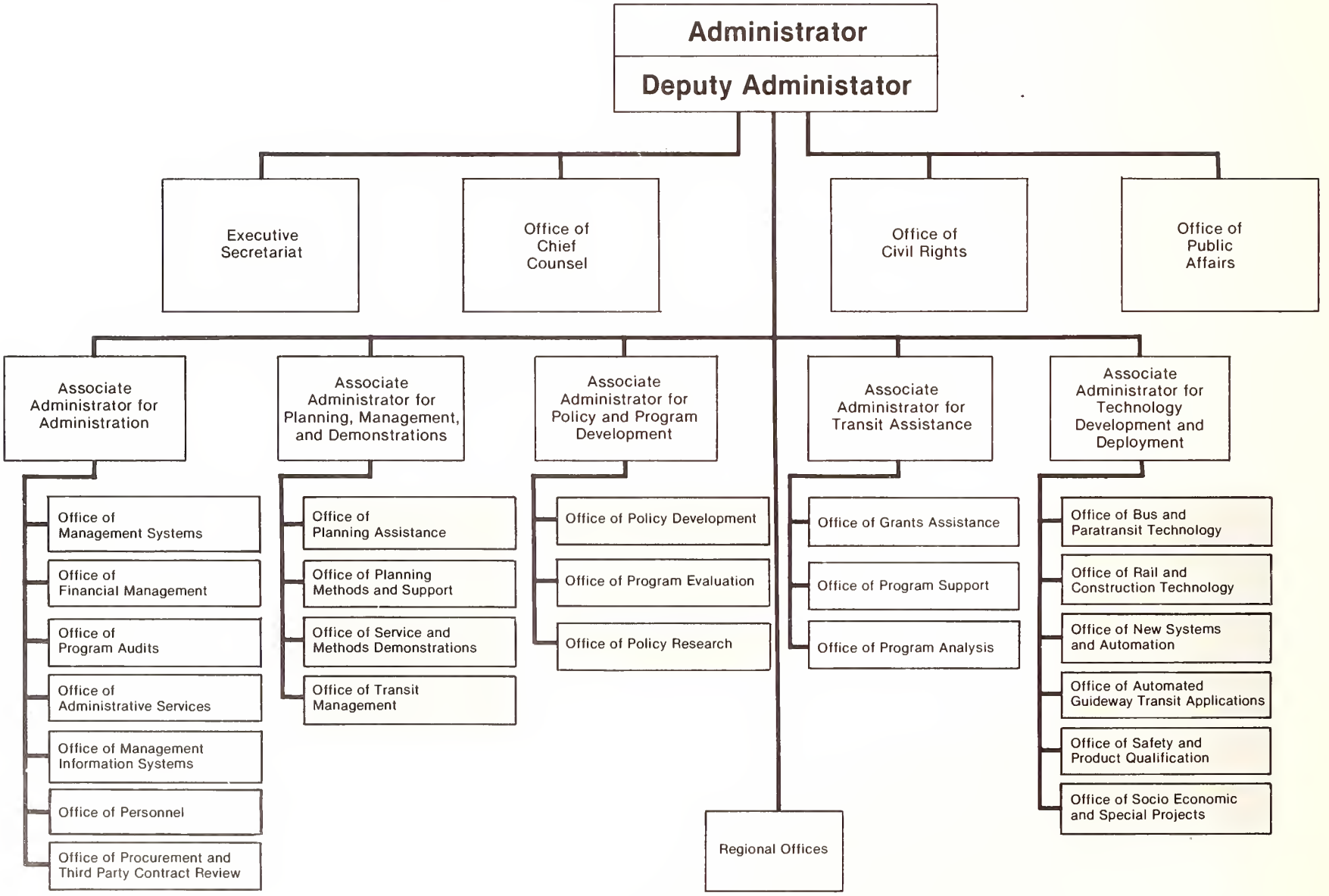
URBAN MASS TRANSPORTATION ADMINISTRATION



INTRODUCTION AND OVERVIEW

This annual publication contains descriptions of current research development and demonstration (RD&D) projects sponspored and funded by the U.S. Department of Transportation's Urban Mass Transportation Administration (UMTA).

RD&D projects are conducted under the authority of Section 6 of the Urban Mass Transportation Act of 1964. This statute authorizes the Secretary of Transportation "to undertake research, development, and demonstration projects in all phases of urban mass transportation...which he determines will assist in the reduction of urban transportation needs, the improvement of mass transportation service, or the contribution of such service toward meeting total urban transportation needs at minimum costs." The Act also authorizes "the development, testing and demonstration of new facilities, equipment, techniques and methods."

Each year a portion of the funds which are made available for local transportation planning studies (Technical Studies) is used for Special Studies to help local planning agencies and UMTA improve the quality of information used for local transportation planning. Technical Studies activities are authorized under Section 9 of the Urban Mass Transportation Act. In addition, Section 11 of the Act authorizes a program of University Research and Training Grants. These grants are designed both to meet UMTA's research needs and to stimulate professional growth in fields relating to transportation. Because the Special Studies and University Research Programs contribute materially to transportation research and to the urban transportation knowledge base, summaries of their projects and listings of available reports are included in this publication.

The charts show UMTA's organization structure and a summary of RD&D activities as indicated by funding. Organizational units which are responsible for RD&D are shaded in the organization chart. The summary of activities indicates the relative effort in each program area and identifies the chapter where project descriptions are located in this report.

Urban Mass Transportation Administration

Summary of RD&D and Related Funding
(dollars in thousands)

	Prior Years	FY 1977 Actual	FY 1978 Estimate	Chapters
Technology Development and Deployment:				
Bus and Paratransit Technology	$ 59,571	$ 7,059	$ 6,800	1 & 2
Rail and Construction Technology	116,713	13,742	14,000	3
New Systems and Automation	66,336	7,913	11,725	4
Automated Guideway Transit (AGT) Applications	66,942	4,921	6,975	5
Safety and Product Qualification	1,776	784	1,300	6
AGT Socio-economic Research	1,426	964	750	7
Special Projects	11,961	967	1,050	7
Service and Methods Demonstrations	65,000	14,000	15,500	8 thru 11
Planning Methods and Support	9,825	3,200	3,250	12
Special Studies (Section 9 Funds)	10,420	2,000	3,000	12
Transit Management Techniques and Methods	13,431	2,950	3,000	12
Policy and Program Development	4,500	2,200	2,150	13
University Research (Section 11 Funds)	19,247	2,000	2,000	14

TECHNOLOGY DEVELOPMENT AND DEPLOYMENT (CHAPTERS 1-7)

Although technology cannot provide direct solutions to many of the economic and institutional problems of urban mass transportation, it is clear that the influence and resources of the Federal Government should be used to maximize the contribution of modern technology toward solving these problems. Accordingly, UMTA has established the following objectives for its research, development, and demonstration efforts in Technology Development and Deployment:

In conventional bus and rail transit design, equipment manufacture, or construction, to obtain either (a) substantial reduction in life-cycle costs without sacrificing performance, safety, or service capability, or (b) substantial improvements in safety, performance, or service capability in a cost-effective manner;

To support selected high-risk, high-technology R&D initiatives which promise significant potential increase in productivity through the introduction of automation into transit operations (where such initiatives are beyond the financial or other capabilities of the private sector); and

To support national priorities, such as central city revitalization, accessibility for elderly and handicapped persons, safety, energy conservation, and environmental protection.

The approach used by UTD to meet its objectives involves sponsoring research, development, test, evaluation, and demonstration of selected new technologies to prepare for their deployment in operational transit service. In addition, the Office of Technology Development and Deployment participates actively in developing and reviewing equipment specifications, in promoting standardization of transit vehicles and equipment, and in qualification of new and improved transit products. UMTA conducts evaluations and assessments of existing technology, publishes state-of-the-art summaries, and cooperates with agencies such as EPA, ERDA, and the National Bureau of Standards in carrying out programs of national importance.

UMTA's delivery system for new or improved transit technologies depends, ultimately, on the purchase of new products with UMTA capital grant assistance. The fundamental strategy for improving the deployment process for new transit technology will be to coordinate the efforts of UMTA's Office of Technology Development and Deployment (UTD) and its Office of Transit Assistance (UTA) in such a way as to foster the timely introduction of proven new products, and to conduct the field demonstrations in revenue service necessary to prove them.

UMTA attempts to meet the technical information needs of client groups through conferences, seminars, workshops, technical papers, project reports, and special reports targeted at particular groups of users. The needs of client groups are ascertained, and the results of UMTA Technology Development and Deployment efforts are communicated by conferring and cooperating directly with representatives of these groups, which include transit operating properties, transit equipment suppliers and developers, consultant firms, State and local government agencies, public interest groups, universities, foreign governments, and foreign industrial firms.

Responsibility for developing and introducing new or improved systems and technologies is delegated to the Associate Administrator for Technology Development and Deployment (UTD), George J. Pastor. The principal organizational units which manage programs in this area are:

Office of Bus and Paratransit Technology, Bernard J. Vierling, Director

Office of Rail and Construction Technology, Russell K. McFarland, Director

Office of New Systems and Automation, Charles Broxmeyer, Director

Office of AGT Applications, Steven Barsony, Director

Office of Safety and Product Qualifications, William J. Rhine, Director

Office of Socio-Economic and Special Projects, Henry Nejako, Acting Director

SERVICE AND METHODS DEMONSTRATIONS (CHAPTERS 8-11)

UMTA's Service and Methods Demonstrations Program is intended to develop new

techniques for using the current generation of transit equipment in providing improved quality, quantity and efficiency in public transportation. A large number of innovative methods for increasing the level of service and the productivity of transit have been developed both by UMTA and by various transit properties over the past few years. The primary focus of this program is to perform the final developmental steps, where required, and to bring some of these techniques into full operational application.

Service and methods demonstrations emphasize coordinated transportation for the entire trip; that is, the means for getting a person from his origin to his desired destination, wherever it may be, as quickly, efficiently and comfortably as possible. In most cases this requires a combination of modes (paratransit, bus, rail) working together in a coordinated fashion in order to provide a variety of services for the various users, trip purposes, and routes.

The program is designed to accomplish one or a combination of the following objectives:

Reduce travel time by transit. This is an important factor in increasing transit ridership and improving vehicle productivity.

Increase the area coverage of transit service. This is important for increasing transit ridership by responding with cost effective approaches for new transit service in lower density sururban areas.

Improve the reliability of transit service. This is one of the most important factors in maintaining and increasing ridership.

Increase the productivity of transit vehicles. This is most important in the continuing struggle to reduce operating deficits while maintaining or improving service.

Improve the mobility of transit dependents. This is important to provide mobility to people without automobiles.

In order to accomplish its objectives, the Service and Methods Demonstrations Program is organized into five major functional areas as follows:

Conventional Transit Service Innovations, which includes a wide variety of demonstrations aimed at improving conventional fixed-route transit systems. Emphasis has been placed on expediting peak period movement of passengers on surface transit vehicles (bus, light rail, and trolley bus). Other multiple occupant vehicles such as shared ride taxis, carpools, and vanpools also may be candidates for receiving priority treatment depending on local conditions. Projects also include exclusive busways, reserved lanes on freeways, arterials and city streets; signal preemption, transit malls, auto restricted zones, and vehicle innovations.

Paratransit, which includes a broad range of services that occupy the transportation spectrum between conventional transit and the private auto, i.e., dial-a-ride, jitney, vanpools, taxis, subscription buses, and other forms of ride sharing. The main intent is to provide improved transportation by increasing vehicle occupancy in a number of ways.

Service for Special User Groups, which seeks to develop specialized services that will provide for the needs of the transit dependent person - the elderly, handicapped, young, and poor. These kinds of services include novel methods to improve inner city circulation, "reverse" commuting, testing of specialized equipment for elderly and handicapped, subscription services, demand responsive services and user side subsidies.

Pricing Policies, which focus on experiments to better understand the relationship between increased transit patronage and reduced auto usage through a variety of price-related (i.e., economic) incentives and/or disincentives. These include fare prepayment, reduced fare and free fare transit, and methods to reduce auto use in certain congested areas.

Information dissemination. The final element includes formal and informal distribution of findings regarding concepts and applications through site visits, workshops, conferences, and publications.

The Service and Methods Demonstrations Program is one of the responsiblities of the Associate Administrator for Transportation Planning, Management, and Demonstrations, Robert H. McManus. Projects in this area are managed by the Office of Service and Methods Demonstrations, Ronald J. Fisher, Director.

TRANSPORTATION PLANNING AND MANAGEMENT (CHAPTER 12)

The objective of UMTA's programs in this area is to obtain more effective and economical results from Federal planning, capital and operating assistance funding by means of improved planning and management information and techniques.

The Planning Methods and Support Programs consist of research, development, and dissemination of new, computerized, and manual techniques to assist Federal, State, and local agencies in their planning, implementation, and operation of urban transportation systems. These techniques, called, collectively, UTPS for Urban Transportation Planning System, support both national and local transportation resources, and the evaluation of alternative system improvements. The goal of these research and development efforts is to provide essential support for the planning assistance and capital grant programs by continually improving local and Federal planning capabilities.

As an integral part of its planning assistance program, UMTA supports special studies to improve the quality of information available for use in the local planning process, or for UMTA policy and investment decisions. The focus of these studies is to improve evaluation techniques and develop information readily and accurately transferrable from one area to another.

During FY 1976 and FY 1977, studies to investigate impacts of major transit investments have continued to have a high priority. A substantial amount of special studies funds have been used to determine the effects of major rail rapid transit improvements in San Francisco and Washington, D.C. Study design efforts for similar studies are under way in Atlanta, Miami, and Buffalo. Funds allocated for special studies are being used to improve the efficiency of various in-house policies (e.g., Elderly and Handicapped Regulations). Some of the funds are being used to develop Transportation System Management (TSM) prototype planning studies, as well as new planning tools for TSM in response to UMTA policy on efficient use of existing transportation facilities.

The Transit Management program is designed to assist mass transit operators in making the most effective use of their limited funds. Assistance takes the form of research and demonstration projects to develop new and improved management techniques for the transit industry, as well as efforts to implement these new techniques in the day-to-day operations of transit systems. The administration of the Section 15 Reporting System is also the responsibility of the Transit Management Program. Section 15 of the Urban Mass Transportation Act calls for development of uniform operating and financial reporting and uniform accounts and records systems.

Responsibility for these programs is delegated to the Associate Administrator for Transportation Planning, Management, and Demonstrations, Robert H. McManus. Principal organizational units consist of the following:

Office of Planning Methods and Support, Robert B. Dial, Director

Office of Planning Assistance, Charles H. Graves, Director

Office of Transit Management, Brian J. Cudahy, Director

POLICY AND PROGRAM DEVELOPMENT (CHAPTER 13)

The primary purpose of research in this field is to promote a better understanding of the emerging urban transportation issues, needs, and objectives; to monitor and evaluate the impact and effectiveness of UMTA programs; and to aid in the formulation of new policies and program directions.

Projects in the policy development area include development of policy and program alternatives on such issues as the private vs. public roles for transportation services and the potential effects of transit projects on urban development, and accessibility for elderly and handicapped people. Evaluations include the development of performance measures and analysis of trends as well as evaluations of such UMTA programs as the formula assistance and rail modernization programs. UMTA's program in policy research is designed to advance the understanding and resolution of urban transportation problems and to aid policy and program decisions at the Federal level. Studies include transportation and land use interactions, productivity, financing, energy conservation, center city, and low density service problems and accessibility for elderly and handicapped people.

During FY-77 these activities were the responsibility of C. Kenneth Orski, who was then Associate Administrator for Policy and Program Development. The current Associate Administrator is Lillian C. Liburdi. Activities are conducted under the following organizations:

Office of Policy Development, Lawrence L. Schulman, Director

Office of Program Evaluation, Bruce T. Barkley, Director

Office of Policy Research, Milton Brooke, Acting Director

UNIVERSITY RESEARCH (CHAPTER 14)

Grants to universities, as authorized by Section 11 of the UMT Act, are used to (1) support research which is relevant to the programmatic needs of the Urban Mass Transportation Administration and will strengthen State and local capabilities to plan, design, and operate transportation systems and services; (2) encourage and support increased university involvement in transportation matters of local concern; (3) provide mid-career training for urban transportation professional and management employees (4) attract more of the nation's young talent into public transportation careers, and (5) encourage universities to become a source of ongoing advice, observation, and evaluation with respect to transportation plans, programs and projects in their own communities, and to serve as a mechanism for the exchange of experience with other cities and transit properties.

The University Research Program is administered by the Office of Policy Research under responsibilities delegated to the Associate Administrator for Policy and Program Development. The program is directed by Philip G. Hughes.

ABOUT THIS DOCUMENT

It is UMTA's policy to make readily available to the public information about research, development, and demonstration activities it conducts. The principal methods of reporting are through publication of report abstracts and by this publication which summarizes the status of individual projects.

Most of the completed projects included in this 1977 volume have reports already published or in the publication process. The Urban Mass Transportation Administration does not distribute these reports unless so indicated. They are available from the National Technical Information Service, U.S. Department of Commerce. Since its inception, UMTA has published four volumes of report abstracts. Details on how to obtain the abstract volumes and technical reports are provided in Appendix 1 of this volume along with information about other information sources.

The dates listed in the table at the end of each chapter usually indicate the period of time from approval by the UMTA Administrator to receipt of a draft of the final report. The "Funding" represents, except when otherwise indicated, Federal money provided by UMTA. Funding figures in this document are provided only to give an indication of the scope of individual tasks, and in most cases, funding figures are cumulative. Small support tasks and contracts under $10,000 are not always calculated into the project totals. The figures in this document, therefore, should not be used for budget analysis. This volume focuses on activity during the period October 1, 1976 September 30, 1977. Funding recipients are listed as 'contractor' although some may in fact to grantees.

Appendix 2 provides information on participating in UMTA's research development and demonstration programs, including: notification of planned procurements, submission of proposals, proposal evaluation criteria, University Research grants, etc.

This document was prepared as part of the Technology Sharing program of the Office of Technology Development and Deployment for distribution to State and local governments, planners, legislators, educational institutions, transportation agencies, industry, and the research community. While copies are still available, they may be obtained from:

Technology Sharing Office, DTS-151
U.S. Department of Transportation
Research and Special
Programs Administration
Transportation Systems Center
Kendall Square
Cambridge, Massachusetts 02142
(617) 494-2486

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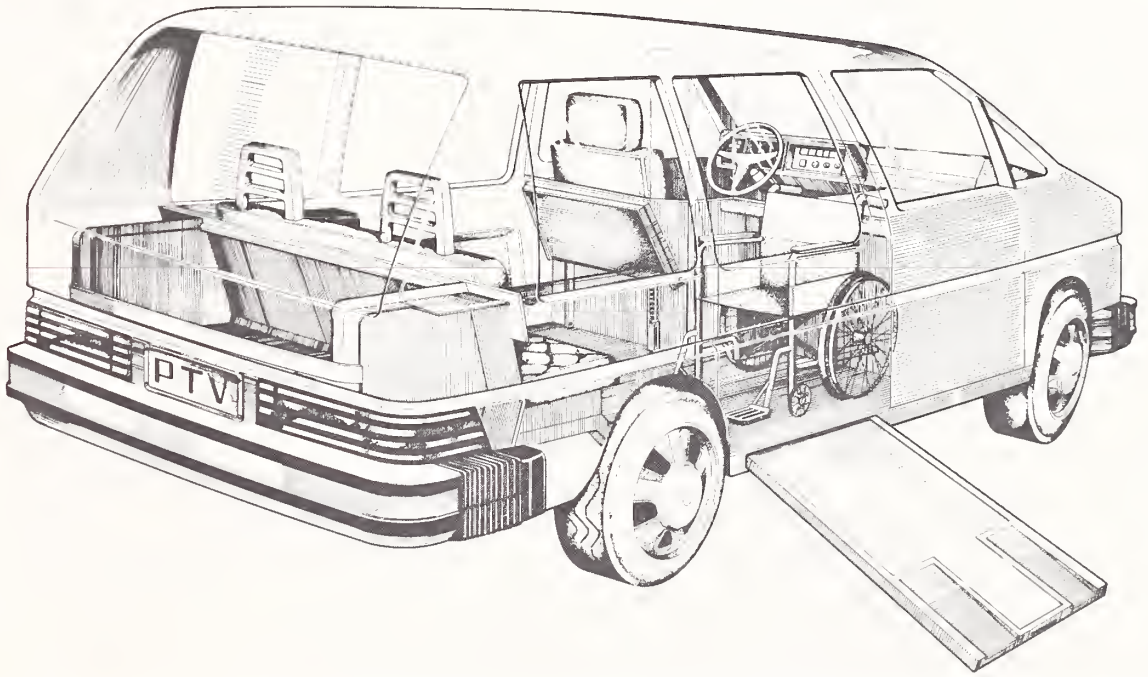


Paratransit Vehicles - Developed to Fill the Gap Between Conventional Public Transit and the Private Automobile.

Bus and paratransit vehicles offer the most flexible and readily available form of public transportation in urban areas - in fact, buses and paratransit vehicles carry more people in our cities than do all other mass transit modes combined. The UMTA Office of Bus and Paratransit Technology has directed its research and development efforts to bus vehicle development, paratransit vehicle development and the development of operational systems that will increase efficiency and service levels.

Special attention is directed to increasing the safety, comfort, efficiency and public acceptability of bus and paratransit services. Projects to reduce fuel consumption, improve air quality, and accommodate elderly and handicapped people are also part of the UMTA program.

Culminating six years of development of TRANSBUS, Transportation Secretary Brock Adams mandated that all future standard-size urban buses must meet the DOT TRANSBUS requirements. These requirements, which take into account the needs of elderly and handicapped people will make public transportation more accessible to a greater number of people.

Paratransit vehicles which provide transportation in many areas that cannot sustain regular transit service are also an important part of UMTA's work in developing more useful and efficient equipment. The two UMTA-developed paratransit vehicle prototypes have been applauded by paratransit operators, users, and various elderly and handicapped groups at national paratransit and taxicab meetings, state fairs, and auto shows throughout the country.

BUS DEVELOPMENT

Design of a Modern 40-Foot Transit Bus (TRANSBUS)

UMTA's TRANSBUS program was designed to achieve the most advanced bus design practicable within the state-of-the-art. The particular areas of improvement emphasized were: comfort and ride quality; improved safety for passengers, pedestrians, and occupants of other vehicles; reduced maintenance; and lower floor and better access and interior arrangements which accommodate elderly and handicapped riders.

Designs have been developed, prototype vehicles fabricated, and the designs evaluated, following both proving-ground and transit in-service tests. From the evaluation of the prototype designs, a technical specification has been developed for a production TRANSBUS. A production version of any one of the three different prototype designs could meet this specification. With the development of the technical specifications and related procurement documents for the purchase of the production Transbus, the prototype phase was completed.

The deployment phase of the program was initiated by the mandate of TRANSBUS in May 1977, by the Secretary of Transportation. Under the stated policy all full-size buses purchased with Federal assistance after September 30, 1979, will be required to meet the TRANSBUS specification, including a 22-inch floor height, a 4-inch kneeling feature, and an access ramp. The

AM General Corp.

General Motors Corp.

Rohr Industries

procurement documents have been revised to incorporate the details of the Secretary's mandate, and are subject to constant revision. Anyone needing these documents for the procurement process or other serious purposes may obtain them directly from UMTA.

The design data packages which cover the prototype designs in detail will be maintained by the Transportation Systems Center (TSC), Kendall Square, Cambridge, MA 02142. Representatives of organizations who wish to review or obtain these data should contact TSC directly.

The TRANSBUS prototype program produced reports covering a variety of subjects. All data of permanent significance which was developed under the prototype project is available. Test plans, evaluation plans, interim reports, and other data of a temporary nature are not included in the report listings at the end of the chapter.

Small Bus Requirements, Concepts and Specifications

A small bus suitable for use in urban mass transit applications is increasingly needed but essentially unavailable. Although there are a number of small buses on the market, most are conversions of vehicles designed for other uses and are not entirely suitable for transit use.

The small bus project was designed to; 1) examine small bus operations and projected operations in the U.S.; 2) define desired operating features for small buses; 3) include in these features considerations for elderly and handicapped riders, including wheelchair travelers; 4) produce conceptual small bus designs to meet the operating features; and 5) establish a specification for a small bus suitable for mass transit service in the U.S.

A contract modification included mock-up work to permit evaluation of the effect of varying such factors as floor height, ramp slope, and interior dimensions of access by wheelchair passengers and other handicapped persons. Volunteer subjects with different handicaps participated and assisted in this evaluation.

Study of the Impact of Fare Collection on Bus Design

The nearly universal requirement that the driver monitor the collection of fares inevitably adversely affects the design of buses and their operation. This study was conducted to identify and, when possible, quantity the effects of driver-supervised fare collection. Conceptual bus designs were developed which suggest alternatives when freed from the constraint of providing for on-board fare collection. The actual cost of fare collection was determined for a few typical properties.

Life-Cycle Procurement

This project was designed to establish a procurement method for full-size transit buses based on an operator's actual operating cost data, and a projection of life cycle costing based on relating specific bus designs to these cost data. The work is an application of the methods developed under an earlier project (VA-06-0039).

The project is being carried out parallel to, but independent of, an actual bus procurement under UMTA capital assistance. A normal procurement was selected for comparison and a concurrent simulated procurement was conducted based on projected life-cycle cost.

PARATRANSIT VEHICLE DEVELOPMENT

Paratransit Vehicle

The objective of this program is to stimulate the development of vehicles designed to meet the special requirements of the sector of paratransit services for which present vehicles have only a limited suitability and to bring about a situation where these new vehicles, or similar ones, are produced by the automotive industry. This sector of paratransit includes shared-ride, as well as regular taxicab service, jitney service, and special services for elderly and handicapped people which do not require the larger capacity of small buses.

The vehicle features are: a capacity of 4-6 passengers; convertibility to accommodate 1 or 2 wheelchair passengers; a low, flat floor for improved accessibility; a high maneuverability in urban traffic; high fuel economy; and a low cost of acquisition and maintenance.

In March 1975 contracts were awarded for the design and construction of two vehicles, one to the Advanced Systems Lab in Santa Barbara, Cal. (then a division of AMF, Inc.) and one to Steam Power Systems, San Diego (now Dutcher Industries). Since the pollutant emission requirements were very stringent, both contractors proposed the use of experimental steam engines as the only practical way of meeting them within the specified time period.

In June 1976, the two vehicles were displayed at the Museum of Modern Art in New York along with other innovative taxi vehicles as part of a special exhibition. Both vehicles were an instant success with the public because they demonstrated the feasibility of accommodating 4 passengers in comfort, one of them in a wheelchair, in a vehicle of a size between a subcompact and a compact passenger car. Representatives of the taxicab industry reviewed the vehicles and expressed their interest in the availability of the respective production versions and so testified to Congress.

After completion of the exhibition, the experimental steam engines of the 2 vehicles were replaced with commercially available gasoline engines to assure availability of the vehicles during the subsequent testing without interruptions expected to be caused by the low reliability of the one-of-a-kind steam engines.

After the completion of the tests conducted by an independent laboratory (Dynamic Science, Phoenix, Arizona) both contractors were funded to provide a new set of drawings and specifications for their respective

Paratransit Vehicle Built by the AMF Corporation.

Paratransit Vehicle Built by Dutcher Industries.

vehicles to document changes suggested by the test results, by the evaluation of taxicab operators and handicapped individuals, by the change to internal combustion engines, and by their studies on life cycle cost reduction.

The vehicles have since been exhibited in a number of cities and viewed by 4-6 million people. Their popularity continues at a very high level.

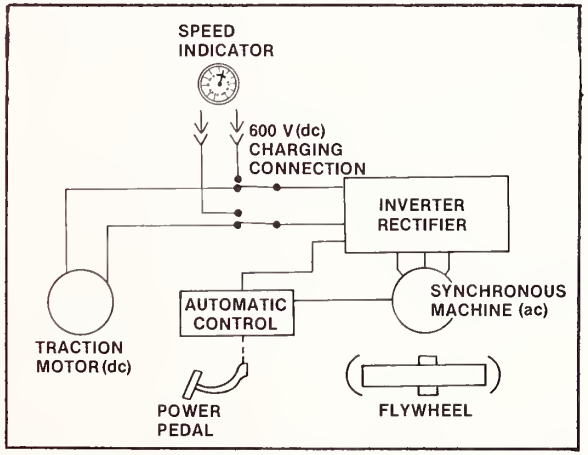
In the meantime, UMTA's plan was approved to procure driveable preproduction prototypes to be tested and exhibited in suitable locations across the U.S. These vehicles will be functionally similar to the earlier ones but they will be designed with special emphasis on low cost of initial investment as well as of maintenance and operation. It is anticipated that up to 3 contracts will be awarded by the end of 1978 for design and fabrication of 3 prototype vehicles by each manufacturer.

Future Paratransit Requirements

Energy cost, population growth, urban development patterns, and institutional incentives are just a few of the many factors that will determine the nature and extent of future paratransit services in this country. This project estimated future paratransit needs by examining a variety of paratransit service alternatives in typical urban settings in three different hypothetical situations for the year 1995, described in terms of energy cost and the degree of automobile disincentives.

The study produced nationwide estimates of future paratransit activity. These estimates show what the country can expect in terms of passenger demand and future vehicle requirements.

The report findings were applied to three areas of immediate concern — paratransit demonstrations, vehicles and facilities, and policy issues. A framework was developed to apply study findings to past and current demonstrations. Vehicle and facility requirements for handling two to fourteen passengers were considered in terms of the future. The study also examined policy issues including resource allocation, the role of private enterprise in paratransit development, labor management concerns, and regulatory barriers.



This Type of Flywheel Propulsion Will Conserve Energy and Permit a More Flexible Trolley Coach System.

ENERGY CONSERVATION AND ENVIRONMENTAL PROJECTS

With the recognition of the energy crisis several years ago, greater public and governmental concern for fuel consumption in public transit vehicles as well as private automobiles led to greater efforts to discover ways to conserve energy. Many of these *discoveries* are methods of propulsion which engineers have known about for years, but which were considered inefficient or troublesome for one reason or another compared with the gasoline engine. Now, battery-powered vehicles, fly-wheel energy storage systems, diesel and hybrid engines are being re-examined to find ways to efficiently and effectively use these alternatives. The gasoline engine is also responsible for polluting the air and some of the alternatives offer the additional advantages of lower noxious emissions and quieter operation.

UMTA Flywheel Energy Storage Program

The primary goal of the UMTA Flywheel Energy Storage Program is to reduce the mass transit operator's dependence on petroleum fuels, while maintaining the route flexibility inherent in the motor bus. A trolley coach that is not dependent all the time on an overhead wire system, for example, could accomplish this goal.

Energy storage systems are based on two engineering principles - regenerative braking and load leveling. What these mean is that energy used during braking is recaptured and stored to be used during subsequent vehicle acceleration. This capability would be especially useful in multi-stop vehicles, such as urban transit buses.

Energy storage systems were considered and even applied in public transit prior to the energy crisis. The Swiss had designed and built the Oerlikon Gyrobus in the 1950's and operated about 40 such buses over a 19-year period with considerable success. Other applications include the R-32 rapid rail transit car discussed in Chapter 3.

These programs used the flywheel as an energy storage device, although other devices, such as the hydraulic accumulator and batteries have been considered. The flywheel, however, appears to be the best all-around compromise available for today's applications.

As the first phase of the program, in September 1976, UMTA awarded contracts to AiResearch and General Electric for conceptual design studies using flywheel energy storage in a broad range of transit applications. The ground rules for the study required each contractor to use state-of-the-art technology and employ a highly modular design approach. The latter requirement is essential in the small transit industry in order to establish the most economical production base.

UMTA has recommended continuation of the second phase of the program which entails completing the design, hardware fabrication, and test and evaluation. Assuming continued support from Congress, flywheel systems may be operating transit buses within the next decade.

Battery Bus Assessment

Clean, quiet, and smooth battery-powered buses are an attractive alternative to conventionally-powered buses for passenger service on some routes, in spite of some drawbacks in range, power, cost, and maintenance. Under this project, battery bus operations in six different countries were studied. These operations ranged from single-vehicle demonstrations to a fleet of 20 buses providing full transit service on three routes.

Thirteen of the vehicle types studied are powered by electric batteries only, two are diesel-battery hybrids, and one is a trolley bus equipped with a battery for extended off-wire operation. Although none of these vehicles is in production, several manufacturers are ready to accept orders. The status of the electric battery bus development is reflected in the fact that 57 buses have accumulated more than 2.1 million vehicle-miles in passenger service.

Because the buses are adaptations of available equipment and are still in the prototype stage, these vehicles are initially more expensive than diesel buses and need special care and maintenance.

Evaluation of the Florida Hybrid Bus

The Florida State Department of Transportation sponsored the University of Florida in the development of a small bus based on the hybrid (diesel-electric) principle. The basic vehicle is an early model Electrobus, normally furnished by the manufacturer with only electric battery power, which severely limits its range. In the hybrid version, a small diesel engine with an electric generator is added to charge the batteries. To achieve fuel economy and low emissions, the diesel engine was run under optimum conditions, i.e., it was not subjected to the stop-and-go operation of normal transit service.

Through a grant to the Florida DOT, UMTA provided support of tests by the University to evaluate general performance, including acceleration, top speed, endurance, emissions, fuel consumption, and power transmission efficiency.

Through the Transportation Systems Center, (TSC) the bus was operated in simulated transit service to obtain more definitive data. The bus, instrumented and carrying a simulated passenger load, was operated in conjunction with a transit bus in regular service. Upon completion of the tests in simulated service, the U.S. Environmental Protection Agency conducted emissions tests at Ann Arbor, Michigan.

The preliminary data developed have indicated that the hybrid vehicle has a definite potential for fuel economy and lower emissions. The data, however, are not sufficiently conclusive to justify a final report. TSC is

continuing to refine the concept and to compare it with other hybrid configurations.

Evaluation of Diesel Propulsion in Fleet Taxicabs

Data on the use of diesel engines in paratransit situations in the U.S. is very limited. Diesel engines in a fleet of taxicabs are now being compared with the more conventionally powered gasoline engines in the same fleet to determine relative fuel efficiency and maintenance and repair requirements. The project is also assessing driver and passenger reaction to the diesel engines to determine if the engine would be suitable and advantageous for use in other paratransit vehicles.

Sixty-six pairs of cars, each pair consisting of one gasoline-powered and one diesel-powered Dodge Coronet taxi were put into service in February 1977. The diesel engines are the Nissan CN633, six cylinder, 198 cubic inch model; Pace Project of New York is gathering the operational data, such as fuel mileage, maintenance costs, and emissions, making weekly reports to DOT and will continue to report on the vehicles until February 1979 when each vehicle will have been operating for more than 8000 hours.

Preliminary results show that the diesel taxis are obtaining 50 percent more miles per gallon of fuel than their gasoline-powered counterparts. The diesel exhaust is much lower in all regulated emissions and appears to show little degradation with vehicle age. So far, there has been no significant difference in user acceptance between diesel and gasoline powered taxis. The diesel taxis have been generating consistent, slightly higher revenues than the gasoline taxis.

ELDERLY AND HANDICAPPED ACCESSIBILITY

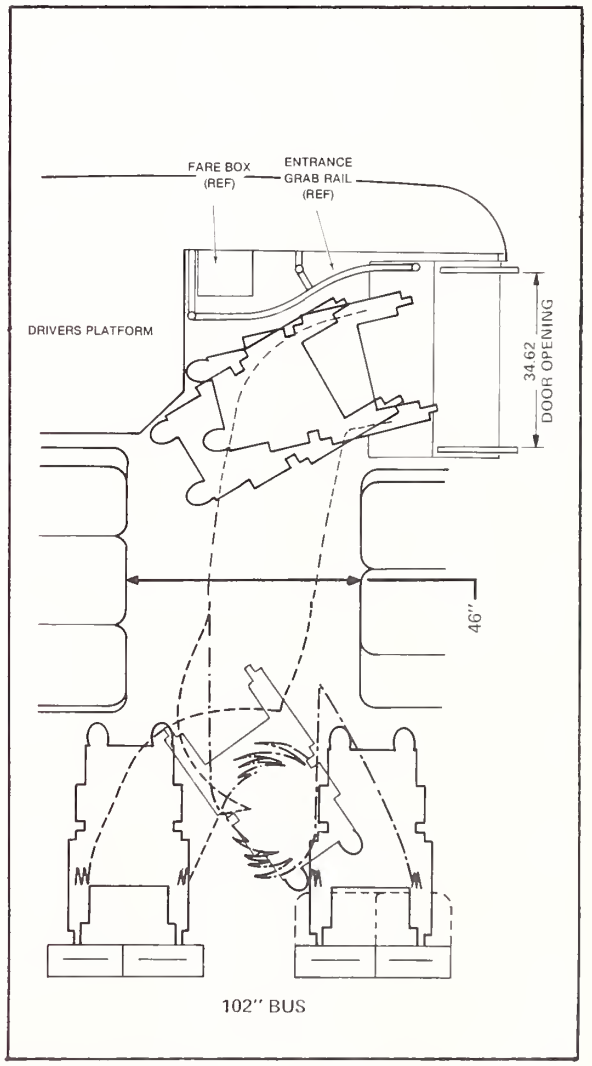
While UMTA has invested a great deal of time and money in developing new equipment to make public transportation accessible to elderly and handicapped patrons, it is also studying ways that current equipment can be adapted for their use. Two such programs are described below.

Passive Wheelchair Lifts on Public Transit Buses

The primary objective of this project is to develop information on which transit properties can base planning, purchasing, and retrofitting of wheelchair lifts into existing transit buses. The lifts under consideration are *passive lifts* that is, their stowed configuration does not interfere with the normal entrance at the door where the lift is located. Four different lift configurations will be installed, de-bugged, and evaluated, both in and out of transit service. Three different models will be installed at the bus front door and one at the rear door.

Wheelchair Access to Current Buses

This project was established to determine whether it was feasible to incorporate a wheelchair access option into current bus design. The lift would be built in at the time of manufacture. AM General conducted the study under contract.



Wheelchair Maneuvering Constraints in Buses of Current Design.

Bus and Paratransit Vehicle Technology

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Bus Development					
Design of a Modern 40-Foot Transit Bus (TRANSBUS)	IT-06-0025 FL-06-0012 MO-06-0009 NY-06-0045 WA-06-0007	$28,684,000	Nov. 1971-Nov. 1977	Booz Allen & Hamilton Subcontractors: Rohr Industries, Inc.; AM General Corp.; General Motors Corp.	Charles J. Daniels 426-4035
Small Bus Requirements Concepts & Specifications	IT-06-0074	$300,000	Dec. 1974-March 1977	RRC International, Inc.	Charles J. Daniels 426-4035
Study of the Impact of Fare Collection on Bus Design	IT-06-0132	$176,000	Sept. 1976-Oct. 1977	Booz Allen & Hamilton, Inc.	Charles J. Daniels 426-4035
Life-Cycle Procurement	VA-06-0045	$125,000	May 1977-May 1978	Advanced Management Systems	Charles J. Daniels 426-4035
Paratransit Vehicle Development					
Paratransit Vehicle	NY-06-0043 MA-06-0052 CA-06-0079 CA-06-0080 IL-06-0037	$2,726,000	March 1975-Dec. 1976	AMF, Inc.; ASL Engineering; Steam Power Systems, Inc. (now Dutcher Industries); TSC; International Taxi Assoc.; Museum of Modern Art	Wilhelm Raithel 426-4035
Future Paratransit Requirements	IT-06-0104	$205,000 UMTA	Jan. 1976-Jan. 1977	Alan M. Voorhees & Associates, Inc.	Wilhelm Raithel 426-4035
Energy Conservation and Environmental Projects					
UMTA Flywheel Energy Storage	IT-06-0117	———	To be determined	———	James F. Campbell 426-4035
Battery Bus Assessment	VA-06-0044	$41,000 (UMTA) $10,000 (ERDA)	March 1977-July 1977	Trans Systems Corp.	Wilhelm Raithel 426-4035

Bus and Paratransit Vehicle Technology

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Energy Conservation and Environmental Projects (Continued)					
Evaluation of the Florida Hybrid Bus	FL-06-0014	$25,000	July 1975-Nov. 1977	Florida Department of Transportation; University of Florida	Charles J. Daniels 426-4035
Evaluation of Diesel Propulsion in Fleet Taxicabs	NY-06-0049 MA-06-0066	$480,000 (UMTA) $300,000 (DOT)	June 1976-Feb. 1979	Pace Project, Inc.; NY Metropolitan Taxicab Board of Trade	John E. Ridgley 426-8483
Elderly and Handicapped Accessibility					
Passive Wheelchair Lifts on Public Transit Buses	CA-06-0103	$260,000 Fed. 75,000 non-Fed.	Feb. 1977-June 1978	California Department of Transportation	Charles J. Daniels 426-4035
Wheelchair Access to Current Buses	MI-06-0017	$110,000	May 1976-April 1977	AM General Corp.	Charles J. Daniels 426-4035

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This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

Energy Absorbing Bumpers for Transit Buses—
Transbus Program
Proj. IT-06-0025
Booz-Allen Applied Research
May, 1976 — PB 259-405/AS

Transbus Operational, Passenger, and Cost Impacts—
Final Report
Proj. IT-06-0025
Booz-Allen Applied Research
July, 1976 — PB 269-911

The General Motors Transbus—
Final Report
Proj. IT-06-0025

General Motors Corporation/Truck and Coach Division—
May, 1975 — PB 262-637/AS-SET
Vol. 1 - Summary of Final Design - PB-262-638
Vol. 2 - Program Effort - PB-262-639
Vol. 3 - Appendix - PB-262-640

Rohr Industries Transbus—
Final Report
Proj. IT-06-0025
Rohr Industries, Inc.
June, 1975 — PB 264-612/AS

Transbus Public Testing and Evaluation Program—
Final Report
Proj. IT-06-0025
Simpson and Curtin
January, 1976 — PB 251-882/AS

Human Factors Evaluation of Transbus by the Elderly—
Final Report
Proj. IT-06-0025
Booz-Allen Applied Research
May, 1976 -- PB 264-757/AS

Transbus Safety and Human Factors—
Proj. IT-06-0025
September, 1977

Gas Turbine Engine Application in Transit Coaches—
Proj. IT-06-0025
March, 1977 — PB 272-608

Transit Bus Propulsion Systems, Alternate Power Plant Installations—
Proj. IT-06-0025
Booz, Allen & Hamilton, Inc.
September, 1977 — PB 276-612

Bus Interior Design for Improved Safety—
Proj. IT-06-0025
Booz, Allen Applied Research
April, 1976 — PB 252-253/AS

Boarding Ramps for Transit Buses—
Final Report
Proj. MD-06-0024
Booz, Allen & Hamilton, Inc.
May, 1977 — PB 269-290/AS

Transbus Engineering Test Program—
Booz, Allen & Hamilton, Inc.
December, 1977 — PB 276-196/AS

Forecast of Urban 40-foot Coach Demand 1972-1990—
Proj. IT-06-0025
Booz Allen Research and Simpson & Curtis
December, 1972 — PB 222-684

Transit Bus Propulsion Systems State-of-the-Art—
Proj. IT-06-0025
Booz Allen Research Inc., Development Inc.
August, 1972 — PB 222-871/AS

Baseline Bus Ride and Handling Test Methodology and Data Presentation—
February, 1976

Transit Bus Propulsion Requirements—
January, 1978

AM General Transbus—
Final Report
AM General Corp.
November, 1977

Booz Allen Transbus—
Final Report
Proj. IT-06-0025
Booz Allen Applied Research
June, 1978

Small Transit Bus Requirements Study—
Summary
Proj. IT-06-0074
RRC International, Inc.
March, 1977 — PB 269-392/AS - Set of Six

Operations of Small Buses in Urban Transit Service in the United States—
Proj. IT-06-0072
RRC International, Inc.
July, 1975 — PB 269-392/AS - Set of Six

Operating Profiles and Small Bus Performance Requirements in Urban Transit Service—
Proj. IT-06-0074
RRC International, Inc.
December, 1976 — PB 269-392/AS - Set of Six

General and Performance Specifications for a Small Urban Transit Bus—
Proj. IT-06-0074
RRC International, Inc.
December, 1976 — PB 269-392/AS - Set of Six

Guidelines for the Design of Future Small Transit Buses and Bus Stops to Accommodate the Elderly and Handicapped—
Proj. IT-06-0074
RRC International, Inc.
March, 1977 — PB 269-392/AS - Set of Six

Bus Characteristics Needed for Elderly and Handicapped in Urban Travel—
Proj. IT-06-0074
RRC International, Inc.
March, 1976 — PB 269-392/AS - Set of Six

Assessment of Battery Buses—
Final Report
Proj. VA-06-0044
Trans Systems Corporation
July, 1977 — PB 271-321

Study of Future Paratransit Requirements—
Scenario Report
Proj. IT-06-0104
Alan M. Voorhees & Associates, Inc.
November, 1976 — PB 262-629/AS

Study of Future Paratransit Requirements—
Final Report
Proj. IT-06-0104
Alan M. Voorhees & Associates, Inc.
January, 1977 — PB 264-082/AS

Study of Future Paratransit Requirements—
Executive Summary
Proj. IT-06-0104
February, 1977 — PB 265-821/AS

Assessment of Service Requirements & Design Characteristics of Present and Future Paratransit Vehicles—
Proj. NY-06-0058
Ronald Adams
April, 1977 - PB 267-574/AS

Technology Delivery for a New Paratransit Vehicle—
Final Report
Proj. PA-06-0039
Gellman Research Associates, Inc.
July, 1977 — PB 272-128/AS

A Study of Wheelchair Access to the Current Transit Bus Design—
Final Report
Proj. MI-06-0017
AM General Corporation
April, 1977 — PB 270-101

CHAPTER 2
BUS AND PARATRANSIT OPERATIONAL TECHNOLOGY

PARATRANSIT INTEGRATION
AUTOMATIC VEHICLE MONITORING

A Modern Bus Dispatch Operation in Use by the Washington, D.C., Metro.

Successful operation of a public transportation system involves much more than the vehicles themselves. For services to be both reliable and economical, personnel and equipment have to be at the right place at the right time. This means that virtually all transportation service organizations must depend to some degree on some form of communication, monitoring, and dispatching functions.

Technologies which can be used to support these functions have been advanced in capabilities and cost savings during the past decade. On being applied to transportation, they provide new opportunities for demand-responsive services and real-time control of operations. They may, in fact, offer the only practical way for many communities to meet a number of important objectives for personal mobility within the constraints of rising labor costs.

UMTA's development approach has been to follow-up exploratory or hardware feasibility projects with thorough market and cost/benefit studies. Analysis of a system for automated vehicle monitoring was completed in FY77. It indicates that such systems can provide a high benefit-to-cost ratio for bus, taxi, and police applications. A demonstration program in Los Angeles is now underway in a carefully controlled experiment to measure the effectiveness of a system under actual operating conditions.

Dial-A-Ride has been an attractive solution to the problem of providing service to areas with low demand density and scattered trip patterns. Over 100 communities are now using this type of service which is well suited to the needs of elderly and handicapped people, and can be a private as well as a public service.

Low-cost computing and communications equipment are within the state-of-the-art and can support a wide variety of service innovations: shared-ride taxis, integrated fixed-route and demand responsive services, mixed private and public services operating through a transportation broker, etc. A wide number of possibilities in the field of paratransit are being explored and evaluated operationally under UMTA's Service and Methods Demonstrations Program (Chapter 11). Projects which encompass system studies, computer hardware and software, and communications and control equipment developed and supplied by Technology Development and Deployment are described in this chapter.

PARATRANSIT INTEGRATION

The Paratransit Integration Program was established to conduct the studies and to develop the tools needed for the management of flexible, ride-sharing services and their coordination with conventional fixed-route, fixed-schedule mass transit systems.

Paratransit systems were designed to serve trip-demand operations dispersed temporally or spatially and, therefore, are flexible with respect to these parameters. These sysems include such passenger transportation services as taxicab, jitney, dial-a-ride subscription, vanpool, carpool, and special services for elderly and handicapped riders. They are particularly suited for the low-density areas of the suburbs.

UMTA has played a major role in transforming Dial-A-Ride service from an attractive theoretical concept to a working reality by supporting the research that made computerized dispatching possible and by conducting the first major pilot experiment. The field experiment in Haddonfield, New Jersey attracted increased patronage with every increase in the service area. Dial-A-Ride has emerged as a major provider of transportation in over 100 small cities.

UMTA's projects on paratransit operations, active during FY1977 are briefly summarized below.

Rochester Demonstration

This project provided computer software development support to UMTA's Dial-A-Ride demonstration in Rochester, New York. It expanded and enhanced the Haddonfield, New Jersey demonstration software through:

- Expanding the system to more than one suburb, and the fleet up to [illegible] vehicles;
- Providing transfers [illegible] suburbs and between Dial-A-Ride and fixed-route vehicles;
- Assigning different priorities to various types of customers, e.g., advance callers, transfers, handicapped patrons;
- Providing fully automated communications between the driver and computer;

The Dial-A-Ride Bus Drivers are Linked to the Computer to Advise on Pick-Ups and Routes.

The Success of the Rochester Dial-A-Bus Project Has Encouraged Expansion of the System Into Surrounding Areas.

Devising more true-to-life models of customer preferences in computer scheduling decisions;

Choosing software language and time-share processing that would permit the software to be transferred and the system to function without a computer.

Large Regional Systems Analyses

This project will analyze the effects of integrating paratransit services with conventional transit services on a large-scale, region-wide basis. The researchers will estimate, for medium and large urban areas, what changes integration may bring about in level of service, the economy, the environment and the consumption of energy.

Two methodologies will be developed. The researchers will construct a network model, compatible with today's planning tools and transit data bases, for use in detailed system planning. They will also develop a relatively easy-to-use, sketch planning methodology that will enable planners to assess the results of installing any one of a wide variety of system and combinations of systems.

Review and Assessment of Operational Experience

This project will produce guidelines and tools for planners of paratransit systems to help them avoid costly errors in the design of integrated areawide transportation services. The guidelines will be based on a review and evaluation of past experience in integrating paratransit services with conventional transportation services. A micro-simulation model will also be developed for use in planning and evaluating areawide demonstrations and in future research.

Shared-Ride Taxi Computer Fare

This project makes use of computer technology to calculate taxi fares based upon a time-distance data base, replacing zone systems and electronic meters. A computer with a fare calculation algorithm, will notify the rider in advance and will record the fare. While fares would be based upon the origin and destination of each trip, exclusive of shared-ride diversions, the computer could adjust them. For example, discounts could be made for shared-rides, and rates could be set higher during peak travel hours. This system could also dispense a receipt to the rider, and provide computer credit billing and audit procedures for the taxi company.

Cost/Benefit Study

This project will determine to what extent an investment in paratransit integration will be beneficial to the communities, transit authorities, users, and the nation. The study will estimate the costs for system installation, operation, and maintenance, and user charges. It will evaluate these costs in terms of the objectives of the integrated system.

Low Cost Van-Pool Computer System; Transportation Broker Support

This project explores the use of computers in support of the wide variety of services offered by a transportation broker. The general functions of the broker are:

To identify the travel needs of the community, including its people and agencies

To identify all existing and potential transportation suppliers, including even carpools

To acquire vans and lease them to individuals and establish maintenance, accounting, and control procedures

To match passengers and transportation suppliers and through agreements arrange the necessary transportation

To act as an obmudsman and information clearing house for services costs, and insurance

To maintain liaison with existing transportation suppliers

To promote institutional and regulatory modifications to facilitate the broker's function.

Since the broker's services range from coordination of disparate services matched to diverse client needs, a computer is required to maintain the data base of available services and transportation users. Since the use of large computers for this task is often prohibitive, microcomputers offer increased capabilities at a moderate cost. These systems could be tailored to fit the needs of small and medium size cities. This project will assess the applicability of microcomputers to transportation broker functions.

Subscription Scheduling Algorithm

This project will examine and help determine the appropriate role of the computer, in the management of subscription bus services. The basic question is whether the computer's role should be limited to merely providing information storage and retrieval, or whether it should be expanded to the scheduling of subscription services. If the latter, the segment of the riding public that would benefit the most would probably be the elderly and handicapped riders.

Pilot System Software

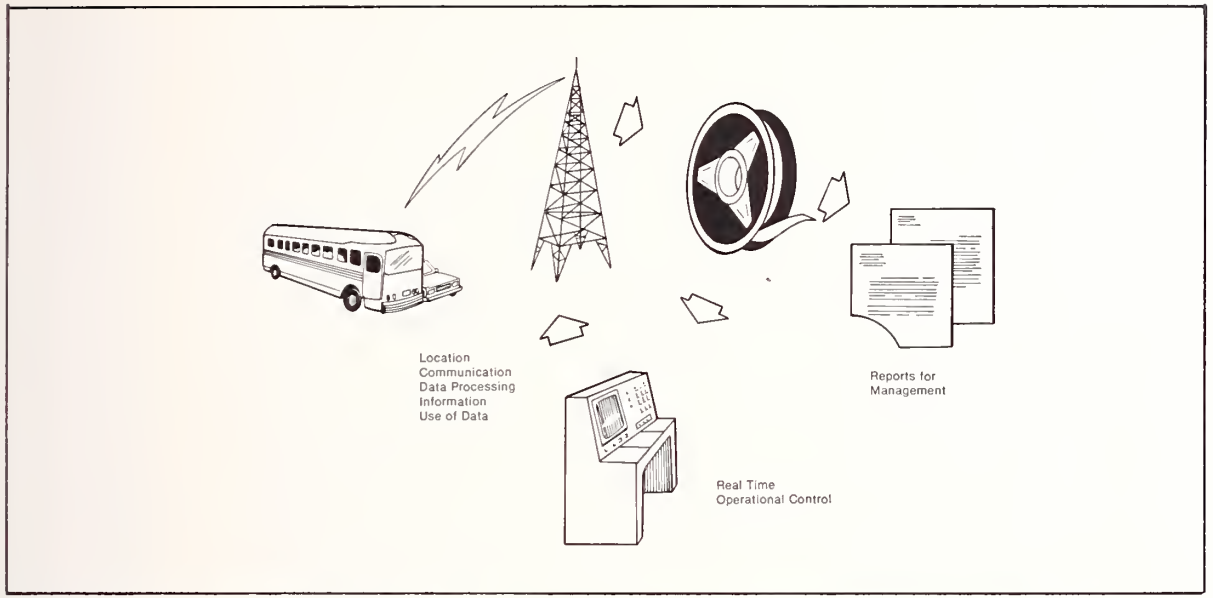
This project will transfer the software developed in the Rochester, New York, Dial-A-Ride demonstration to a minicomputer environment, and will be used in expanded demonstrations of Dial-A-Ride services. The availability of the Rochester software on a minicomputer will reduce data processing costs of Dial-A-Ride services.

AUTOMATIC VEHICLE MONITORING

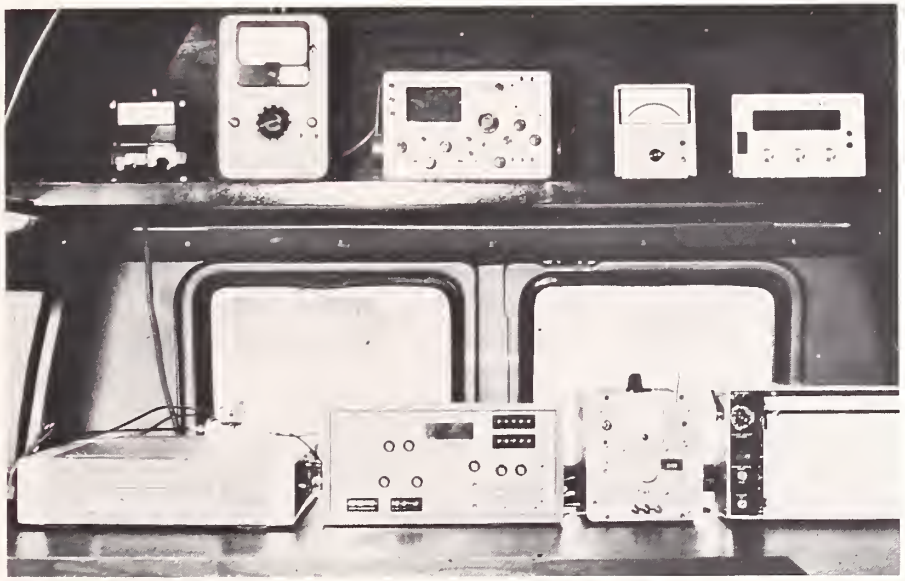
Automatic vehicle monitoring (AVM) is an electronic means of ascertaining the location and status of land-based vehicles. The location of all vehicles is shown in real time on display panels in the control center. The display automatically indicates to the dispatcher whether the bus is on schedule or not and, in the event of an emergency, the driver can activate a silent alarm on the bus which will alert the dispatcher to his problem.

Essentially, an AVM system consists of four subsystems: location, communications, data processing, and control. The locations subsystem consists of the equipment used to determine a position fix. The communication subsystem relays location data from the vehicle to the control center where data processing is performed. Finally, vehicle location information will be automatically compared by computer to schedule information and presented to the dispatcher who will then be able to more effectively manage the fleet. In the automatic operating mode, directions will be automatically transmitted to the bus operator for him to execute to restore bus schedules.

AVM is expected to result in better service to passengers because buses will adhere more closely to schedules and headways; greater operational efficiency because better schedule adherence may be translated into fewer buses required to maintain a given level of service; data for management purposes can be automatically collected; and greater passenger and operator security because the driver can notify the dispatcher of an emergency so the police can be alerted and told the bus location.



Advantages of Automatic Vehicle Monitoring.



Experimental AVM Equipment in a Van.

For random-route users, studies indicate that AVM can substantially improve police effectiveness by permitting the dispatch of the car closest to the scene of an emergency. AVM also offers similar benefits to demand-responsive transit operations, taxi service, delivery services, postal service operations, and other vehicle fleet applications.

UMTA is developing, testing, and evaluating an advanced, area-coverage AVM system that could satisfy the requirements of multiple users, many of them governmental services. By accomodating the requirements of diverse users with a single system, cities will be able to install and maintain a single system and thus preclude the need for installing separate systems for each user.

Advanced Area-Coverage Automatic Vehicle Monitoring

UMTA's area-coverage AVM program consists of two phases: In Phase I, four contractors were selected to test the feasibility of their location subsystem approach. Philadelphia, the site of previous tests, was selected as the Phase I test site because it represents a typical environment with high rise buildings and harsh electromagnetic interference.

For the tests, each of the four competing contractors deployed the necessary location equipment and drove a vehicle along a predetermined route. Location data were recorded on magnetic tape and analyzed on a computer to determine the accuracy of each system. On the basis of these tests, Gould Information Identification, Inc. (formerly Hoffman), was selected to develop the Phase II system.

Phase II will develop, deploy, operate, and evaluate a fully functional area-coverage AVM system in a representative transit and police environment. Los Angeles was selected as the test site after an extensive evaluation of 19 potential sites. In Phase II, UMTA will evaluate AVM, determine its actual costs and benefits, and measure the improvements in operational control and effectiveness. Six (6) bus routes and a 30-square-mile area will be equipped for AVM operation during the Phase II experiment that will involve up to 200 fixed-route transit buses and 25 random-route vehicles.

As part of the Phase I effort, a cost/benefit study was conducted to ascertain the expected benefits of AVM. The study developed a computer model that can be used by transit properties, police departments, and others to estimate AVM benefits on the basis of their own costs and circumstances.

Bus and Paratransit Operational Technology

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Paratransit Integration*					
Rochester Demonstration Computer Software Support	MA-06-0071 DC-06-0141 DC-06-0099-(02, 04, 05)	$1,240,000	Sept. 1974-Sept. 1977	Massachusetts Institute of Technology; First Data Corporation	Mike Markowski 426-8483
Large Regional Systems Analyses	IT-06-0150 MA-06-0084	$ 530,000	Nov. 1977-Nov. 1979	SYSTAN Inc.; Multisystems, Inc.	Mike Markowski 426-8483
Review & Assessment of Operational Experience	MA-06-0054	$ 399,000	March 1977-Sept. 1978	SYSTAN, Inc. TSC	Mike Markowski 426-8483
Shared Ride Taxi Computer Fare	PA-06-0040	$ 345,000 (OST-250,000 UMTA-95,000)	July 1974-March 1979	Carnegie-Mellon University	Mike Markowski 426-8483
Cost/Benefit Study	MA-06-0054	$ 240,000	March 1977-Feb. 1978	TSC, Multisystems, Inc.	Mike Markowski 426-8483
Low Cost Van Pool Computer System - Transportation Broker Support	DC-06-0160 DC-06-0199	$ 200,000	Jan. 1977-Dec. 1978	International Management Resources, Inc.	Mike Markowski 426-8483
Subscription Scheduling Algorithm	MD-06-0027	$ 63,000	Oct. 1976-Sept. 1978	University of Maryland	Mike Markowski 426-8483
Pilot System Software	MA-06-0054-04	$ 150,000	Sept. 1977-April 1978	TSC; First Data Corporation	Mike Markowski 426-8483
Operational Technology					
Advanced Area-Coverage Automatic Vehicle Monitoring	MA-06-0041	$9,500,000	Sept. 1976-July 1981	TSC; Gould Identification Information Inc.; (formerly Hoffman) and SCRTD	Denis J. Symes 426-4035

*Formerly Area-Wide Demand Responsive Transportation (ADRT)

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This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

Shared-Ride Taxi Computer Control System Requirements Study—
Interim Report
Proj. MA-06-0054
DAVE Systems
August, 1977 — PB 275-335/AS

A Study of the Costs and Benefits Associated with AVM—
Proj. MA-06-0041
Transportation Systems Center
February, 1977 — PB 266-293/AS

Experiments on Four Different Techniques for Automatically Locating Land Vehicles, A Summary of Results—
Proj. MA-06-0041
June, 1977 — PB 270-251

A Comprehensive Field Test and Evaluation of an Electronic Signpost AVM System—
Final Report/Phase I
Proj. MA-06-0041
Hoffman Information Identification, Inc.
August, 1977
Volume I: Test Results — PB 272-907/AS
Volume II: Appendix — PB 273-436/AS

Loran Automatic Vehicle Monitoring System—
Phase I
Proj. MA-06-0041
Teledyne Systems Company
August, 1977
Volume I: Test Results — PB 274-955/AS
Volume II: Appendices — PB 274-956/AS

Report on Phase One Tests of Fairchild Automatic Vehicle Monitoring (AVM) System—
Final Report
Proj. MA-06-0041
Fairchild Space & Electronics Company
August, 1977 — PB 273-816/AS

Integrated Dial-A-Ride and Fixed Route Transit in Ann Arbor, Michigan—
Proj. MA-06-1083
Cambridge Systematics, Inc. and Multisystems, Inc.
March, 1977 — PB 267-942/AS

An Analysis of the Demand for Bus and Shared-Ride Taxi Service in Two Smaller Urban Areas—
Proj. TN-06-0004
The University of Tennessee Transportation Center
May, 1975 — PB 245-105/AS

An Analysis of Two Privately Owned Shared-Ride Taxi Systems: Executive Summary—
Proj. TN-06-0004
The University of Tennessee Transportation Center
April, 1975 — PB 245-106/AS

System Performance Data Processing for a Demand-Responsive Public Transportation System—
Proj. VA-06-0012
The MITRE Corporation
November, 1974 — PB 248-921/AS

Summary Evaluation of the Haddonfield Dial-A-Ride Demonstration—
Proj. VA-06-0012
The MITRE Corporation
May, 1975 — PB 248-839/AS

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The MITRE Corporation
March, 1976 — PB 257-033/AS

Data Base Design for Demand-Responsive Transit—
Proj. VA-06-0024
The MITRE Corporation
July, 1976 — PB 256-820/AS

Dial-A-Ride Software Installation Guide—
Proj. VA-06-0024
The MITRE Corporation
September, 1976 — PB 258-333/AS

Demand Responsive Transportation Planning Guidelines (1976)—
Proj. VA-06-0024
The MITRE Corporation
October, 1976 — PB 261-314/AS

CHAPTER 3
RAIL AND CONSTRUCTION TECHNOLOGIES

URBAN RAPID RAIL VEHICLES AND SYSTEMS
URBAN RAIL SUPPORTING TECHNOLOGY
COMMUTER RAIL VEHICLES AND SYSTEMS
LIGHT RAIL VEHICLES AND SYSTEMS

Washington Metro Cars Undergoing Tests at the Transportation Test Center, Pueblo, Colorado.

UMTA's activities in urban rail transportation research and development include development, testing, and evaluation of new vehicles, subsystems, and other transit system elements, as well as a continuing effort to develop supporting technology and test facilities. These activities include rapid rail vehicles and systems, commuter rail vehicles and systems, and light rail vehicles and systems.

In cooperation with FHWA and FRA, UMTA's Office of Rail and Construction Technology serves as the lead Administration within DOT for the encouragement of new initiatives to reduce costs of construction for new and ongoing urban transportation systems. From a cost standpoint, construction activity in urban areas represents the greatest savings potential in deploying new transit systems at the local level.

The Urban Rail Technology Program considers both near- and long-term improvements for urban rail transit. It is designed to encourage evolutionary development of existing systems and to make available new technology for the rail systems of the future. Specific objectives include:

- **Providing transit operators with technology and hardware leading to urban transit systems which will benefit riders, operators, and suppliers.**
- **Developing promising and higher-risk hardware for test and evaluation on existing railcars.**
- **Achieving significant standardization of components, vehicles, and systems in a cooperative program involving UMTA, operators, and suppliers.**
- **Collecting and disseminating data derived from research studies, test and evaluation, and other related activities that are needed by transit authorities, state and local governments, UMTA, and the public to assist in choosing the best solutions to mass transportation programs.**

The benefits for the operators and passengers of urban rail systems which UMTA is seeking in its rail program include lower initial and life-cycle operating costs of rail vehicles and facilities; improvements in the reliability, maintainability, and availability of vehicles and systems; improved operations; and a safe environment for passengers and system personnel. Even though the nature of any research carries the risk of failure, the probability of eventual application is weighted heavily in choosing rail technology research programs.

URBAN RAPID RAIL VEHICLES AND SYSTEMS

Rapid rail systems characteristically operate underground, at grade, or on elevated guideways at speeds up to 80 mph and with station spacing ranging from 1/2 mile to several miles. Currently, there are nine U.S. cities that have rail rapid transit systems in operation, under construction, or in final engineering: San Francisco, Chicago, Cleveland, Philadelphia, New York, Boston, Washington, Baltimore, and Atlanta. Together with commuter railroads, rail rapid transit systems carry more than 2 billion passengers annually, or 1/3 of all mass transit riders.

There is a widespread interest in upgrading and extending existing rapid rail systems. Replacing old equipment or acquiring new rolling stock offer opportunities to apply new technology in their production.

UMTA's Rapid Rail Program includes both hardware and software development efforts. Under the systems management of Boeing Vertol, the State-of-the-Art (SOAC) cars and Advanced Concept Train (ACT-1) were developed. Promising subsystems tested in these projects include flywheel (energy-storage) and regenerative AC propulsion systems. UMTA is also pursuing the development of standardized rapid transit car specifications with the goal of minimizing initial and life cycle costs.

Ten prototype cars for San Francisco's Bay Area Rapid Transit (BART) were engineered, produced, tested, and evaluated under an UMTA research and development grant. These were the basis for subsequent production of BART cars. Boeing Vertol Company, the systems manager, reviewed the test program, monitored the progress of the BART prototype cars in early revenue service, and recommended methods for incorporating improvements appropriate to the development of the State-of-the-Art and Advanced-Concept-Train cars.

The State-of-the-Art Car.

State-of-the-Art Car

Two new State-of-the-Art Cars (SOAC) were built, incorporating the best in existing technology, and tested in New York, Boston, Cleveland, Chicago, and Philadelphia. Passenger convenience and operating efficiency were the primary goals set for these cars. Boeing Vertol conducted technical tests and directed their operational demonstration in the five cities. The SOAC's operated in 20,000 miles of revenue service and carried 312,500 passengers. An extended revenue service operation of SOAC on PATCO's Lindenwold High Speed Line in the Philadelphia area was performed in 1976.

Advanced Concept Train

As a long-range goal, an Advanced Concept Train (ACT) is being developed to test, evaluate, and demonstrate the operation of subsystems which provide improved maintenance, reliability, and operating costs for future rapid rail cars. Many of the features incorporated in the ACT will upgrade and replace obsolete rail vehicles.

The ACT cars, capable of operating over the same transit lines as the SOAC cars, are also being built under the direction of Boeing Vertol. As a result of the design and specification development competition for alternate concepts representative of the next generation of rapid rail subsystems, manufacturing, and maintenance approaches, the Garrett design was selected.

Features of the ACT train include a new lightweight, easily maintained monomotor truck using automotive concepts such as split axles; bolt-on, ring-damped wheels; and copper disc brakes; an advanced flywheel energy-storage propulsion system, eliminating major high-power electronics; all major auxiliaries driven from the flywheel, eliminating many electric motors; an aluminum frame with composite panel carbody for easy manufacture; an energy-absorbing system for low-speed impact control; modular interiors for demand-tailored applications; and reduced lifecycle cost of ownership and operation.

The assembly of the first of two vehicles was completed in September 1977, and the first car was shipped to the Transportation Test Center (TTC) in October 1977 for

extensive testing and evaluation. The second car was delivered in November 1977. The vehicles are now undergoing engineering and acceptance testing and have accumulated more than 6,000 miles.

Advanced Subsystems Development Program

Concurrent with the development of the Advanced Concept Train is the Advanced Subsystems Development Program (ASDP), under which a number of promising subsystems designed for near-term applicability either to existing or planned rapid transit vehicles are being developed. The objective of this program is to develop subsystems that are responsive to the needs and desires of the transit industry and that have the capability of being retrofitted into existing vehicles or incorporated into a new car with minimal risk. UMTA has initiated work on an AC synchronous propulsion system, a monomotor truck, and a synchronous brake system to be fitted onto the SOAC cars for testing and demonstration.

The AC propulsion system was being developed by the Delco Division of General Motors Corporation. It featured liquid-cooled brushless motors and solid state control. Due to technical difficulties and concerns regarding the deployment potential of this propulsion concept, the Delco development effort was terminated in February 1978. At present an indepth technical propulsion assessment is being performed in order to establish the propulsion needs of the U.S. transit industry and to restructure the UMTA propulsion program.

The Advanced Concept Train.

The monomotor truck which is one of the ASDP subsystems is being developed by the Budd Company. It features a lightweight steel design with a unique suspension, resulting in ride quality equal to the ACT-1 vehicle.

A synchronous brake system will complete the ASDP package to be installed on SOAC. The new brake system will sense wheel spins and slides virtually as they occur and will apply the proper force to correct these conditions more rapidly than do present systems. The result will be more effective braking and more consistent stopping distances. In addition, a split-disc configuration will result in improved maintainability.

In the future, subsystem technology application work will extend to subsystems installed on various transit cars in service. These subsystems may include Pulse Width Modulation (PWM) propulsion, multiplex train lines, signal, power, and communication subsystem improvements, as well as maintainability and operations product improvement projects. In all cases, an experimental design will be implemented to assure proper comparison among various subsystems.

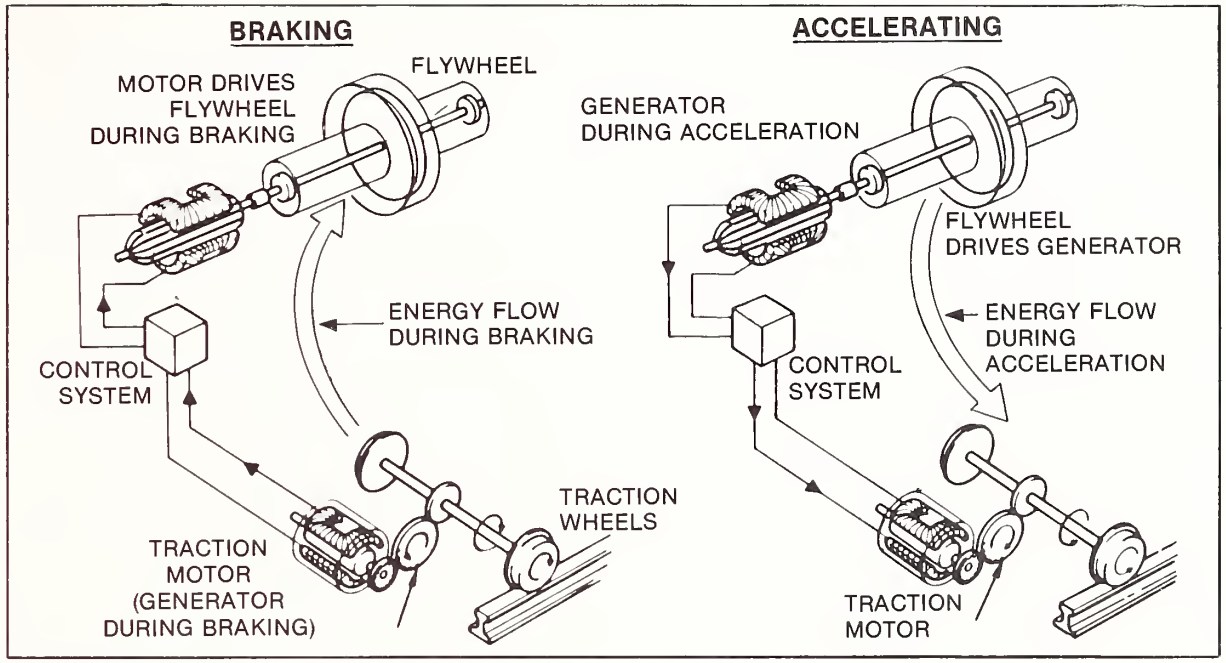
Stored Energy (Flywheel) Propulsion for Rapid Rail Cars

While flywheel technology is not new, it has never before been applied to rapid transit. It can, however, significantly reduce power consumption, costs, and the amount of heat released in subway tunnels during the braking cycle.

The energy storage system works as follows: During braking, energy normally dissipated as heat through the resistor grids will spin-up the flywheel through a motor-generator. During acceleration, the spinning flywheels will be used to produce electricity through the motor-generator to assist in driving the traction motors. The result will be a reduction in peak power demand from the third rail during acceleration and less wasted heat during braking. A DC chopper system, used on UMTA's State-of-the-Art car, is the heart of the solid state control system.

One of the most significant benefits of the project will be improved safety. In the event of a power failure, a train ordinarily stops and the passengers must walk along the tracks to the nearest station. Using the stored energy principle, the train will be able to travel to the next station after an electrical power failure. Thus, passengers will be spared a potential hazard.

Two conventional New York City Transit Authority R-32 cars were retrofitted with energy storage systems. The cars underwent performance and other tests at the Pueblo (Colorado) Transportation Test Center in 1974 and were tested and evaluated for nine months in 1976 on the New York City rapid transit system. A second generation storage system is incorporated into the ACT-1 vehicles now being tested.



Flywheel Energy Storage and Propulsion.

Railcar Standardization

Because of increasingly complex equipment, lower reliability of new cars, and the trend toward customized transit cars, it is necessary to study the potential benefits of railcar standardization. The small volume of typical car orders and increasingly stringent contractural terms and conditions have also contributed to higher car prices.

The rail transit equipment industry historically has responded to specifications developed by individual operators or their consultants in a proliferation of customized designs. This approach is in contrast to the locomotive and bus industries which offer essentially a range of standardized sizes and types of vehicles. The vehicles share components, and the designs benefit from the manufacturer's ability to improve the total product line in an evolutionary fashion without making previous models obsolete.

The street railway industry first approached the problem of standardization during the development of the PCC car in the 1930's. Variations in size, door placement, etc. were accommodated in a standard design. Thousands of such vehicles are now operating on many systems in the U.S. and Canada and worldwide.

UMTA first approached the problems of standardization when, in cooperation with the rail transit operators, it developed the Guideline Specification for Urban Railcars (Report No. UMTA-IT-06-0027-72-1). The Guideline is an attempt to standardize the manner in which new car orders are described by providing a common format in which to specify technical requirements.

A two-phase project has been developed with the first phase being to determine the feasibility of standardization. The contractor found standardization to be feasible, and made recommendations as to an implementation plan. The second phase of the project, development of a standardized rapid transit car specification, is underway.

URBAN RAIL SUPPORTING TECHNOLOGY

The Urban Rail Supporting Technology (URST) program, which utilizes as system managers the Transportation Systems Center (TSC) of Cambridge, Massachusetts, is directed toward the systematic study and advancement of urban rail technology. Under the URST program, technology objectives are set and priorities established by UMTA and technologies are developed, tested, and demonstrated.

The URST program is organized into seven major project or task areas:

- General Engineering Support
- Facilities Development
- Test and Evaluation
- Noise Abatement Technology
- Track and Wayside Technology
- Tunneling Technology
- Safety and Reliability Technology

General Engineering Support

This area provides overall program plans and engineering direction, establishes resource requirements and test and demonstration schedules, identifies industry interfaces, assesses accomplishments, recommends implementation, and provides reports. It provides overall technical support for UMTA rail programs and provides an interface with industry to apply research and development results. This is accomplished by coordinating the development of selected technology, equipment, specifications, and procedures for industry-wide application. Close coordination is maintained with the American Public Transit Association, and various industry ad hoc committees, in order to identify the needs of individual transit operators and coordinate R&D plans for industry-wide application.

Facilities Development

Facilities Development provides technical support for the design, construction, and operation of facilities and equipment needed to conduct a comprehensive program of test and evaluation of urban rail cars and car systems, track structures and structural components, power systems, and signal systems for train operation and control.

UMTA's test facilities are located at the U.S. Department of Transportation's Transportation Test Center (TTC), located near Pueblo, Colorado. It is DOT's test center for all ground transportation systems.

The TTC, managed by the Federal Railroad Administration, operates and administers an intermodal center for comprehensive testing, evaluation, and associated development of ground transportation systems and their components by DOT organizations, other government agencies and private industry.

The urban rail test facilities at the TTC consist of a 9.1 mile oval, electrified Rail Transit Test Track, the power system for energizing that track, repair, maintenance and support facilities.

The Rail Transit Test Track is designed for the test and evaluation of urban rail vehicles - light, rapid, and commuter rail.

A secondary purpose of the track is the development, test, and evaluation of the state-of-the-art and advanced track structures. A new track and wayside technology program was initiated during FY77 which will utilize the test track in some of the R&D projects.

In addition to the conventional contact rail electrification, about two miles of simple overhead power wires have been constructed over part of the track to permit test and evaluation of urban rail vehicles using overhead power collection systems, such as light rail vehicles and commuter cars.

A permanent power system has been installed and will be ready for use in early 1979. Two substations will be located on the oval and computer controls will facilitate simulation of various voltage profiles as required. Power is currently provided by an interim power station located near the vehicle performance section of track.

There also is a Rail Dynamics Laboratory (RDL), designed to simulate rail dynamics

for rail vehicles. The primary purpose of the RDL Component/Vehicle Preliminary Evaluation System (C/VPES) is the study of periodic and random oscillations of rail vehicles.

Test and Evaluation

Test and Evaluation provides plans and conducts system testing and operational evaluations; establishes test objectives, constraints, criteria, and procedures; provides measurement instrumentation and data acquisition and processing equipment; and prepares final reports and recommendations.

The objective of the urban rail test and evaluation activity is to collect and disseminate data that can be used by the manufacturers, transit system operators and municipal governments, in addition to meeting UMTA's needs for data. To date, the test and evaluation effort has emphasized vehicle testing. The first tests carried out at Pueblo were in 1971, using two New York City Transit Authority R-42 vehicles. These early tests formed a data base for development of test procedures.

In 1975, TSC published a document *General Vehicle Test Plan for Urban Rapid Transit Cars,* (UMTA-MA-06-0025-75-14) which provides a consistent specification for tests that have been carried out at Pueblo on the State-of-the-Art Cars, the Energy Storage Cars, the Standard Light Rail Vehicles, and most recently, the Washington Metro cars.

The rail transit test track provides an ideal facility for putting a great number of miles on new vehicles in a short time, to evaluate system reliability and to get through the "infant mortality" stage. The test program for the Washington Metro cars included repetitive duty cycle tests to evaluate system reliability and brake pad materials.

Track and Wayside Technology

This program was initiated in FY77 to achieve UMTA's goals of increased track performance, reliability, safety, reduced overall costs and the optimum use of rapid transit track. Every effort will be made to coordinate activities with the various U.S. transit companies. This will insure that research efforts are directed toward solving real problems and that results are implemented by the transit industry. Through these cooperative efforts, the UMTA track research program will result in track design standards, construction standards, and maintenance guidelines.

The objectives of the UMTA Track and Wayside Technology Program are to meet the goals of increased performance, reliability and safety, and decreased overall costs of urban transit track structures through the use of:

Improved component design methods under realistic loading conditions

Reduced construction costs and increased construction productivity

Improved maintenance and upgrading techniques for existing and future track systems

Increased safety and reduction of environment related problems such as noise and disruption of urban activity

More efficient traction power systems
Dissemination of research results to transit authorities the design and construction industry, and component manufacturers.

These objectives apply equally to elevated, at-grade, and subway track and to both tie-ballast and direct fixation track. The UMTA track program has been divided into the following major areas of interest: track structures design methods, track structure, design standards, construction, maintenance, environmental factors, traction power systems, education, and evaluation.

Noise Abatement Technology

The purpose of the urban rail noise abatement program is to effect a reduction of the environmental impact of existing transit systems, and to reduce noise control costs for future systems through the development and deployment of new and improved methods, data, and hardware.

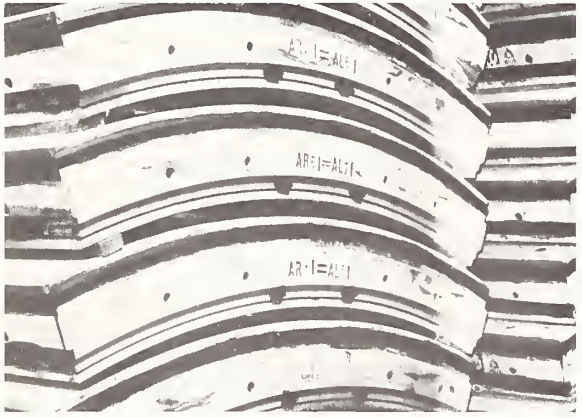
During FY77, TSC completed the draft for a National Urban Rail Noise Assessment Report which summarizes and compares the noise exposure of patrons and community residents from urban rail rapid transit operations in the U.S. Additional work is underway toward refining the noise assessment and cost estimates for noise abatement on the New York City Transit Authority rapid transit system.

In-service tests are currently being performed on the Southeastern Pennsylvania Transit Authority (SEPTA) by the team of DeLeuw Cather Co. and Wilson, Ihrig and Assoc. to determine the costs and performance of three types of resilient wheels, wheel truing, and rail grinding.

Contracted research with Bolt, Beranek and Newman Inc. has led to improved understanding of wheel-rail noise generation mechanisms for screech, impact and rolling noise, and the vibration and noise radiation from urban rail transit elevated structures has been cast in a coherent analytical framework in work performed by Cambridge Collaborative, Inc. (See Bibliography at the end of this chapter.)

Tunneling Technology

The UMTA tunneling program is conducted in support of the U.S. Department of Transportation Tunneling Program Plan. This is a 10-year effort begun in FY 1973 to reduce the costs of urban underground construction by 30 percent, to accelerate the rate of construction by 30 percent, to educate planners in the advantages of proper use of tunnels, and to optimize the use of tunnels in urban transportation systems.



Precast Tunnel Liners Can Help to Lower the Cost of Tunnel Construction.

Within the program, UMTA has the responsibility for sponsoring research in the following categories: economic analysis and planning, contractor and management practices, materials handling and utilization, maintenance, ground control and stabilization, design and construction standards, and transit system environment criteria. This program includes projects to develop guidelines for selecting cost-effective insurance programs for construction of urban subway systems, to study improved construction management procedures for urban underground transportation systems, to identify the disruptive effects of underground construction and the existing means of measuring the effects, to develop guidelines for safety and environmental impact as they relate to subway construction, and to improve methods for estimating underground construction costs based on historical data and site conditions.

The Use of Shotcrete is an Example of a Cost Saving Construction Technique Being Investigated.

A number of studies in these areas have recently been completed and should be interesting to those in tunneling. In high demand is one entitled *Insurance for Urban Transportation Construction*, which gives the pros and cons of conventional practices and construction management which have been funded jointly by a number of federal agencies. All these reports are listed with NTIS numbers, when available, at the end of the chapter.

Materials Handling — This involves activities to conduct a field test program of a pneumatic muck transport pipeline system to improve the cost performance analysis of a hydraulic pipeline and an extensible component tunnel muck transportation system, and to identify current and potential uses of excavated material (muck) from tunnels to provide both economic and environmental benefits.

The field tests have been completed at the Colorado School of Mines and the data will be available soon. A report *Muck Utilization Planning Handbook* was prepared under contract to TSC by the engineering firm of Haley and Aldrich and gives procedures for planning the economical disposal or use of tunneling muck. Several transit systems are already using these recommendations and finding substantial cost savings and increased benefits as they construct their systems.

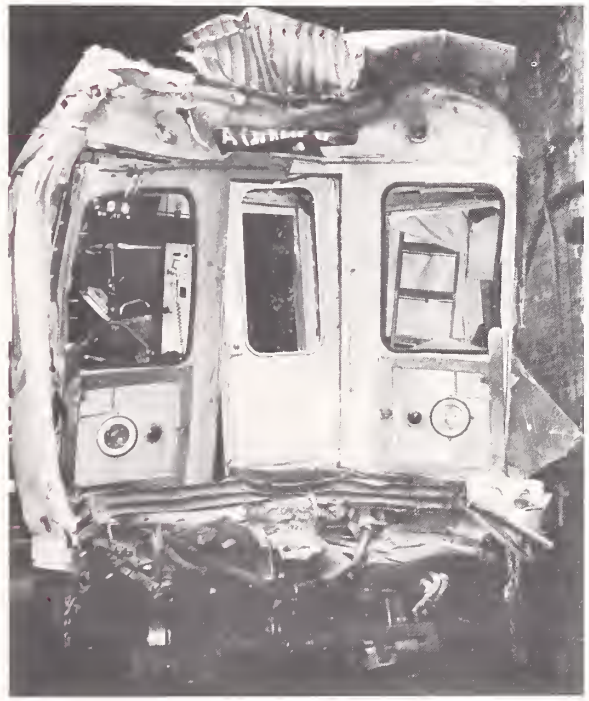
Maintenance — This activity is an in-depth study to determine methods for detecting deterioration, methods for evaluating or measuring the degree of deterioration, and methods for repairing and improving the quality of existing tunnel systems.

The series of publications on maintenance of existing subway systems and the planning of new subway systems and stations for reduced maintenance are in the process of being printed and should be available shortly.

Ground Control — Activities in this area include a study to devise, fabricate, and test circular joint configurations and sealants for future use in soft ground transportation tunnels, and the design of a precast concrete tunnel liner to be used in a test section in the Baltimore Region Rapid Transit System. These activities are currently underway with sealant and liner model testing at the Bureau of Reclamation and the first scheduled use of precast concrete liners in a transit system in the United States in Baltimore.

Modal Problems — These activities address major concerns of the various modes of the transit industry in relation to tunneling and include a study to assess the relative values of alternate techniques of subway station construction and to establish a set of conditions under which each method becomes cost effective.

The study Subway Station Design and Construction has been printed and the computer program entitled *Subway Environmental Simulation* which can be used for determining subway ventilation characteristics and the location and sizing of ventilation shafts is currently in use by several transit properties. The computer program is being modified to permit calculation of reaction procedures in the event of a subway fire and also to modify the program to permit its instantaneous use by interested parties on the computer system at the Transportation Systems Center in Cambridge, Massachusetts.



Front-End Vehicle Crashworthiness is a Major Objective of the Safety and Reliability Technology Program.

Safety and Reliability Technology

To provide both passengers and crews with increased safety and reliability, the Urban Rail Supporting Technology (URST) Program is conducting research, development, and demonstration efforts directed toward achieving safer, more reliable, and more economical rail vehicles. Current efforts include collision avoidance, improved vehicle crashworthiness, improved material characteristics, and a reliability data bank.

Vehicle crashworthiness is a major area of activity and is directed both at existing and future vehicles. During FY1974, Calspan Corporation assessed the crashworthiness of existing urban rail vehicle types. Simultaneously, the Boeing Vertol Company evaluated the State-of-the-Art Cars for crashworthiness. Recently, the Illinois Institute of Technology Research Institute (II-TRI) has undertaken the development of mechanisms for increased rail transit vehicle crashworthiness in head-on collisions. Complementary efforts are being sponsored by the Federal Railroad Administration. The results generated by these programs will provide the foundation for guidelines to evaluate new railcar designs as well as for the retrofitting of existing cars.

The demand for increased safety, is being addressed through an effort that will examine the flammability, smoke, and toxic gas emission properties of materials currently available. In the past year, a study has been carried out on insulation materials for signal wire and power cables in vehicles and wayside installations. This includes both flammability and toxicity tests on selected materials.

The Transit Reliability Information Program (TRIP) has been initiated and plans have been made to provide consistency in reliability reporting by the various transit systems. This will facilitate the pooling of data at some central location so that any system can benefit from the experience of all the other systems.

COMMUTER RAIL VEHICLES AND SYSTEMS

Commuter rail systems operate generally with railroad equipment on railroad rights-of-way, extending as far as 100 miles from city centers. Commuter rail service presently exists in the New York-New Jersey metropolitan area, Philadelphia, Boston, Chicago, Detroit, Pittsburgh, Washington, and San Francisco.

In the commuter rail area, UMTA has concentrated its efforts on the development of a new vehicle and propulsion system suitable for operation on combinations of electrified and nonelectrified trackage. This vehicle, the Gas Turbine Electric or GT/E, is described in the next section. UMTA also directed a study of the feasibility of restructuring and expanding commuter rail service in the Washington, D.C. metropolitan area.

Dual Power Gas/Turbine/Electric Commuter Rail Cars

This project is an outgrowth of UMTA's previous work under Project IT-06-0015. Under a grant to the Tri-State Transportation Commission, a Budd long-distance coach was equipped first as a turbine/mechanical lab car (GT-1) and then as a turbine/electric lab car (GT-2). Once feasibility was determined, the next steps were the development, test, and evaluation of revenue service gas turbine/electric (GT/E) cars. Two 4-car gas turbine/electric trains were constructed, one by Garrett AiResearch and the other by General Electric, under contract to the New York MTA. The MTA and its consultants are implementing an UMTA-developed experimental design to measure the comparative performance and economics of turbine and electric propulsion. A cost/benefit analysis will indicate under what conditions either GT/E or electrification might be justified.

LIGHT RAIL VEHICLES AND SYSTEMS

Light rail transit (LRT) is defined as modern rail vehicles operating on predominantly reserved, but not necessarily grade-separated, rights-of-way. Electrically propelled rail vehicles operate singly or in trains. LRT provides a wide range of passenger capacities and performance levels at moderate cost. In some European cities, light rail is

Dual-Power Gas Turbine/Electric Commuter Rail Car.

introduced as "pre-metro" for future upgrading to standard rapid transit. Light rail transit may be considered as an outgrowth of street railway technology.

The light rail area presents a particular challenge to UMTA and the transit industry. There has been no new development in U.S. light rail technology since the President's Conference Committee (PCC) car was introduced in 1935. Existing streetcar fleets, therefore, are obsolete.

Several light rail properties are committed to retaining and modernizing their systems, and the need for a replacement vehicle is of paramount importance. Because of the limited size of the market, it is to the operators', manufacturers' and UMTA's advantage to produce a nearly standard vehicle while simultaneously using technological advances that have been made elsewhere.

The Massachusetts Bay Transportation Authority (MBTA), working with the San Francisco municipal Railway, the Southeastern Pennsylvania Transportation Authority and other U.S. transit authorities, developed a standard specification for new light rail vehicles under UMTA funding. As a result, some 275 new Standard Light Rail Vehicles (SLRV's) are now in production for Boston MBTA and San Francisco MUNI.

The New Standard Light Rail Vehicle is in Service in Boston and San Francisco.

Wheel Chair Elevator

The current Standard Light Rail Vehicle (SLRV) design provides for both high-level platform and street level loading boarding with both fixed and movable steps. In order to assist elderly or handicapped persons who are unable or have difficulty climbing steps, Boeing Vertol is designing and fabricating a lift device to carry passengers from a low street level loading position into the SLRV and vice versa. A laboratory prototype using an actual SLRV car shell is under development. The prototype will be designed to operate on any SLRV door; it will have facilities for self-operation by occupant with motorman override controls, and will have positive wheelchair restraints to prevent chair movement on the elevator. Deliverables include a final report and specification for the Wheelchair Elevator.

Rail and Construction Technologies

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Urban Rapid Rail Vehicles and Systems					
State-of-the-Art Car (SOAC)	IT-06-0026	$6,987,000	FY 1971 (Completed)	Boeing Vertol Company; St. Louis Car Division of General Steel	Russell K. McFarland 426-0090
Advanced Concept Train (ACT)	IT-06-0026	$25,505,000	FY-1972 (Continuing)	Boeing Vertol Company; Garrett AiResearch	Russell K. McFarland 426-0090
Advanced Subsystems Development Program (ASDP)	IT-06-0026	$7,663,000	FY-1974 (Continuing)	Boeing Vertol Company; Delco Electronics; Budd Company; WABCO	Russell K. McFarland 426-0090
Stored Energy (Flywheel) Propulsion for Rapid Rail Cars	NY-06-0006	$1,264,000	Completed	New York City Metropolitan Transit Authority	Russell K. McFarland 426-0090
Railcar Standardization	IT-06-0131	$835,000	FY-1975- FY-1979	International Research and Technology Corp.; American Public Transit Association	Russell K. McFarland 426-0090
Urban Rail Supporting Technologies					
Urban Rail Supporting Technology General Engineering Support Facilities Development Test and Evaluation Noise Abatement Technology Track and Wayside Technology Tunneling Technology Safety and Reliability Technology	CO-06-0001 MA-06-0025	$50,513,000	FY-1972 (Continuing)	TSC; Federal Railroad Administration; Transportation Test Center	Russell K. McFarland 426-0090

Rail and Construction Technologies

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Commuter Rail Vehicles and Systems					
Dual-Power Gas Turbine/Electric Commuter Rail Car	NY-06-0005	$7,400,000	FY-1971 FY-1978	New York City Metropolitan Transit Authority	Russell K. McFarland 426-0090
Light Rail Vehicles and Systems					
Wheelchair Elevator	PA-06-0034	$124,000	Nov. 1976- Mar. 1978	Boeing Vertol	Russell K. McFarland 426-0090

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This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

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Proj. IT-06-0026
Boeing Vertol Company
July, 1975 — PB 254-727/AS

SOAC State-of-the-Art Car Development Program—
Volume 2: Repair, Re-test and Operational Evaluation
Proj. IT-06-0026
Boeing Vertol Company
September, 1975 — PB 254-770/AS

Urban Rapid Rail Vehicle and Systems Program—
Annual Report October 1976
Proj. IT-06-0026
Boeing Vertol Company
October, 1976 — PB 266-096/AS

Energy Storage Propulsion System for Rapid Transit Cars—
System Design and Equipment Description
Proj. NY-06-0006
September, 1975 — PB 249-063/AS

Stored Energy (Flywheel) Propulsion for Rapid Rail Cars—
Proj. NY-06-0006
1975 — PB 249-063

Determination of the Optimal Approach to Rail Rapid Transit Car Standardization—
Proj. IT-06-0131
International Research & Technology Corporation
August, 1976 — PB 259-363/AS

SOAC (State-of-the-Art Car) Engineering Tests at the Department of Transportation High Speed Ground Test Center-Final Test Report—
Muck Utilization Planning - Urban Transportation
Boeing Vertol Company
January, 1975

Volume I: Program Description and Test Summary — PB 244-747/AS
Volume II: Performance Tests — PB 244-748/AS
Volume III: Ride Quality Tests — PB 244-749/AS
Volume IV: Noise Tests — PB 244-750/AS

Volume V: Structural, Voltage, and Radio Frequency Interference Tests — PB 244-751/AS
Volume VI: SOAC Instrumentation System — PB 244-752/AS
Volume VII: Postrepair Tests — PB 252-337/AS (November, 1975)

Engineering Tests for Energy Storage Cars at the Transportation Test Center
Proj. MA-06-0025
Volume I: Program Description and Test Summary, PB 269-400
Volume II: Performance Power Consumption and Radio Frequency Interference Tests, PB 269-401
Volume III: Noise Tests, PB 269-402
Volume IV: Ride Roughness Tests, PB 269-403
May, 1977 — Vols. I-IV — PB 269-399

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Proj. MA-06-0025
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September, 1975 — PB 251-086/AS

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Proj. MA-06-0025
Transportation Systems Center
March, 1977 — PB 269-598/AS

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September, 1977 — PB 274-543/AS

Wheel/Rail Noise and Vibration—
Proj. MA-06-0025
Bolt, Beranek and Newman, Inc.
May, 1975
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April, 1977 — PB 272-521/AS

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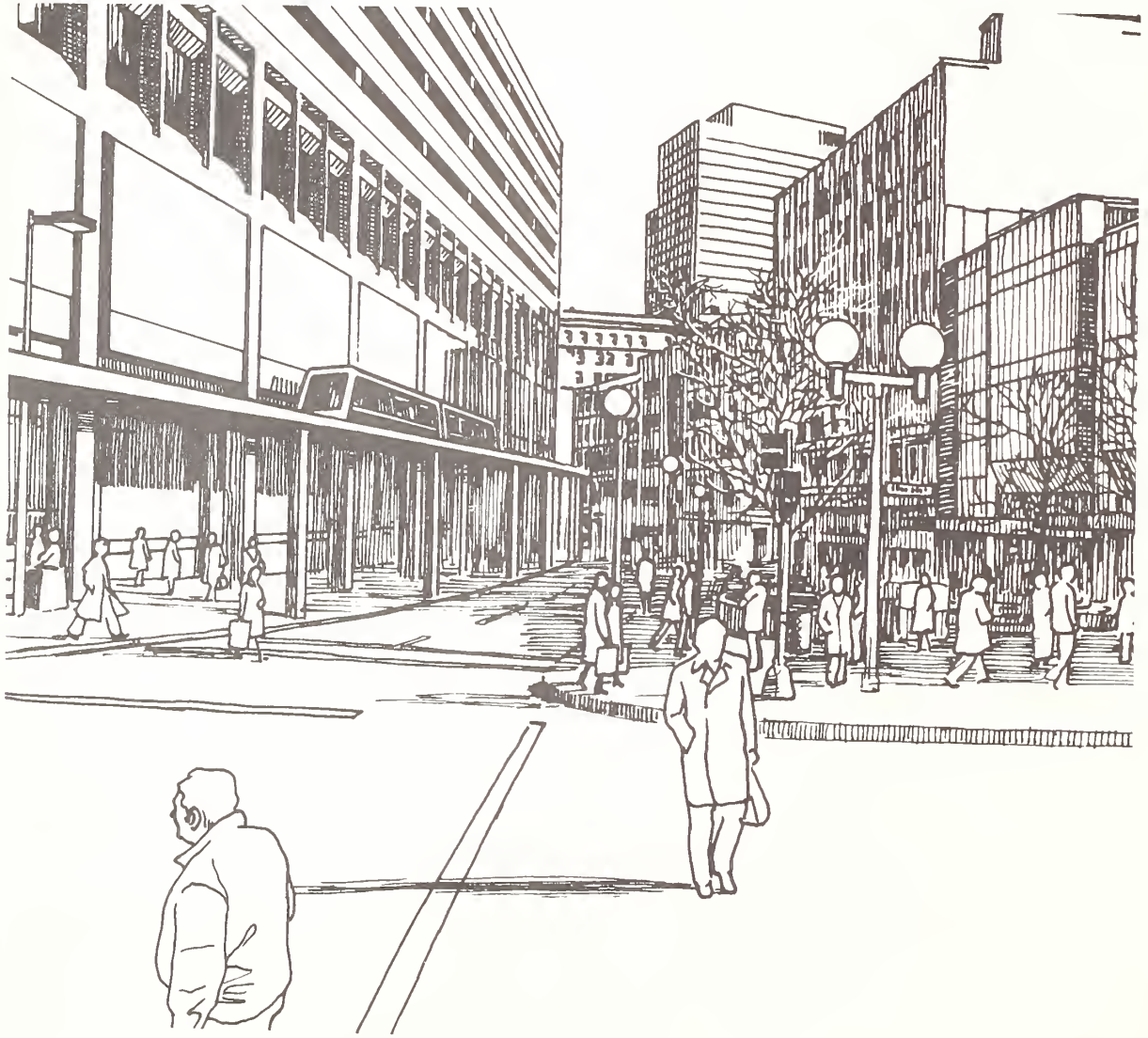
CHAPTER 4
NEW SYSTEMS AND AUTOMATION



AUTOMATED GUIDEWAY TRANSIT (AGT)
ADVANCED GROUP RAPID TRANSIT
AUTOMATED GUIDEWAY TRANSIT TECHNOLOGY
ACCELERATING WALKWAYS

Under the Automated Guideway Transit Technology Program, Wayside Technologies are Being Studied to Find Low-Cost Construction Methods for Producing Guideways and Stations with Minimum Intrusion and Environmental Impact.

During the second half of the 20th Century, research and development in several fields has applied highly advanced technology to operational systems. It has only been a few years, however, that high technology has been recognized as a potential solution for many of the mobility problems in urban areas. UMTA's research and development program has identified several new, unconventional transit systems which promise to provide improved solutions to many urban transportation problems.

The object of the New Systems and Automation Program is to provide a framework for the logical development, test and demonstration of new transit concepts.

AUTOMATED GUIDEWAY TRANSIT (AGT)

Concepts which include the use of vehicles capable of automatic operations on separate roads or guideways are classified as Automated Guideway Transit (AGT) systems. Systems of this type, often called *horizontal elevators* because of their similarity in operation to the elevators in a building, have been successfully deployed at several activity center locations such as airports, shopping centers, college campuses, and amusement parks. Existing AGT installations in this country include Tampa, Seattle, Houston, and Dallas-Forth Worth airports, Fairlane (Michigan) and Pearl Ridge (Honolulu) shopping centers and the University of West Virginia (Morgantown). Presently, systems are under construction at additional airports and a university medical center.

When applied to urban public transportation needs, AGT systems are capable of improving services and of reducing operating costs. However, like other exclusive guideway systems, they are characterized by high capital investment requirements. The most expensive components of such systems are the guideway and station structures. The cost of vehicles and command and control generally is a small percentage of the total system cost. By using small vehicles on light guideway structures, AGT may realize significant economies in guideway and station cost compared with rapid rail. Because of the cost of urban installation, the development of less expensive, readily deployed unobtrusive guideway and station structures for AGT is an important objective.

Another important area where improvements in AGT performance can be achieved is in passenger-carrying capacity. Capacity is defined as the number of passengers a system can move past a fixed point per unit time per lane of guideway. The capacity is proportional to the size of the AGT vehicles (number of seats) and inversely proportional to the minimum spacing in time (headway) between the passage of separate vehicles on the same lane.

Current operational AGT systems achieve relatively modest capacities (3,000 - 5,000 seats per lane per hour) as a result of small vehicle size (6 - 12 seats) and relatively long headways (8 - 18 seconds). While such lane capacities can effectively meet transportation demand in limited configurations, greater capacities are required for more extensive networks in urban areas.

Improved capacity also would assure that AGT systems would realize their potential cost-effectiveness advantages. High capacities permit more revenue passengers to use the expensive guideways and stations, thus increasing return on investment.

Urban applications of existing AGT technologies will be tested at Morgantown, and on the Downtown People Mover Program (see Chapter 5). New developments are managed under two major programs; 1) Advanced Group Rapid Transit Systems, and 2) the Automated Guideway Transit Technology program.

Advanced Group Rapid Transit System

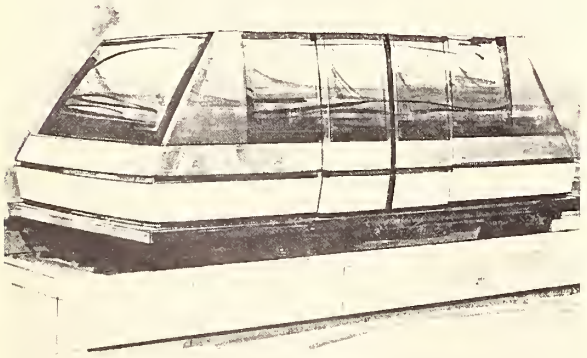
The goal of the Advanced GRT development is the design and installation of an

advanced prototype GRT System in a test track configuration. The specifications for the Advanced GRT include achievement of a peak capacity of 14,000 seats per lane per hour using 12-seat vehicles. The use of small vehicles allows the system to provide a high level of service to dispersed origins and destinations over various urban areas. The system will also be suitable for collection and distribution in central business districts and feeder service to existing line-haul systems. Phase I, the concept definition phase, was completed in August 1975. During Phase I, three contractors, Boeing, Otis and Rohr, produced competing preliminary designs. Phase IIA, which commenced in June 1976 and was completed in December 1977 continued the Phase I design competition. The three contractors further developed their designs, conducted development of critical subsystems, and performed extensive simulation studies of the behavior of their systems on a test network provided by UMTA.

The system designed by Boeing utilizes a rubber-tired vehicle steered along a guideway by side mounted steering wheels which guide both the front and rear axles. The guideway is U-shaped and is fabricated of reinforced concrete. The vehicles are equipped with a radar detection system to provide collision protection.

The Otis Elevator Company system uses a vehicle with an air-cushion suspension system and a single-sided linear induction motor (LIM) propulsion system. The LIM primary is on-board the vehicle and the LIM secondary is embedded in the center of the guideway. Here too, the guideway is an open U-shaped design with an overall external width of 7 feet. The vehicle emergency braking system uses a skid-type brake pad which drops onto the guideway surface under emergency conditions.

The Rohr Industries system is a suspended motorail based on the Monocab design demonstrated at TRANSPO 72. The system is magnetically suspended and propelled; the magnetic force used for suspension is developed by the same linear electric motor that propels the vehicle. The overhead guideway cross-section is about 4 feet by 4 feet and has enclosed sides and top to provide protection from adverse weather conditions.



Boeing Aerospace Co. AGRT Vehicle.

Rohr Industries AGRT Vehicle.

Otis Elevator Company AGRT Vehicle.

At the conclusion of Phase IIB, the Advanced GRT proram will provide a design suitable for a variety of urban applications. Sufficient test data will be produced during the engineering evaluation of the program to resolve the outstanding engineering problems. The simulations will provide a means of analyzing the system behavior for various urban configurations and demand situations.

Automated Guideway Transit Technology Program

The Automated Guideway Transit Technology Program is directed toward the development of the critical technologies that provide the foundation for the successful deployment of automated, exclusive-guideway urban transportation systems. This program is not directed toward deployment of complete deployable systems but rather toward system elements that may be used in a variety of advanced urban transportation systems.

The goal of the program is to provide information to system designers, developers, and planners that will assist them in the selection of new automated guideway systems for a variety of applications and to reduce the risk involved in the deployment of such systems.

Previous non-system oriented activities in the new systems research and development program included the Development Engineering program and command and control studies performed by APL. The Automated Guideway Transit Technology program has expanded the scope of these earlier programs and is focused on three areas; system technology, subsystem and component technology, and wayside technology. At the system technology level, the major thrusts are in the area of system simulations and operational analyses, and development of guidelines and standards. The performance of system-level operational analyses, and the determination of design guidelines and requirements will provide the technical and cost data and the analytical tools (such as computer simulations) that will permit local urban planners and government officials to evaluate expected technical performance characteristics and to identify and project various cost elements of a proposed automated ground transportation system.

The System Operation Studies are addressing a wide spectrum of different technologies ranging from large vehicle shuttles to PRT systems. Both single and trained vehicle configurations are being considered. Computer simulation progams have been developed which will be made available to assist designers and planners in all facets of system operations.

System Safety and Passenger Security Studies are being conducted and tests are being performed to develop and evaluate various methods of minimizing vandalism and of enhancing passenger security and safety in automated systems. Studies are also being conducted to determine design guidelines and requirements for automated systems. Particular emphasis is being placed on user and non-user impacts, and on passenger safety and comfort. Under the Systems Hardware and Service Availability project, a study has been performed to identify the reliability requirements for critical subsystems and components, and to determine the impact of subsystem reliability on service availability.

The Subsystem and Component Technology areas treat two key technical areas that are common to all AGT systems: vehicle longitudinal control and reliability; and vehicle lateral control and switching.

The Vehicle Longitudinal Control and Reliability project is concerned with the improvement of performance, reliability, and maintenance of longitudinal systems, with *fail-operational* design concepts receiving particular attention. Redundant implementation will provide the key to operation that permits vehicles suffering single failures to continue to the nearest maintenance area, station, or siding. Fail-operational design approaches will signficantly improve the mean time between failures leading to vehicle breakdowns on the guideway. The longitudinal control studies also are exploring the potential of a variety of control approaches including vehicle-follower and point-follower strategies, and platooning and training to improve system capacity. The longitudinal control system project will include analyses, evaluation, design and experimental investigations.

The Vehicle Lateral Control and Switching project is exploring techniques to improve reliability, reduce costs and improve performance of vehicle electronic *wire-follower* and mechanical *wall-follower* lateral control and switching systems. Reducing the guideway length required to execute

switching maneuvers and improving ride comfort are two major objectives of this program that will include lateral control and switching system design analyses computer simulations, and vehicle tests at the contractor's facility.

All the investigations in the longitudinal and lateral control areas will be tied to cost and performance goals to assure that the results of the development reflect practical objectives. The work in this area includes review of the status of existing technology, detailed mathematical modeling, analyses and simulation, development of design concepts, and experimental validation of those designs.

A small number of independent study contracts also have been awarded to assist the UMTA staff in evaluating technical approaches, performing cost analyses, developing new hardware system concepts, and evaluating environmental impacts of AGT systems.

The Wayside Technology area is being addressed through the Guideway and Station Technology project. This project includes studies of implementation technologies for guideways, stations, power distribution systems, and weather protection concepts. Studies in these areas are emphasizing identification (through analyses, modeling, and tests) of improved approaches in construction techniques, material selection, and installations. Reduction of cost, implementation time and environmental impact of guideways and stations is emphasized. Design considerations for all-weather vehicle operation (such as guideway heating or protected designs) also is being addressed.

The output data and analytical tools obtained from each program element will be extensively documented. It is anticipated that some of the results will change the scope and nature of tasks and the correlation between task areas. Annual reports will be prepared to summarize the progress made in the AGT development program and workshops will be conducted, where appropriate, to disseminate the collected data to system designers and urban planners. Data evolving from the program will be applied to a broad spectrum of automated guideway technologies ranging from simple shuttles to network applications.

The data obtained from the AGT program will be used to decrease the technical and cost risks associated with the development and installation of automated guideway systems, including the Advanced GRT system.

ACCELERATING WALKWAYS

Accelerating Walkways (AW's) are a promising new means of transporting large numbers of travelers over short distances. These systems address the critical problem of providing fast, cost-effective transportation in the range between what is considered to be the limit of normal walking distance and the distance at which vehicular-based transit services are considered necessary. Because AW's do not have wait times or operators, these systems are expected to compare favorably with vehicular transit in terms of operating cost and travel time over short distances.

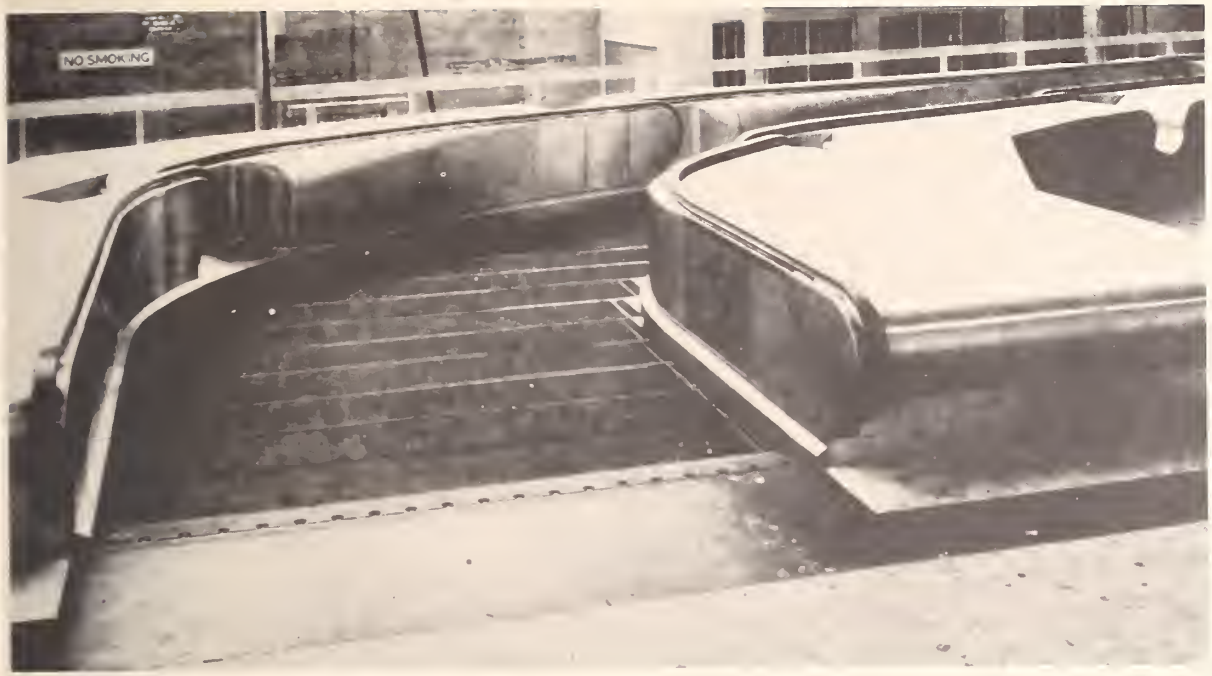
AW's hold great promise for improving transportation around activity centers such as transit terminals, CBD's and shopping centers, permitting optimum land-use development in these areas and improving the practicability of auto-free zones.

Several different AW concepts have been developed whereby the normal moving walk entry speed of 1 - 1.5 mph is gradually increased by factors of four to five times, resulting in speeds about double that of normal walking. Gradual deceleration occurs at the discharge end of these systems to provide exit speeds comparable to that of conventional moving walkways. Although several prototype systems such as the Johns Hopkins Applied Physics Laboratory's AW and Dunlop's Speedaway have been built, no system has been tested in an urban environment.

Before AW's can be readily deployed, questions concerning their safety, reliability and operating characteristics must be addressed.

Accelerating Walkway Program

The goal of Accelerating Walkway (AW) program is to determine the practicality, reliability, and safety of accelerating walkway systems. The high travel speeds (7 - 10 mph) achieved by accelerating walkways permit deployment over longer distances than conventional moving walkways since they are competitive with other urban transit modes. The ability to increase walkway length may result in substantial benefits in intermodal transfer and terminal expansion applications. The high speeds also offer



Dunlop Speedaway Accelerating Walkway.

the potential for application in central business districts and other major activity centers. Although several prototype AW's are in existence, no operational system has been installed.

The AW program provides for a phased demonstration program consisting of feasibility studies (completed), design development, hardware design and laboratory testing, public demonstration, and product qualification.

The AW feasibility study provided a comprehensive overview of accelerating walkway technology (including three systems developed to the full scale prototype stage), identified 6 potential applications and associated cost-benefits, conducted an independent safety assessment, and provided preliminary demonstration planning.

The results of the feasibility study indicated that the potential benefits of accelerating walkways provide substantial justification for their deployment. The development of higher speed accelerating walkways operating at 2-3 times normal walking speed extending pedestrian range up to 3,000 feet would permit a large number of potential urban applications including:

Substituting for other more costly bus or automated guideway systems over short routes.

Providing transit service in areas where conventional transit systems could not be implemented because of cost or environmental impact considerations.

Acting as a connecting link between transit terminals and as a feeder and distributor for transit by connecting with peripheral parking or activity centers, increasing transit convenience and ridership.

Improving the practicality of vehicle-free zones by providing access to zones from peripheral parking as well as transit within the zones.

Improving the development potential of urban property by providing accessibility to transit, parking, residential areas, retail store, and activity centers.

Improving the convenience of interterminal movement at airports and within cities.

The design development phase will provide AW hardware design and demonstration implementation studies. The hardware design and laboratory testing phase will include detailed hardware design, equipment fabrication, and testing prior to demonstration. The public demonstration phase will demonstrate an AW approximately 300 feet in length. Product qualification will address the delivery system issues including product improvement and development of AW standards.

New Systems and Automation

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Advanced Group Rapid Transit System	CA-06-0094 CO-06-0008 WA-06-0008	$ 9,700,000	1975-1981	Boeing Aerospace, Otis, Elevator, Rohr Ind.	Aldo DeSimone 426-9264
Automated Guideway Transit Technology	CA-06-0071 CA-06-0088 CA-06-0089 CA-06-0091 DC-06-0142 MD-06-0022 MA-06-0048 VA-06-0025 VA-06-0041 IT-06-0148 IT-06-0152 IT-06-0156	$13,500,000	1974-1979	Aerospace Corp.; Battelle; Calif. Inst. of Tech./Jet Prop. Lab.; DeLeuw Cather; Dunlop; Gen'l Motors Corp.; Johns Hopkins Appl. Physics Lab.; MITRE; Mobility Systems and Equipment; TSC.	Duncan MacKinnon 426-4047
Accelerating Walkway Program	IT-06-0126	$ 1,200,000	1976-1982	Tri-State Regional Planning Commission	Duncan MacKinnon 426-4047

Bibliography

This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

Advanced Group Rapid Transit System Development Program, Phase IIA—
Executive Summary
Proj. CA-06-0094
Rohr Industries, Inc.

Advanced Group Rapid Transit System Development Program, Phase IIA—
Executive Summary
Proj. CO-06-0008
Otis Elevator Company

Advanced Group Rapid Transit System Development Program, Phase IIA—
Executive Summary
Proj. WA-06-0008
Boeing Aerospace Company

Costs and Energy Efficiency of a Dual Mode System—
Proj. CA-06-0088
April, 1976

Automatic Mixed Traffic Vehicle Control and Scheduling Study—
Proj. CA-06-0088
California Institute of Technology
Jet Propulsion Laboratory
December, 1976 — PB 264-527/AS

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Proj. CA-06-0088
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April, 1977 — PB 272-714/AS

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Proj. CA-06-0088
February, 1978

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Final Report
Proj. MD-06-0022
Johns Hopkins University Applied Physics Laboratory
May, 1977 — PB 270-354

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Final Report
Proj. MD-06-0022

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August, 1977 — PB 272-239/AS

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Proj. MA-06-0048
Transportation Systems Center
February, 1975 — PB 247-061/AS

A Survey of Propulsion Systems for High Capacity Personal Rapid Transit—
Proj. MA-06-0048
Alexander Kusko, Inc.
July, 1975 — PB 250-581/AS

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Proj. MA-06-0048
Transportation Systems Center
August, 1975 — PB 246-758/AS

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Proj. MA-06-0048
Boeing Aerospace Company
December, 1975 — PB 256-139/AS

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Proj. MA-06-0048
July, 1977 — PB 272-351

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Proj. MA-06-0048
July, 1977 - PB 273-695/AS

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October, 1977

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Proj. MA-0048-77-4
February, 1978

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The MITRE Corporation
July, 1976 — PB 263-640/AS

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Proj. VA-06-0025
The MITRE Corporation
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Proj. IT-06-0152
March, 1978

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Proj. IT-06-0156
March, 1978

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Proj. IT-06-0126
March, 1978

Accelerating Moving Walkway System Market Attributes, Applications, Benefits—
Proj. IT-06-0126
March, 1978

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Proj. MA-06-0022
August, 1976 — PB 277-046/AS

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Proj. CA-06-0078
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Proj. MA-06-0031
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Proj. MA-06-0031
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July, 1975 — PB 244-667/AS

Personal Rapid Transit Research Conducted at the Aerospace Corporation—
Proj. CA-06-0071
The Aerospace Corporation
March, 1976 — PB 256-846/AS

CHAPTER 5

AUTOMATED GUIDEWAY TRANSIT (AGT) APPLICATIONS

DOWNTOWN PEOPLE MOVERS
AIRTRANS URBAN TECHNOLOGY
MORGANTOWN PEOPLE MOVER

Superimposed Photograph Showing What a Downtown People Mover System Could Look Like in an Urban Area.

Automation of transit systems is one of the most promising approaches for increasing service levels while at the same time reducing costs through increased system productivity. The Office of Automated Guideway Transit (AGT) Applications was established to expedite the use of AGT research and development products. The Office develops and implements demonstration programs of promising existing AGT systems in urban areas. It also pursues research and development efforts by supporting:

- **Urban installations of proven AGT systems (operating in sheltered environments, such as airports and recreational parks), that promise significant benefits such as increased productivity and reduced operating costs through the introduction of automated transit operations; and National priorities such as central city revitalization, accessibility to public transit for elderly and handicapped people, and energy conservation and environmental protection.**

To meet these objectives, the Office currently provides the necessary planning, management, and technical guidance to City and State officials as well as to the transportation industry involved with the implementation of AGT systems in urban applications.

DOWNTOWN PEOPLE MOVER (DPM) PROGRAM

Under the DPM program, UMTA will provide several urban sites with capital assistance for the preliminary engineering, construction, and initial public operation of fully automated guideway transit systems in downtown environments. The program is intended to show that fully automated, relatively simple Shuttle and Loop Transit (SLT) type systems can be reliable urban transit alternatives that provide adequate service at a reasonable cost.

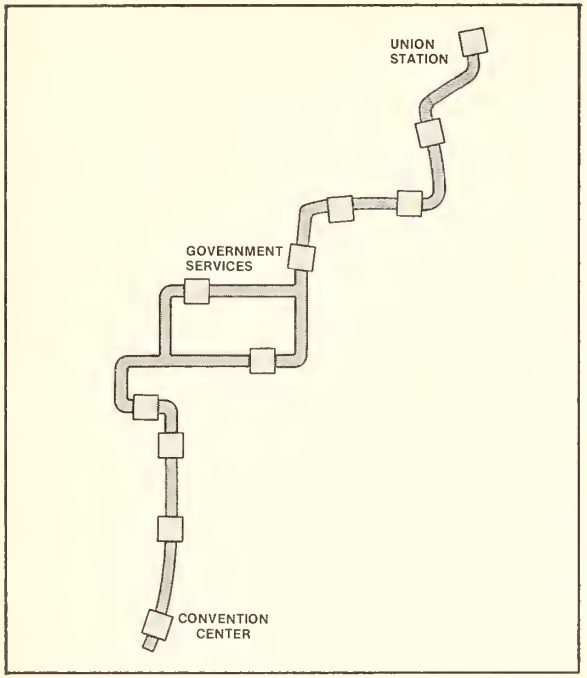
This program also responds to one of the broader goals of UMTA, which is to support the effective economic functioning of our central cities. The DPM program will provide operating data, planning tools, and experience that other cities can use in solving their transportation needs for downtown circulation systems. If such systems can be proven reliable, safe, and economical, they could become imaginative solutions to the local circulation problems in congested downtown areas and serve as a revitalizing force for urban centers.

On April 5, 1976, proposals for DPM projects were solicited nationwide and, of the 38 cities responding, four, Cleveland, Houston, Los Angeles, and St. Paul were initially chosen by the Department in December 1976 as demonstration sites. In addition to these, the Department indicated to the cities of Baltimore, Detroit, and Miami that they might divert funds from existing transit commitments for their proposed DPM systems.

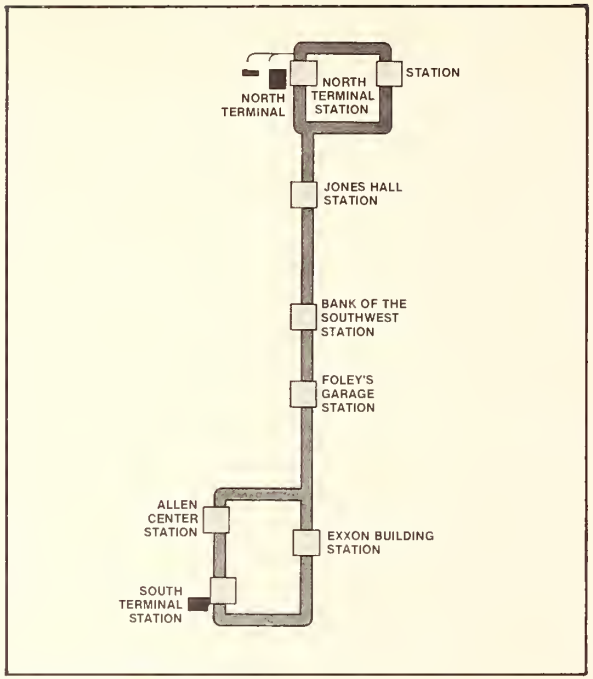
In March 1977, UMTA issued the DPM Program Implementation Guidelines to assist the DPM cities in the planning, implementation, and documentation of their proposed DPM systems.

By May 1977, Cleveland, Los Angeles, and St. Paul had submitted their final capital grant applications for Preliminary Engineering (PE) to UMTA. PE grants were awarded to St. Paul in September 1977, Houston in December 1977, and Los Angeles in January 1978. (Because of a conflict between Cleveland's legislative and executive branches, action on the Cleveland PE grant application has been suspended). Miami and Detroit have elected to proceed with their DPM projects; PE grants were awarded to Miami in May, 1978 and Detroit in June, 1978.

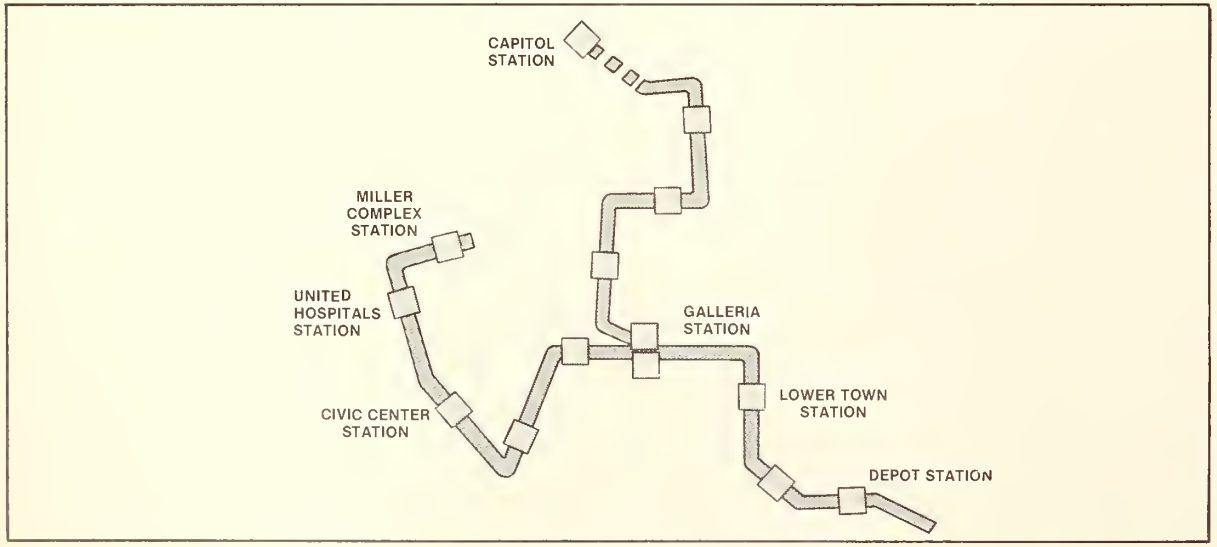
In June, 1977 the Department received direction from Congress to consider four additional cities, Baltimore, Indianapolis, Jacksonville, and St. Louis as part of the DPM program. In response to this direction and upon further review of the original DPM finalists' proposals, the Department established a two-tier DPM program in which the first-tier cities, Cleveland, Houston, Los Angeles, St. Paul, Detroit, and Miami, would be provided capital funds to perform the first phase preliminary engineering efforts and environmental impact studies. Upon the successful review of these design efforts and the potential environmental impacts, these cities would proceed with the construction of their DPM systems. The second-tier cities, Baltimore, Indianapolis,



Los Angeles People Mover.



Houston People Mover.



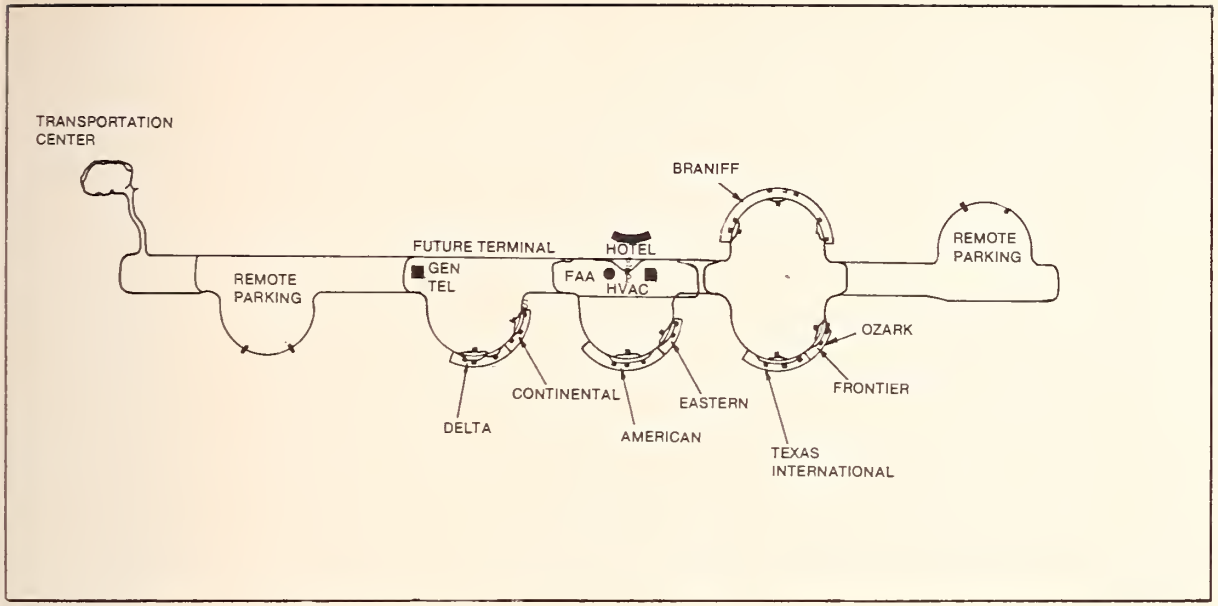
St. Paul People Mover.

Jacksonville, Norfolk, and St. Louis, would be provided technical study funds to perform feasibility analyses and further refinement of their proposed projects. If the results of these studies so warrant and if sufficient Federal funds are available, these cities may be provided capital funds for their first-phase preliminary engineering efforts. Any other city besides these eleven would be required to undergo an analysis of transportation alternatives prior to submitting an application for capital grant assistance and must in addition await the successful operation of at least one of these initial demonstration projects.

An illustrated brochure, *People Mover Profile*, (Revised-May, 1977) describing a number of existing AGT systems and several under construction, is available from the U.S. Government Printing Office, Washington, D.C. 20401 (Stock Number 050-014-00013-4) or the UMTA Office of Public Affairs (Area Code 202-426-4043).

AIRTRANS URBAN TECHNOLOGY PROGRAM

At the Dallas-Ft. Worth (DFW) Airport, the AIRTRANS system provides vital transportation service for passengers and employees. The system operates fully automatically 24 hours a day serving 53 stations, which are connected by 13 miles of guideway and uses a fleet of 68 vehicles. AIRTRANS carries both passengers and employees between parking lots and the airlines' terminals, and also operates utility vehicles for baggage, supplies, mail, and refuse in containers between utility stations. The AIRTRANS Guideway and Station layout is shown below.



AIRTRANS Guideway and Station Layout.

The AIRTRANS System Provides Transportation for Passengers and Employees at the Dallas-Ft. Worth Airport.

Since its opening in January 1974, AIRTRANS operational performance has steadily improved. During the first four years of operation, it carried over 16 million riders and accumulated 13 million vehicle miles without any major accidents.

AIRTRANS was the subject of an intensive assessment study sponsored by UMTA in 1975. The study performed by the U.S. Department of Transportation, Transportation Systems Center, identified a number of areas where further technical development was necessary to make AIRTRANS suitable for urban application.

In 1976, Congress also expressed a growing interest in applying the technology of AGT systems to solving urban transportation needs. Since airports represent a different environment than that of urban areas, the AIRTRANS Urban Technology Program (AUTP) was designed to improve the technology of AIRTRANS to be more suitable for urban use.

The principal objectives of the AUTP include development and demonstration of higher speeds for increased productivity, higher subsystem reliability, and lower capital and operating costs. The AUTP comprises two phases with the following sequence of steps:

1. characterization of baseline AIRTRANS system,
2. identification and analyses of the components and subsystems requiring change,
3. re-design and testing improved subsystems,

4. integration of improved subsystems prototype hardware into test vehicle,

5. demonstration of prototype hardware at DFW Airport.

Phase I of the program covers the period, December 1976 through December 1977. During this phase an AIRTRANS utility vehicle was converted to a test vehicle and instrumented for test purposes. Measurements have been made and tests performed on a portion of the AIRTRANS system guideway at speeds up to 30 miles per hour to characterize the present vehicle and guideway subsystems. The analysis of the data has been used to support the design of upgraded subsystems including vehicle control electronics, mechanical and servo-actuated steering, and collectors for wayside power and control signals. Under contract to the Dallas-Ft. Worth Regional Airport Board, Vought Corporation is developing the hardware and conducting the tests. A vehicle propulsion system to provide speeds up to 45 miles per hour and a propulsion control system with regenerative braking to reduce energy consumption and extend brake lining life has been developed. Under Phase I, improved propulsion, steering, power and signal collector, and controls were developed. These improved subsystems were installed in a test vehicle for evaluation and demonstration on the AIRTRANS system in November 1977. The Phase II program is a 24-month effort building on the results of Phase I. Further subsystem development and testing will take place and a final demonstration is planned for November 1979.

A Morgantown Station.

MORGANTOWN PEOPLE MOVER (MPM) DEMONSTRATION PROJECT

The Morgantown system is an automated self-service transit system operating a fleet of electrically powered, rubber-tired vehicles on a dedicated guideway at 15-second separations either scheduled or on demand. The system provides a safe, comfortable, and reliable means of transportation with a high level of availability for passenger service while alleviating congestion and air and noise pollution. The system is capable of transporting 1100 passengers in 20 minutes between two stations 1.5 miles apart. It can operate 24 hours a day and provides nonstop origin-to-destination service by the use of off-line stations.

The Morgantown vehicles, small by mass transit standards, carry up to 21 passengers-eight seated and 13 standing. The vehicle has been designed to provide economical service during both peak and low demand periods. The vehicle is 15.5 feet long and six feet wide; it weighs 8600 pounds empty. Speeds of up to 30 mph are provided by a DC motor powered by a three-phase, 575-volt AC distribution system. Rubber tires and an air-bag suspension system provide a quiet and comfortable ride. Unique features include a heated guideway for operation during icing conditions, onboard steering, and a synchronous point-follower control system to manage all system operations via computers. Fail-safe design and redundant safety-critical systems enhance reliability and assure passenger safety at all times.

A View Along the Morgantown Guideway.

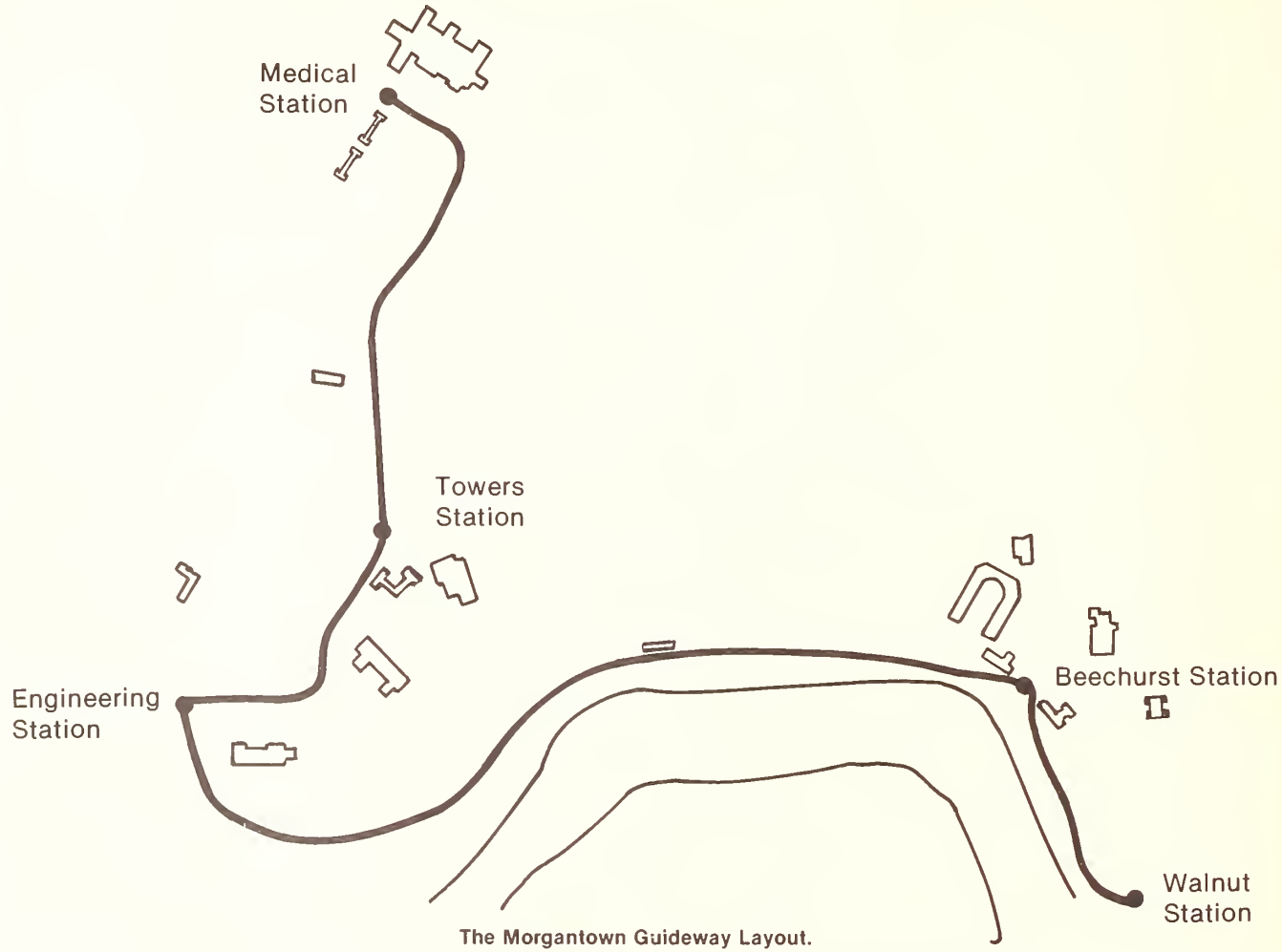
View from Within a Morgantown Vehicle.

Compared with conventional transit systems, the Morgantown system provides increased frequency of service and demand-responsive schedule flexibility. The transportation technology that has been developed for Morgantown also will be applicable to the transportation problems of urban core areas. In addition, such systems also will be capable of being integrated with existing transit systems.

Since its opening for regular revenue service in October 1975, for West Virginia University students, the Morgantown system has been a great success. It demonstrated both its reliability and its acceptability as a modern transit alternative to increasing automobile use in a high density urban corridor. In its first year of operation, MPM registered a total of almost 600,000 vehicle-miles and almost 800,000 passengers.

Improvements made during the first year of operations resulted in significantly greater reliability and greater ridership. During its second year of operation, the system carried more than 1.85 million passengers and operated almost 600,000 vehicle miles. In September 1977, the system carried 308,000 passengers; average system availability was 97.9%. Perhaps most importantly, there were no serious passenger injuries associated with system operations during the entire first 2 years.

Since the system has demonstrated compliance with its specifications and has been accepted by the university, UMTA has approved a capital grant to the West Virginia



The Morgantown Guideway Layout.

Board of Regents for the Phase II expansion. It will extend the system another 1.1 miles, add two and one half new stations, 28 cars, and a small maintenance facility below the Engineering Station. The present vehicle fleet will be refurbished and a new heated power rail installed to complement the heated guideway for better winter operations. Phase II construction activity is scheduled for completion late in 1978, and revenue operations are expected to begin in late Spring of 1979.

The knowledge gained from building and operating the MPM system will be of enormous help in making future automated guideway transit (AGT) systems more reliable. It has shown the technical feasibility, operational practicality, and transportation benefits of the AGT concepts for the future, paving the way for things to come.

Automated Guideway Transit (AGT) Applications

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Downtown People Mover	CA-06-0012 MN-06-0009 OH-06-0024 TX-06-0024	$ 4,100,000*	April 1976- Dec. 1984	Los Angeles, St. Paul, Cleveland, Houston	Vincent R. DeMarco 426-2896
AIRTRANS Urban Technology Program	TX-06-0020	$ 2,000,000	Jan. 1977- Jan. 1978	Dallas-Ft. Worth Airport Board (Vought Corp.)	John J. Marino 426-2896
Morgantown People Mover Demonstration Project**	MA-06-0026 WV-03-0006 WV-06-0005 WV-06-0006 WV-06-0007	$133,600,000	June 1969- April 1980	Cal. Inst. of Tech., Jet Propulsion Lab; The Boeing Company & subcontractors	John J. Marino 426-2896

*Since the end of FY-77 fourteen additional projects have been initiated. The funding shown here reflects all eighteen projects.

**Renamed "Morgantown People Mover" instead of Morgantown Personal Rapid Transit (PRT) based on development of uniform definitions.

Bibliography

This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

PRT Impact Study Pre-PRT Phase—
Proj. MA-06-0026
West Virginia University
March, 1976
Volume I: Travel Analysis — PB 254-481/AS
Volume II: Data Collection Procedure and Coding Manual — PB 254-482/AS
Volume III: Frequency Tabulations from Four Transportation-Related Surveys — PB 24-483/AS

Impact Evaluation of Morgantown PRT 1975-1976
Ridership: Interim Analysis—
Final Report
Proj. MA-06-0026
Transportation Systems Center
June, 1977 — PB 270-916

Morgantown Personal Rapid Transit System—
Proj. WV-06-0005
Boeing Aerospace Company
Automated Transportation Systems
November, 1975 — PB 263-673/AS

MPRT O&M Phase Operating, Availability and Maintenance History—
Proj. WV-06-0005
Boeing Aerospace Company
Surface Transportation Systems
January, 1977 — PB 266-994/AS

People Mover Profile—
Proj. MA-06-0081
Urban Mass Transportation Administration
May, 1977 — PB 268-335/AS

CHAPTER 6
SAFETY AND PRODUCT QUALIFICATION

Safety and System Assurance Programs Provide Training with Several Levels of Technical Detail.

In mid-1976 UMTA established the Office of Safety and Product Qualification to assure increased emphasis on safety and reliability characteristics of systems being funded through UMTA under the Urban Mass Transportation Acts. The basic approach used by this Office is similar to that of corporate-level product assurance offices in many industries. The Office assists transit developers and operators to plan and implement safety and system assurance programs. It encourages the establishment of general performance objectives for programs, and then conducts on-site reviews to make sure that individual programs are appropriate for the kinds of transportation services being provided and acquired, and that the programs are being implemented adequately to meet their objectives. This approach allows operating agencies sufficient flexibility to design detailed organizations and procedures which accommodate the unique characteristics of their systems and communities.

While it is important that safety and system assurance programs be planned and executed at the local level, it is not necessary for each operator to start from scratch. The Office conducts a number of projects which are designed to minimize the amount of re-invention needed by transit providers. These include:

Program plans, standards, and guidelines which can be adapted for local use

Educational programs in management and the technical aspects of safety, security, reliability, quality assurance, etc.

A project to accelerate the interchange of experience in procedures, standards, organization, and management practices among transit operators.

Direct assistance by consultation and by the on-site safety and system assurance reviews.

Research on common or critical safety and reliability problems.

At the other end of the development cycle, the Office works within development programs to assure adequate attention to safety and systems assurance considerations and opportunities for standardization in the design of equipment which will obtain widespread use. Efforts in this area include:

A transit reliability information program to accumulate knowledge which can be used to improve equipment reliability and reduce maintenance costs.

Development of materials fire safety standards supported by the data bank.

Preparation of procurement policies, specifications, and contract clauses which can be applied to development and acquisition contracts.

Development of qualification and acceptance test policies.

Technical support to ongoing UMTA RD&D programs and regulatory programs of the Federal Highway Administration and National Highway Traffic Safety Administration.

Safety and system assurance activities become more important as systems become more complex and as the quantity of new transit equipment increases. The projects described in this chapter provide UMTA with the expertise necessary to help and to oversee development of safety and system assurance functions within the urban transportation industry.

Mass Transit System Safety and Product Qualification

The U.S. Department of Transportation's Transportation Systems Center (TSC) support to this program was initiated in July 1974. Its primary purpose is to apply in-house technical and managerial resources to the planning, conduct, and evaluation of safety, system assurance, and product qualification activities.

The activities performed at TSC during FY 1977 included developing guidelines for

system reviews, procedures for safety and security of elderly and handicapped riders, initiation of the development of a transit reliability data bank, participation in system safety reviews, and a project to upgrade the quality of vehicles being funded by UMTA's 16 (b)(2) program. These vehicles are procured by State agencies for use by local non-profit organizations to transport elderly and handicapped people.

Future activities will include participation in the reliability data bank, standardization of transit equipment, technical qualification requirements for Federally funded transit hardware procurements, and research toward product improvement of both bus and rail. TSC will be instrumental in safety program planning, developing Downtown People Mover (DPM) safety requirements, and performing technical reviews of vehicle and automatic train controls for rapid rail systems. TSC will also continue work with other projects in the Office of Safety and Product Qualification, such as education courses at the Transportation Safety Institute (TSI) and safety and system assurance support from the American Public Transit Association (APTA).

Development of a Safety Program Plan

The Office is develping a Safety Program Plan in an effort to allocate its resources in an optional and most effective manner. This project initiated in FY 1977 is to develop information on the characteristics of transit safety and accidents to aid in establishing this plan. The Institute of Safety and Systems Management at USC will assess and classify hazards and recommend ameliorating lines of research. These recommendations are to be tempered by a consideration of UMTA's statutory and regulatory authority as well as the responsibilities of other DOT Administrations such as the Federal Railroad Administration, the National Highway Traffic Safety Administration, and the Federal Highway Administration. An essential task of the project is the assessment and critique of existing transit accident reporting systems. The information content of these data systems is to be analyzed in terms of UMTA's needs for transit safety statistics. A literature search for safety research projects is another significant task. The results of this search are to be used in identifying on-going research relevant to the remedy of urban transportation safety problems.

Safety and System Assurance Training Program

This project is designed to use the resources of the Transportation Safety

DOT Transportation Safety Institute, Oklahoma City, OK

Safety and System Assurance Training Program

Course	Designed for	Duration	Frequency	Location	When Implemented
Intro. to Mass Transit Safety and System Assurance	Transit management personnel and those entering management, consultants, manufact. suppliers	5 days	quarterly	Oklahoma City	Sept. 1976
Quality Assurance	Transit staff and line managers	5 days	quarterly	Oklahoma City	Nov. 1976
System Safety	Transit staff and line managers	5 days	quarterly	Oklahoma City	Jan. 1977
System Security	Transit staff and line managers	5 days		Oklahoma City	Nov. 1977
Reliability Maintenance, Availability, Dependability, RMAD	Transit staff and line managers	5 days		Oklahoma City	Nov. 1977
Safety and System Assurance Executive Briefing	Transit management personnel and those entering management, consultants, manufact. suppliers, Federal, local, State transit people	1-4 hr.	when called for	where required	Jan. 1977

Institute (TSI) and to assist UMTA in planning organizing, and conducting safety and systems assurance educational courses, activities, and programs for transit industry and governmental personnel. UMTA continues to encourage, stimulate, and improve the application of system-oriented technical management programs and processes to the planning, development, and operation of mass transit systems. Tasks under this project include:

Planning, development, and conduct of training programs in safety and system assurance which are responsive to the needs of the transit industry (see chart);

Establishment and use of an associate staff equipped to handle highly technical subjects;

Provision of consultant services as needed by staff and local agencies with regard to transit safety; accident and incident investigation policy, procedures and techniques; hosting of meetings; seminars, and symposiums to exchange information about safety and system assurance; accident and incident investigation procedures and analysis; and

Conduct of special projects or reviews in the area of safety and systems assurance as requested by UMTA.

The target group for the training courses includes personnel from transit operators, consultants, supplier organizations, state departments of transportation, and the Federal Government. Transit consultants, manufacturers, and suppliers also are eligible to attend the TSI courses, as are operators of private transit and commuter lines. Instructional costs, including the cost of reference materials and training supplies, are waived for Federal, State, and local employees. Personnel from private organizations are charged a fee for these costs.

Further information on the safety and system assurance courses may be obtained from:

Mr. Robert F. Creson
Director, Transportation Safety Institute
Department of Transportation
8500 South MacArthur Boulevard
Oklahoma City, OK 73125

Safety and System Assurance Support-APTA

Managed through the American Public Transit Association (APTA), this project draws upon the operational experience and expertise of transit managers to support UMTA in its safety and product qualification programs. In addition to the support furnished, participation in this project should aid in the stimulation of transit management to address safety and system assurance issues. Representative project tasks include:

Identification of safety priorities in bus and rapid rail systems;

Compilation and documentation of existing rapid rail system safety programs;

Development and documentation of the scope and cost of a data system that will maintain pertinent transit safety, security, reliability, maintainability, and service dependability data; and

Provision of support to UMTA in its safety and system assurance activities, to include program reviews, accident and incident investigations, development of safety and system assurance training, and the acquisition of responses to special queries. It is important to have transit industry participation in the UMTA safety and product qualification program, and this project will insure their participation.

Fire Safety in Transit Systems

This is a project to assess the overall fire hazard in transit systems and to identify and recommend remedial techniques and procedures. These recommendations will be directed towards all methods of fire protection - from basic design standards and materials standards to operational practices.

A significant component of this project is the information data bank on various structural and non-structural materials used in transit systems. This data bank was developed at TSC and contains information on flammability, smoke generation, toxic gas production, and other characteristics relative to fire safety. The data bank will be updated and kept current as part of the project and the data will be made available for public use, as appropriate. An important objective of this project is the development of materials fire safety standards for use by UMTA grantees. Information in the data bank will be used to support the development of these standards.

Under this project TSC will maintain liaison with all other Government agencies involved in similar projects as well as with the American Public Transit Association (APTA) and the National Fire Protection Association (NGPA). TSC serves as a consultant to UMTA on transit materials characteristics and supports the investigation and analyses of transit fires as required by UMTA.

Safety and Product Qualification

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Mass. Transit System Safety and Product Qualification	MA-06-0060	$1,344,000	July 1975- continuing	TSC	William J. Rhine 426-9545
Development of a Safety Program Plan	CA-06-0105	$ 96,000	July 1977- Sept. 1978	University of Southern California, Institute of Safety and Systems Management	William J. Rhine 426-9545
Safety and System Assurance Training Program	DC-06-0139	$ 359,500	Sept. 1975- continuing	Transportation Safety Institute	Edward J. Boyle 426-9545
Safety and System Assurance Support - APTA	DC-06-0123	$ 270,000	Dec. 1976- continuing	American Public Transit Association	Edward J. Boyle 426-9545
Fire Safety in Transit Systems	MA-06-0051	$ 495,000	1973- continuing	TSC	Robert I. Haught 426-0545

Bibliography

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The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

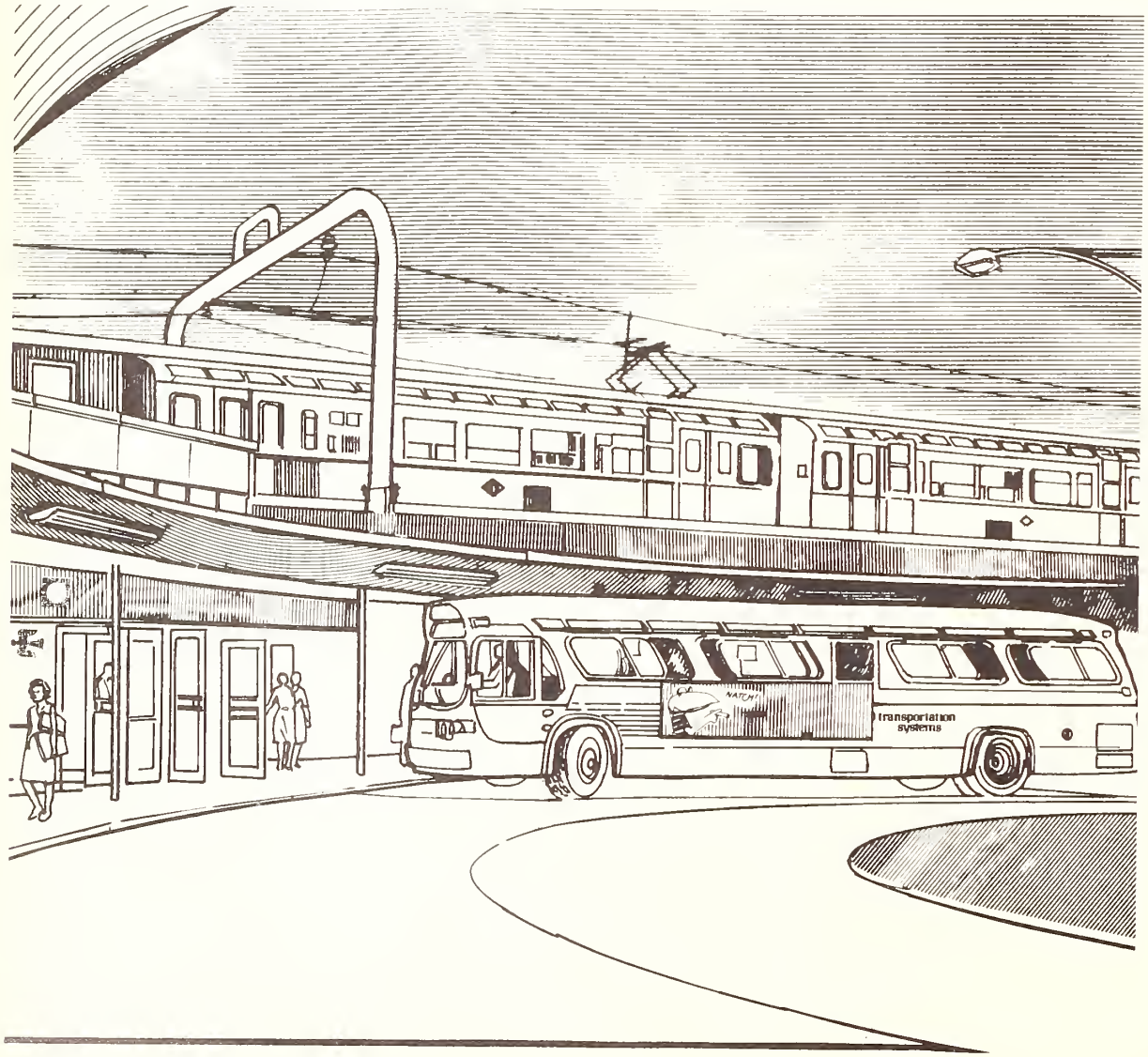
Order blanks are included in the Appendix for your convenience.

Safety in Urban Mass Transportation: Guidelines Manual—
Proj. RI-06-0005-75-2
Battelle Columbus Laboratories
May, 1975 — PB 245-413

Safety in Urban Mass Transportation: Research Report—
Proj. RI-06-0005-75-3
Battelle Columbus Laboratories
March, 1976

Development of a Safety Program Plan for the Office of Safety and Product Qualification—
Proj. CA-06-0105
Institute of Safety and Systems Management
University of Southern California
September 1, 1977
Volume I: PB 279-331
Volume II: PB 279-332

CHAPTER 7
SOCIO-ECONOMIC RESEARCH AND SPECIAL PROJECTS



SOCIO-ECONOMIC RESEARCH

GENERIC ALTERNATIVES ANALYSIS

ASSESSMENTS

TECHNOLOGICAL QUALIFICATIONS AND OPERATIONAL CERTIFICATION

ALTERNATIVE METROPOLITAN DEVELOPMENT

METRIC CONVERSION PLANNING

ACCOMMODATION OF ELDERLY AND HANDICAPPED RIDERS

SYSTEMS DEVELOPMENT

EXPERIMENTAL DESIGN AND EVALUATION

TECHNOLOGY SHARING AND COMMUNICATION

There are several topics susceptible to or requiring research that are common to several or, in some cases, all of the other projects encompassed by UMTA's research, development, and demonstration program. One, for example, is safety which is of such paramount importance that the work of an entire separate Office is devoted to it. Most of the other across-the-board areas of inquiry are involved with human factors; social, economic, psychological, and political. Projects in these areas are conducted by UMTA's Office of Socio-Economic and Special Projects, where they are grouped under two broad categories: Socio-Economic Research and Systems Studies, Support and Development.

SOCIO-ECONOMIC RESEARCH

Socio-economic research has concentrated heavily on the estimated effects of introducing automated guideway transit systems in the central business districts and other major activity centers of the cities.

The information obtained through the AGT Socio-Economic Research Program will be valuable to local governments in undertaking their local "alternatives analysis" process, an UMTA requirement to qualify for federal capital assistance for a major public transportation investment.

This research program seeks answers to many of the following types of basic questions regarding automated guideway transit systems:(1) Where and under what conditions will AGT service characteristics satisfy the travel needs and socio-economic requirements of U.S. urban areas in a manner competitive with or superior to other transportation alternatives? (2) What is the role of AGT in providing a balanced total transportation service, and how does it integrate with existing service? (3) What are the costs of development, construction, and operation of AGT systems, and how do these costs compare with those of other transportation alternatives? (4) Where and under what conditions will the public accept automated over conventional transportation systems? (5) Will American cities accept the intrusion of AGT guideways? (6) Is there a potential market for transportation technology with the characteristics of AGT systems?

The program contains five activities. "Generic alternatives analyses" will compare AGT systems with other forms of urban transportation. "Assessments" will study how well existing systems work. "Cost" research will determine life-cycle costs of AGT systems. "Market" studies will discover how many communities want and can use AGT systems. "Communications" activity will disseminate information about AGT to all interested audiences and will seek local expression of views about AGT.

Generic Alternatives Analysis

This program is evaluating the modes of transportation available to urban residents including bus, rail, paratransit, private automobile, as well as automated guideway systems in hypothetical applications. It is also examining the social, economic, environmental, and performance considerations associated with each mode. The program will identify which modes are the most appropriate for each hypothetical application and under what conditions AGT would best meet the needs and requirements of a particular urban area.

The program encompasses three major activities - comparative trade-off analyses, an Advanced Group Rapid Transit System planning report, and a review of local alternatives analyses. The report on comparative trade-off analyses will summarize the findings of the hypothetical alternatives analyses and address such issues as the potential impact and probable acceptance of AGT systems relative to urban travel patterns, land use configurations, socio-economic and environmental impacts, and costs. The program will also review transportation planning studies done at the local level which consider AGT as an option.

The Houston Monotrain is one Domestic AGT System being Assessed.

Assessments

Domestic and foreign AGT systems are being evaluated in terms of social, economic, financial, and performance characteristics. Three major projects are being undertaken for this research.

Assessment of Domestic AGT Systems

UMTA assessment teams are studying a number of the seventeen existing AGT systems in this country to obtain information that will help in planning future AGT systems. This information includes economic, system performance, engineering, and operating data, as well as public response. The teams will also review the design, development, and implementation experience of each system to determine what was learned and how future urban installations can be most effectively carried out.

Morgantown Independent Assessment

The Morgantown People Mover System is the only AGT installation that operates in an urban environment. For that reason, it was subjected to an independent and especially detailed scrutiny. The findings of the study will be a valuable resource for planners of AGT systems for the cities participating in UMTA'S Downtown People Mover (DPM) Program. They will learn, literally, from the foundation up, how to build and operate a successful people mover system. The Morgantown Assessment contains information on the construction of guideways, the fabrication of vehicles, the costs of each element, the technical performance of the systems and subsystems, operating costs, and attitudes of the public.

Assessment of Existing Foreign AGT Systems

An UMTA assessment team, working jointly with a foreign team is examining a number of foreign AGT systems with the same objectives and activities as the assessments of the domestic systems. These foreign teams are also taking part in the review of systems in this country. Successful negotiations have so far been conducted and projects initiated with France and Germany for conducting joint assessments of existing foreign and domestic systems. A program of information exchange on urban transportation research on the social, environmental, and other implications of new transportation systems for metropolitan areas has also been arranged with France, Germany, and the Organization for Economic Cooperation and Development.

Costs

The cost analyses will be conducted as integral parts of Generic Alternatives Analyses and Assessments.

Capital, operating, maintenance, and life-cycle cost ranges for the various classes of AGT will be indentified for the hypothetical application in this program activity. Information gained in this study will serve as input to the Comparative Trade-off Alternatives Analysis. Capital costs will include right-of-way acquisition, construction of facilities (stations, guideways, maintenance yards), command and control, vehicles and vehicle subsystems, and O&M costs will include maintenance, parts, labor, administration, etc. cost data will be collected from existing sources to estimate AGT industry cost reduction potential as the technology matures. Life cycle cost analyses of alternative modes will be undertaken to examine the comparative economic potential of AGT under various ranges of possible future inflation and interest rates. This study should also determine those peripheral aspects of AGT systems which might be more economically operated by automation (e.g., fare collection, surveillance).

The economic costs of various physical structures that may be incorporated into AGT sytems to accommodate social, safety, environmental, and energy requirements (i.e., elevators, closed circuit television, noise minimization, regenerative braking, etc.) will be developed under the AGT Technology Program. These results will also be used in undertaking the Comparative Trade-off Alternatives Analyses.

Germany's Cabinentaxi has been Evaluated.

Markets

Estimates will be made of the potential market for AGT systems in selected cities. The cities chosen for market analyses will be selected primarily for their physical, social, and economic characteristics and the availability of essential data; they are not necessarily considering future AGT deployment.

Standard market survey techniques will be used. Data will be derived from the communications activity described immediately below and also from the plentiful data available from local technical studies, public hearings, and studies related to Federal grant applications. Some private market surveys may be available and may contain information that would be applicable.

Communications

Research dissemination is a major part of AGT Socio-Economic Research Program

and will assemble and synthesize the results from the other project activities. A central information repository will be established which will provide technical analysis and information needed for the design and development of the program support activity. In addition to disseminating research results and other data, information will be collected from local sources such as citizens, local officials, planners and organized interest groups to determine public attitudes and concerns.

SYSTEMS STUDIES, SUPPORT, AND DEVELOPMENT

This program extends to five disparate areas: technology studies in support of policy; improved access to transit service for the elderly and handicapped; systems development; experimental design and evaluation; and technology sharing and communication.

SYSTEMS STUDIES

Life-Cycle Costing

Although one of UMTA's basic responsibilities is to study ways to improve mass transportation at minimum costs, it is difficult, when developing new capital alternatives, to determine the real total costs incurred by the user during the full life of a system from initial delivery through final disposition. An ability to predict life-cycle costs would permit wiser choices in planning and implementing improvements. If practical techniques can be developed to take into account estimated life-cycle costs of ownership and operation, rather then just initial price more cost-effective selection could be made in buying equipment with UMTA capital assistance.

The purposes of this study are to examine historical experience and current developments in the concept of procurement based on estimates of life-cycle cost, to identify UMTA program activities that might benefit from its applications, to estimate the effect of such application, to develop a methodology for purchasing transit equipment on the basis of lowest life costs, and to formulate a plan for a pilot experiment applying the methodology.

Guidelines for Technological Qualifications and Operational Certification

This project recommended general guidelines for technological qualification of new transit system or equipment for eligibility for UMTA capital assistance, and guidelines for operational certification newly installed transit system.

Guideline documents for technological qualifications and operational certification were prepared for bus, rail, and AGT systems. These guidelines, in working paper form, have been forwarded to the Office of Safety and Product Qualification for refinement and possible implementation.

Effects of Alternative Metropolitan Development

Several Federal agencies concerned with various aspects of urban life are jointly sponsoring, and the Council on Environmental Quality is administering, a comprehensive project which will contribute to an understanding of the effects of urban mass transportaiton. The project is assembling and analyzing the existing knowledge about the way metropolitan development patterns affect economic costs, environmental quality, and natural resource consumption, as well as the way in which these development patterns are affected by varying transportaion policies and programs and by other Federal, State, and local programs, policies, and regulation.

Metric Conversion Planning

A strategy will be devised enabling UMTA to plan timely and effective action to help the transit industry convert to the metric system. The contractor will develop a plan of action which will be review by transit industry operators and manufacturers so that it will reflect their concerns and timetables for conversion.

ACCOMMODATION OF ELDERLY AND HANDICAPPED TRAVELERS

There is a national policy, established by Congress in 1973 that "no otherwise qualified handicapped individual in the United States...shall solely by reason of his handicap, be excluded from participation

in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance."

UMTA issued regulations describing minimum requirements that transit facilities and vehicles must meet to qualify for the use of Federal funds to purchase or construct such facilities and vehicles.

Within the Office of Technology Development and Deployment, all new system and vehicle developments are providing for the elderly and handicapped travellers. UTD is also undertaking special studies or development efforts that address individual problems or barriers that transit poses for the elderly and handicapped.

Research to improve use of transit by the elderly and handicapped traveller crosses modal lines and can therefore be found in every UTD office. Responsibility for planning and coordinating the Elderly and Handicapped program resides with the Office of Socio-Economic and Special Projects. The Office also sponsors some specific projects as described below.

Elderly and Handicapped Technology-Safety of Wheelchair Loading and Securement Systems

The purpose of this project is to (1) develop safety guidelines for wheelchair loading equipment, (2) test wheelchair fastening systems to determine their effectiveness and crashworthiness when secured at different points on the chair, (3) evaluate fastening systems for their ease of use, cost, and acceptability to the user, and (4) establish the cost-effectiveness of fastening systems.

Preliminary safety guidelines for lifts were developed during FY 1977, and review and comments will be solicited from transit authorities and manufacturers of lift equipment during FY 1978.

Under the crash-testing program, wheelchairs and generic fastening systems were tested with the wheelchair both facing and at right angle to the direction of travel. Additional tests will be conducted with wheelchairs secured only by wheelchair brakes to determine their behavior in transit vehicles under normal operating condition, such as emergency stops, quick starts, and while negotiating curves. Additional crash tests will include secure wheelchairs facing backwards.

Crash-Protection Systems for Handicapped Transit and School Bus Occupants

UMTA is joining with the Veterans Administration and the National Highway Traffic Safety Administration (NHTSA) in this project to develop and demonstrate (1) a seating protection system that protects the handicapped passenger and (2) an entry system to buses that is not hazardous in its storage position during an emergency stop or crash. The project is concerned with protection for handicapped passengers in transit and school buses, both those who use and those who do not use wheelchairs.

The project is a continuation of an earlier project "Safety of Wheelchair Loading and Securement Systems," discussed above. In that project, the California Department of Transportation (Caltrans) is conducting static and dynamic tests to learn where best to attach securement systems to the wheelchair to cause the least deformation and still hold the wheelchair and its user safely in place during emergency conditions. The follow-on effort with NHTSA will use the information of the Caltrans project as well as real accident and injury data to develop an optimum seating-protection system.

Assessment of Stockholm Inclined Elevator

One of the major difficulties encountered by elderly and handicapped travelers using transit systems is the problem of changing from one floor-level to another. In Stockholm, Sweden, in 20 transit stations the level-change problem is solved with inclined elevators. There are 36 inclined elevators which travel at the same angle as escalators and usually alongside them; each carries up to 12 people.

In September 1977, a five-man team traveled to Stockholm under UMTA sponsorship to evaluate the inclined elevator. One member of the team uses a wheelchair. The team was (1) to determine whether the inclined elevator would be useful for helping the elderly and handicapped in transit stations in the United States and (2) to obtain factual engineering, architectural, operational, and user data about the equipment,

which--if the inclined elevator is evaluated as having potential for this country--can be used in planning and designing future stations and future transit systems. The project report is expected to be completed in the spring of 1978.

SYSTEMS DEVELOPMENT

Systems development, in the program of the Office of Socio-Economic and Special Projects, designates the development of new auxiliary systems, or improvements of existing ones, which are applicable to more than one mode of transit, or which facilitate the movement of people or goods on cities by means other than public vehicles. During FY 1977 work was in progress on two projects of this nature: an automated transit information system, and a self-cancelling ticket for limiting the time of use of congreted highways, streets, or parking areas.

Automated Transit Information System

Telephone information specialists in a large, complex transit system sometimes have to spend an undesirable amount of time looking up information in responding to inquiries about schedules, routes, and fares. With computer assistance these can be handled accurately. Operator training time and cost can be reduced.

The objective of this project is to develop, demonstrate, and evaluate a prototype automated transit information system (ATIS).

The contractors supporting the demonstration have developed performance specifications for ATIS, and have developed a methodology to evaluate various forms of ATIS, and their software requirements. A demonstration of an operational ATIS is planned which will handle inquiries about bus and rail transit service in Washington, D.C.

Time-Calibrated, Self-Cancelling Ticket

If drivers of private automobiles were charged for the time they occupy space in traffic-congested areas, it is probable that many would either avoid entering such areas, or would remain in them for the minimum time required by their purpose in being there. The "self-cancelling" ticket is a device that could be used to control priced areas.

This project has developed an operational prototype of a time-calibrated, self-cancelling ticket which is being further refined. The self-cancelling ticket relies on a chemical reaction to trigger a precipitous color change on the face of the ticket after a predetermined length of time. Such a ticket will provide new options for enforcing traffic or parking controls. This technology development project directly supports the planned congestion pricing demonstration by UMTA's Office of Planning, Service and Methods Demonstrations.

EXPERIMENTAL DESIGN AND EVALUATION

Each technology development and deployment project is formulated in terms of an experimental design which establishes the objectives, formalizes the test and evaluation activities to be conducted, and structures the form of the final report. A report based on the expermental design contains the project objectives, the project results in terms of these objectives, and other related information developed during the course of the project. This yields a structural evaluation or objective assessment of a project presented in such a manner as to provide guidance for those planning similar projects. An effective Experimental Design is characterized by:

- Well defined project objectives;
- An analytical framework with necessary statistical support; and
- Presentation of results in a form which is easily assimilated by all of the audiences concerned with the domonstration project.

By the end of FY 1977 initial experimental designs had been prepared for nearly all projects conducted by the Office of Technology Development and Deployment. Particularly important, because of its relation to major UMTA Technology Deployment initiative, was an Experimental Design Plan for the Downtown People Mover Demonstration Projects.

The evaluation of the DPM deployments focuses on the extent to which DPM's: (a) meet stated objectives, (b) resolve demonstration issues, and (c) represent technically, operationally, and economically feasible innovations. The Experimental Design Plan is a detailed, step-by-step set of procedures to be used by each of the DPM cities in evaluating the installation and performance of the DPM system. UMTA will monitor the evaluation activity and provide technical assistance to the cities to assure the accuracy of data and validity of analysis. The evaluation begins with the site selection process, continues through the system design, construction, and testing phases and ends at the conclusion of operation in revenue service. Use of the identical experimental design by all DPM cities will ensure comparability of results. The design was constructed to be compatible also with the AGT assessments.

TECHNOLOGY SHARING AND COMMUNICATION

Technology sharing is intended to improve the communication of UMTA's plans, current effort, and accomplishments in Technology Development and Deployment. Participants in two UMTA R&D Priorities Conferences concluded that the need for more effective communication was critical. Projects include sponsorship of R&D priorities conferences, identification of unmet needs for technical information and methods of meeting those needs, and preparation of special Technology Sharing products, including reports, summaries, workshops, conferences, briefings, and other means of conveying to particular user groups the essential information derived from UMTA's work.

Improved Communication

During FY 1977 a contract was awarded to obtain expert services intended to improve communication about the Office of Technology Development and Deployment and its work. Initial efforts include an analysis of present practice in technical information dissemination; a recommended general approach for strengthening communication; analysis of the effectiveness of specific information exchange mechanisms and their relevance to the Office's requirements; preparation of a summary document for reference by prospective contractors and other interested in the work of the Office, and preparation of detailed *fact sheets* listing key information about ongoing projects.

R&D Priorities Conferences

An important event during FY 1977 was the Second UMTA R&D Priorities Conference in Arlington, Virginia November 30 and December 1, 1976 (an earlier conference took place at the same site during FY 1976. The agenda for the conference, developed jointly by UMTA. the American Public Transit Association and the Urban Consortium for Technology Initiatives, included addresses, resource papers, and workshop discussion on the following topics:

Viewpoints on UMTA's R&D priorities from spokesmen for transit operators, State, and local governments;

Needs and priorities in policy-related research and development;

Needs and priorities in technology development and deployment;

Implementation of non-hardware innovations;

Technology delivery systems; and

Information exchange.

Socio-Economic Research and Special Projects

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Socio-Economic Research					
Generic Alternatives Analysis	IT-06-0168 NY-06-0057 CA-06-0090	$601,000	Dec. 1975	W.V. Rouse & Assoc.; General Research Corp.; URBITRAN Assoc.	Howard D. Evoy 426-4022
Assessment of Domestic AGT Systems	IT-06-0135 MA-06-0067	$450,000	June 1975-April 1978	Stanford Research Institute; TSC	Howard D. Evoy 426-4022
Morgantown Independent Assessment	IT-06-0157	$201,000	Feb. 1977-Jan. 1978	N.D. Lea & Associates, Inc.	Howard D. Evoy 426-4022
Assessment of Existing Foreign AGT Systems	MA-06-0157	$325,000	July 1976-Jan. 1978	TSC	Howard D. Evoy 426-4022
Markets	IT-06-0165	$450,000	Oct. 1977-May 1978	Cambridge Systematics, Inc.	Howard D. Evoy 426-4022
Communications	IT-06-0167	$223,644	Sept. 1977-March 1979	Transportation Assistance, Inc.	Robert J. McCown 426-4022
Systems Studies					
Life Cycle Costing Feasibility Study	RI-06-0007	$137,000	May 1975-May 1978	Naval Underwater Systems Center, Dudley W. Gill & Associates	Patricia E. Simpich 426-4022
Technological Qualifications and Operational Certification Guidelines	MA-06-0064	$195,000	Oct. 1974-Oct. 1976	TSC	John S. Durham 426-4022
Effects of Alternative Metropolitan Development	IT-06-0129	$10,000-UMTA; $ 10,000-FRA; $ 75,000-DOT-Environmental Affairs; $225,000-HUD, FEA & Council on Environmental Quality	June 1975-March 1978	The Urban Institute	John S. Durham 426-4022

Socio-Economic Research and Special Projects

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Systems Studies (Continued)					
Metric Conversion Planning Project	IT-06-0209	$ 55,000	Dec. 1977-Aug. 1978	Automated Management Systems	John S. Durham 426-4022
Accommodation of Elderly and Handicapped Travelers					
Safety of Wheelchair Loading and Securement System	CA-06-0098	$160,000	Oct. 1976-Sept. 1978	California Department of Transportation	Patricia E. Simpich 426-4022
Crash Protection Systems for Handicapped Transit and School Bus Occupants	DC-06-0200	$150,000	Nov. 1977-Jan. 1979	NHTSA; Subcontractor, Minicars, Inc.	Patricia E. Simpich 426-4022
Assessment of Stockholm Inclined Elevator	IT-06-0172 DC-06-0167	$ 39,000	Sept. 1977-March 1978	Public Building Services, General Services Admin.; DeLeuw Cather Co.	Patricia E. Simpich 426-4022
Systems Development					
Automated Transit Information System	DC-06-0154 VA-06-0038 MD-06-0013 MD-06-0037	$645,000 - grant $210,000 - contract	Sept. 1975-Sept. 1979	Washington Metropolitan Area Transit Authority MITRED Corp.; National Bureau of Standards	John S. Durham 426-4022
Time-Calibrated Self Cancelling Ticket	IT-06-0125 RI-06-0009	$ 82,000	June 1976-June 1978	Arthur D. Little, Inc.	John S. Durham 426-4022
Experimental Design and Evaluation					
Experimental Design and Analysis Support	IT-06-0130 DC-06-0162	$ 90,000	Aug. 1976-March 1978	SYSTAN, Inc.; Peat Marwick, Mitchell & Co.; Canyon Research Associates	John S. Durham 426-4022
Experimental Design for Pneumatic Transport System in Tunneling	DC-06-0153	$ 24,000	Sept. 1976-March 1977	Mariscal & Co.	John S. Durham 426-4022

Socio-Economic Research and Special Projects

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Technology Sharing and Communication					
Technical Assistance in Technology Sharing and Technical Information Management	IT-06-0162 IT-06-0179	$104,199	March 1977- July 1978	Mariscal and Co. (via the Small Business Administration)	Henry Nejako 426-9261
Second UMTA R&D Priorities Conference	DC-06-0157	$ 37,000	Nov. 1976-	American Public Transit Association	Henry Nejako 426-9261

Bibliography

This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

An Automated Information Directory System (AIDS)—
Review and Specifications
Proj. VA-06-0038
The MITRE Corporation
July, 1977 — PB 272-253/AS

Path Finding Algorithms and Data Structures for Point-to-Point Trip Management—
Proj. MD-06-0013
National Bureau of Standards
January, 1975 — COM-75-10697

Point-to-Point Trip Management Program—
Preliminary Analysis
Proj. MD-06-0013
National Bureau of Standards
February, 1975 — COM-75-10421

Comparison of the Performance of Three Algorithms for Use in an Automated Transit Information System—
Proj. MD-06-0013-01, MD-06-0037
National Bureau of Standards
August, 1977

Cost/Benefit Analysis of Automated Transit Information Systems—
Proj. MD-06-0013, MD-06-0037
National Bureau of Standards
February, 1977 — NBSIR 77-1235

Experimental Design Plan for the Downtown People Mover Demonstration Projects—
Final Report
Proj. DC-06-0162
Peat, Marwick, Mitchell & Co.
April, 1977 — PB 270-614

Experimental Design Plan for the Pneumatic Transport of Muck in Tunneling—
Proj. DC-06-0153
Mariscal and Co.
March, 1977

Life Cycle Cost Model for Comparing AGT and Conventional Transit Alternatives-
Proj. CA-06-0090

Assessment of Operational Automated Guideway Systems-Airtrans (Phase I)—
Proj. MA-06-0067
Transportation Systems Center
September, 1976 — PB 261-339/AS

Assessment of Operational Automated Guideway Systems - Jetrail—
Final Report
Proj. MA-06-0067
Transportation Systems Center
December, 1977 — PB 278-521/AS

Development/Deployment Investigation of Cabintaxi/ Cabinlift Systems—
Final Report
Proj. MA-06-0067
Transportation Systems Center and
SNV Studiengesellschaft Nahverkehr mbH
December, 1977 — PB 277-184/AS

Technological Qualification Guidelines for AGT Systems, 1976—
Proj. MA-06-0064

Technological Qualification Guidelines for Shuttle Loop Transit Systems—
Proj. MA-06-0064
1976

Technological Qualification Guidelines for Bus Vehicles—
Proj. MA-06-0064
1976

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—
Proj. DC-06-0157
American Public Transit Association
March, 1977 — PB 266-158/AS

Proceedings of the Urban Mass Transportation Administration/American Public Transit Research and Development Priorities Conference, 1976—
Proj. DC-06-0136
American Public Transit Association
May, 1976 — PB 255-898/AS

Analysis of Urban Transportation Needs with Implication for AGT Systems—
Proj. MD-11-0001
July, 1975

A Study on Making Transportation Facilities Accessible to the Handicapped and Elderly—
Proj. PA-06-0031
Franklin Institute Research Laboratories
June, 1975 — PB 248-597/AS

A Directory of Vehicles and Related System Components for the Elderly and Handicapped—
Proj. PA-06-0031
The Franklin Institute Research Laboratories
June, 1975 — PB 244-474/AS

Future Scenarios for Urban Transportation—
Proj. RDD-9
Urban Mass Transportation Administration
August, 1975 — PB 255-349/AS

Joint Strategies for Urban Transportation, Air Quality and Energy Conservation—
Proj. RI-06-0005
Interplan Corporation
January, 1975 — PB 244-473/AS

Life Cycle Costing for Current Rohr and AM General Buses and General Motors RTS-II Bus—
Proj. VA-06-0039
Advanced Management Systems, Inc.
July, 1976 — PB 255-091/AS

CHAPTER 8

TRANSPORTATION SERVICES FOR SPECIAL USER GROUPS

Almost Seven and One Half Million Urban Americans Have Trouble With or Cannot use Regular Public Transportation Because of Age or a Handicap.

Special user groups generally refers to those persons who, because of age, income, or disabilities, do not have use of an automobile, and are therefore dependent on public transportation or special arrangements to meet their mobility needs. The economic constraints on this population generally mean that they have no automobile because of the high costs of ownership and operation. Taxis, too, are normally too expensive for regular travel. If disabled, these individuals may face the separate problem of having physical difficulty using most forms of auto transportation. Even if the individuals are able to make use of automobile rides furnished by others, the degree to which they can rely upon such services being available when needed is still another factor limiting their independence.

One of the objectives of the UMTA SMD Program is to improve the mobility of 7.5 million urban Americans who are transportation handicapped. Special equipment for these people has been designed and is in use on regular transportation routes in a few cities; in addition, and more commonly a variety of special transportation services are provided. Continuing studies are also defining who the special user groups are, the nature of their transportation needs, and the best ways to meet them.

Research on the Transportation Problems of the Transportation Handicapped

The overall objective of this research is to determine what can be done to provide transportation for those who have difficulty with or cannot use conventional transit because of age or a handicap. The central question is: which would be more cost-effective and beneficial; modifying existing and new transportation systems to make them accessible to handicapped people or designing specialized transportation?

This project is characterizing the transportation handicapped, how they travel and what they need. Alternative approaches for meeting those needs are being evaluated and demonstrations are being designed to implement or test proposed solutions. A manual presenting minimum standards and guidelines for urban transportaion planning for special users is being produced as well as a report giving a national perspective on current developments in transportation for the handicapped. Several transit systems will be investigated to determine the principal issues in the off-peak, half-fare program for the transportation handicapped. In addition, attitude surveys will be taken of both handicapped and non-handicapped people in cities which have transportation programs for the handicapped people to help develop planned demonstration projects.

Expansion of a Transit System for Elderly and Handicapped Persons

The transportation system of an entire area was expanded to provide services for elderly and handicapped riders as well as to increase the geographical service area, which will benefit the general population under one UMTA demonstration program. The demonstration was established in the lower Naugatuck Valley area of Connecticut and includes the towns of Seymour, Derby, Ansonia, and Shelton. An additional objective of the demonstration is to provide public transportation to meet the needs of health and social service agencies.

Currently the project transports 3800 people weekly, of whom 2600 are elderly and handicapped riders, at an average cost of less that $2 per trip, with productivity levels of nearly seven passengers per vehicle hour.

Phase One of the project developed specialized transportation services to serve the needs of health and social service clients using six specially equipped vehicles which provided barrier-free features for elderly and handicapped riders. Also introduced were flexible service modes, including demand responsive and agency contract, and a deferred payment credit card fare-collection system.

Under the second phase of the demonstration, these concepts have been applied and

tested in a full public system when eight additional vehicles were added to the system with the assistance of an UMTA capital grant. A revised fare and payment structure was intitiated as well as fixed-route service in and among the four towns in the demonstration area.

During the entire demonstration, the Lower Naugatuck Valley Community Council has acted as a broker and has coordinated several social service agency funding sources to support the system.

ACCESSIBILITY PROGRAMS

Accessible Full-Size Bus Services

The Secretary of Transportation's landmark decision requiring all buses purchased after September 30, 1979 using Federal Funds to be accessible to handicapped people, will have major ramifications in the transit industry. Yet practically no one has any operating experience using full-size accessible transit buses in regular fixed route service. There is an immediate need to collect data and disseminate information about the actual implementation process, experiences, and use of such service by handicapped persons.

Most Buses in Regular Service Are Not Accessible to Those Confined to Wheelchairs.

This research will be based on results from two sets of projects. The first are two demonstration, one in Palm Beach County, Florida, and the other in Champaign-Urbana, Illinois. In these demonstrations existing buses have been retrofitted with lifts to accomodate wheelchair users and the entire system will be made accessible to semi-and non-ambulatory passengers. These projects will be discussed later.

The second set of projects for obtaining data on accessible bus service involves locally sponsored efforts in major urban areas to introduce accessible buses into regular service. Such transit systems are initiating conversion of segments of their bus fleet through the capital grant program. From 5 to 200 accessible buses are being put into service in St. Louis, San Diego, Washington, D.C., Atlanta, Los Angeles, and Santa Clara County, California.

These projects entail the first large scale use of wheelchair-accessible, full-size transit buses, and as such, the experience gained will be of great interest to many other transit systems planning similar programs. Specific aspects to be studied include: handicapped riders market penetration; trip and rider characteristics; operational and maintenance cost increments; equipment suitability and reliability; impact on general service; special driver as well as user training; interfaces with complementary specialized services for elderly and handicapped people, such as, user subisdies and demand responsive services; the planning process for route selection, head-ways, as well as some local aspects in each demonstration.

The use of fully accessible buses will certainly improve the mobility of handicapped persons. However, due to the limitations of transit area coverage, it is obvious that a fully accessible fixed-route system will not meet all of the travel needs of handicapped people. The evaluations will identify which travel needs are not being met and determine appropriate services to supplement fixed-route service in order to meet these needs.

Initial ridership on the accessible bus services to date has been low, however the level of service has also been low. A major issue is whether wheelchair-handicapped ridership totals will increase substantially as more accessible service is provided and as sufficient time passes to allow for adjustments in travel patterns and travel modes. The accessible-bus evaluations will supply answers to this question.

Total Accessibility Demonstration; Champaign-Urbana, IL and Palm Beach County, FL

These two demonstrations are designed to evaluate the impact of a fully retrofitted fleet of buses as an alternative for meeting the transportation needs of elderly and handicapped people. Fifteen and thirty buses, respectively, have been retrofitted with wheelchair lifts. In addition, each demonstration will include a number of new smaller. (18-passenger), specially equipped buses.

A number of areas will be evaluated in both demonstrations, such as, the cost of retrofitting, the utility and durability of the technology, the level of accessibility in fact provided, the effect on maintenance costs, driver responsibility, the nature of the travel characteristics of the transportation handicapped, and, in the case of Champaign-Urbana, the effect of severe weather conditions.

Special Elderly and Handicapped Services for a Medium-Size City

In Portland, Oregon, LIFT, a special needs transportation demonstration, provides demand-responsive bus service to mobility-limited people who cannot use regular transit service and cannot afford alternate means of private transportation. LIFT provides service on an immediate-request and advance reservation basis from 7AM to 7PM daily using a fleet of 15 Mercedes Benz diesel buses which are specially equipped with wheelchair lifts, tiedowns, and a retractable lower step. The public transit agency, Tri-Metropolitan Transportation District of Oregon, is operating the service.

Coordination of special transportation services with public agencies and social service organizations which serve the handicapped is a central feature of the LIFT project. (The next section details the advantages of coordinated transportation services.) Under the current arrangement, the LIFT serves as a central source of rides; agencies contract with LIFT for their clients' trips at $3 per trip. Other elligible riders pay $0.50 per trip. Three out of four of the 4276 registered riders are clients of various social services.

Portland, Oregon's LIFT Program Features Demand-Responsive Buses Equipped with Wheelchair Lifts.

In addition to testing coordinated services, the project will test credit card fare collection and computerized billing for their cost effectiveness and general feasibility. A special survey taken before the project was implemented helped plan the requirements for transporting handicapped people and will be published for use by planners in other cities.

COORDINATED SERVICES FOR THE ELDERLY AND HANDICAPPED

In many areas, a number of social service organizations provide special, sometimes overlapping, transportation services for their elderly and handicapped riders, whereas many other elderly and handicapped people are still unable to get about. This kind of uncoordinated service is costly and inefficient and a coordinated program using public transportation and private transportation firms in conjunction with the social service transportation could provide a partial solution to the problem of immobility experienced by millions of Americans living in cities.

UMTA has been studying ways to bring about coordinated transportation services in a number of localities of various sizes and needs, including New York City, Brockton, Massachusetts, and two counties in New Jersey and Texas. These projects vary from planning studies to actual demonstration projects of coordinated services.

Elderly and Handicapped Social Service Transportation Coordination Demonstration, Mercer County, NJ

In Mercer County, New Jersey planners are setting up a pilot program to coordinate the transportation services of various social service agencies, public transit agencies, and private transportation firms. It is hoped that this pilot project will provide a foundation for a program that will provide transportation services to all elderly and handicapped people of the region, by setting up an effective multi-modal network.

Six local government and social service agencies will participate in the program. An information and referral office will be established to take reservations, coordinate service, and dispatch vehicles. The fleet will consist of 15 twelve-passenger vans, and 2 six-passenger station wagons; five of the vehicles will be radio equipped. In addition a private taxicab company will be contracted to provide a fixed number of round trips within the service area during the demonstration period. Two free taxi trips will be available to eligible elderly and handicapped participants in the program every month during off-peak periods. Operational data collected will be analyzed and the program will be evaluated in the final phase of the project.

Coordinated Services for the Handicapped, New York and Chicago

These projects, although slightly different in detail, have the same broad objective, i.e., to study and develop plans to provide barrier-free transportaion for the elderly and handicapped people of large metropolitan areas.

The very size of the cities makes special problems, e.g., the complexity of existing transportation, funding mechanisms, and institutional considerations. The studies will determine the social agencies and their locations; the location, number, and needs of the elderly and handicapped population; and the present transportation. Plans will then be developed to effectively meet the transportation needs. In the case of New York, this will involve an attempt to arrange a cooperative or consortium arrangement of taxi and livery services, if institutionally feasible, e.g., can funds, existing equipment, and staff be pooled.

Planning and Analysis for Special Service Transportation Coordination, Dallas County, TX

In Dallas County a similar study is also being conducted to plan the coordination of social service transportation, thereby eliminating redundant service, improving vehicle productivity, and reducing costs through centralized dispatching. HEW has been conducting similar projects in non-urban areas and small cities and this study, along with the New York evaluation will complement their work.

The main tasks in this particular project are first to define the role of the transit and paratransit operators, develop an accounting service, and a plan an operational and management structure for the implementation of the model. The final phase of the

study is to design a detailed plan for a project to demonstrate innovative solutions to the transportation problems of elderly, handicapped, and transportation disadvantaged persons served by social service agencies. Specific steps in preparing the plan include; analyses of the current system of providers, developing consolidaton options, studying administrative implications, and coordinating the transportation system.

Coordination of Human Service Transportation - Brockton, Massachusetts

In the small city of Brockton, Massachusetts, the Brockton Area Transit authority has also been planning for the coordination of transportation among thirty different agencies in the Brockton area which provide specialized transportation services to their clients. The coordination of transportation and resources will provide improved service and cost efficiencies by controlling expenditures which are derived from a wide variety of Federal, state, and local sources.

The planning study will centralize administration of the transportation programs, analyze any additional demand for specialized transportation services, design a paratransit system to meet the needs of the agencies and the transit dependent populations, and coordinate operations with intercity transportation providers.

Vera Institute Experimental Transportation for the Elderly and Disabled

This demonstration provides door-to-door transportation for elderly and handicapped people of an inner city area - the Lower East Side of New York. Service is provided 12 hours per day, Monday through Friday. the project, which has 10 fifteen-passenger vans (5 are lift equipped), began pilot operations by the summer of 1977. A unique aspect of the operation is the hiring of rehabilitated ex-offenders and ex-addicts to drive the vans. The project has received major funding from HEW, as well as UMTA, to determine impacts of mobility improvements on the quality of life and health care costs of the target population. The grantee has obtained a waiver from HEW to allow elderly persons on Medicare to receive transportation services paid for by HEW (Medicare) funds. This is the only waiver which is solely related to transportation that HEW has granted to date.

The significant issues to be addressed in the demonstration include the costs and performance of high quality transportation service in an inner city area, the impacts of the service on the individual users and the agencies that serve the target group, the potential for cost savings through coordination or consolidation of agency transportation services, and the performance of the drivers.

Most of the approximately 150 trips per day are for medical, nutritional, or recreational purposes. The project operations have not achieved a high level of vehicle utilization to date (2.26 passengers per vehicle hour). This has been attributed to a number of causes, including the necessity for scheduling trips far away from the Lower East Side, the time consumed in waiting or escorting clients into homes or facilities, and a delay in receiving radio communications equipment. The information to date indicates that the human service agencies operating only in the Lower East Side do not have any transportation budget, but rely on their clients to provide their own transportation to agency services. The potential for obtaining agency funds for these transportation services will depend upon whether this is true for other local agencies as well.

Community Broker Transportation Service for the Elderly

In Mountain View, California, UMTA demonstrated a community broker transportation service that provided transportation to a small target market of elderly and low-income people located in a low-income, elderly-housing project. A single community broker located in the housing project worked directly with the residents to plan and organize trips on a pre-scheduled basis in a twelve-passenger van. The broker, who also drove a van, was an employee of the taxi company providing the service under contract with the grantee. The key issues in the demonstration concerned the economic viability of this concept and its acceptability to the client group. It was expected that the project would lower the cost of door-to door taxi service and be economically self-sufficient because of the pre-scheduled, shared-ride operation. The completed

evaluation has revealed that approximately 30 percent of the target group living in the elderly housing complexes joined the cooperative from which group trips were scheduled. Between one-fourth and one-third of the riders relied exclusively on the van service. An average of 6 passengers per trip was achieved and the most popular trip purposes were shopping, travel to the nutrition program center, and restaurants.

Broker activities related to scheduling trips required a high level of contact with members and restricted the time available for revenue producing trips. Revenues generated were less than ten percent of the total operating cost. For the site tested, economic analyses indicated that even under the most optimistic demand and revenue assumptions, a subsidy of $2 to $3 per passenger trip would be required. Major factors affecting the deficit include the amount of time the broker must spend on outreach and scheduling functions and the impact of available transportation alternatives upon the demand for community broker services.

Ride-Sharing Paratransit Agency Study

This study is designed to determine the feasibility of using a ride-sharing broker to stimulate the demand and supply of paratransit services by consolidating trips that are currently made by private auto. The study will result in a demonstration brokerage project of social service transportation which will begin in fiscal year 1978 and, consequently, much of the groundwork for the demonstration is being set through this project. The study, which is being conducted in Pittsburgh, Pennsylvania, will examine the institutional and regulatory framework into which the ride-sharing brokerage will be introduced, design the specific functions, services, and management structure for the brokerage and outline a marketing approach.

USER SUBSIDY DEMONSTRATIONS

Another way UMTA is attempting to bring about better transportation for the elderly and handicapped people in various cities is through a subsidy to the elderly and handicapped transportation user. This subsidy is usually in the form of reduced ticket prices or fares on buses or in taxis which the bus or taxi owner can later redeem at full fare value. The concept is now being tested and demonstrated in Montgomery, Alabama; Kinston, North Carolina; Danville, Illinois; and Lawrence, Massachusetts. (Please see the chart.)

These cities represent a variety of population sizes and transportation needs, and, consequently, the subsidies are tailored to fit the specific conditions of the various cities. Assessing how well the user subsidy works under a variety of circumstances is one purpose of the demonstrations. Some think a user subsidy will make transportation services more responsive to the needs of elderly and handicapped people than a direct subsidy to the service itself, and this theory is being tested by the user subsidy demonstration program.

Other objectives include evaluating the operational and administrative feasibilities of user subsidies, determining whether elderly and handicapped people are able to take more and different kinds of trips than before the subsidy began, and the effects of the subsidies on the services themselves in terms of transportation supply and level of service.

Preliminary findings are as follows:

- The concept is a workable one. In general, taxi operators are interested in participating, perceiving that they benefit from such a program.

- User subsidies appear significantly less costly than alternative demand-responsive systems. No capital outlay is required.

- The approach appears well suited to small volume, scattered demand.

- The percentage of the total eligible population (65 years and over and the handicapped people) which register ranges between 30 and 40 percent. Actual usage is much lower.

- Administrative costs are manageable. Taxis are willing to absorb administrative burden without raising prices.

- The amount of shared-riding is minimal, despite the requirement that participating taxis must offer this type of service.

Specific findings in Danville, the longest operating project, indicate that 2/5 of the eligible population registered for the service. One-fifth of the eligible population use

User Subsidy Demonstrations

CITY	POPULATION	ELDERLY & HANDICAPPED POPULATION	TYPE OF SERVICE	HOW PROGRAM IS ADMINISTERED	PERCENT SUBSIDY
Montgomery, Alabama	135,000	21,000	shared ride taxi; local bus beginning in 1978.	voucher fare-free in off-peak periods	50 100
Lawrence, Massachusetts	66,915	14,700	shared-ride taxi bus	subsidized tickets redeemed by taxi companies	50 33
Kinston, North Carolina	22,000	about 3,000	shared-ride taxi	advance sale tickets	50
Danville,	42,600	7,500	shared-ride taxi	voucher	75 then 50

the service during any one month. The mean use for all users is four trips per person per month. Three fourths of those who did not register for the project cited availability of alternative transportation resources. During the first year the price to the user averaged $0.31 per trip, out of an average total fare per passenger trip of $1.16. The administrative cost per passenger trip was $0.18.

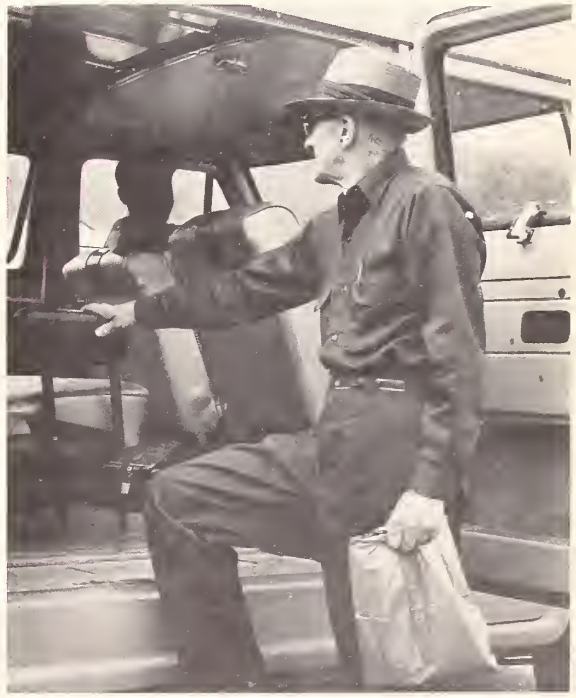
West Virginia TRIP Program

The Transportation Remuneration Incentive Program of West Virginia has two major objectives: to help meet the transportation needs of the low income elderly and handicapped citizens; and to develop and improve public transportation services across the state for all persons. Proposed as an innovative solution to transportation needs, the TRIP program is composed of a ticket subsidy program and the development of a transportation network in pilot regions of the state.

The ticket subsidy program provides low income elderly and handicapped persons with an $8.00 (face value) transportation ticket book each month, while the actual cost to the user averages $1.18. TRIP tickets can be used to purchase transportation from participating providers in the state.

The other element of the TRIP program is the development of a multi-faceted statewide network of primary and feeder transportation systems. The network will include inter-city carriers, taxi operations, and public and private transit operations. New transit services will be initiated to augment existing facilities. Five transportation regions, based on existing planning and development councils, will be established.

Within each region, a TRIP primary network of conventional fixed-route bus service, utilizing mini and mid-size vehicles, will be developed. The primary routes are to be established between small towns and outlying points and the county or regional centers. The base rate for fares will be 5¢ per



The West Virginia TRIP Progam is Striving to Improve Transportation All Across the State for the General Public, as well as Elderly and Handicapped Riders.

mile. The TRIP feeder system, overlaid on the regional primary network, will consist of demand-routed minibuses (two equipped with wheelchair lifts) to take trip reservations on a long lead-time basis, for pick-up and drop-off in specified areas. Different areas will be served on particular days of the week.

Study of Inner-City Transportation

The objective of this study is to determine the travel desires and mobility needs of inner-city residents, and to develop appropriate transit operating services, techniques, institutional frameworks, and financial arrangements to satisfy those transportation needs and desires.

The major features of this project include a literature search of inner-city transportation experiences, data collection on the transportation characteristics of inner city residents, and an analysis of inner-city transportation deficiencies by trip purpose. Alternative inner-city transportation solutions will be developed including type of transportation services, financial plans, and institutional arrangements. Three demonstration concepts, representing the most promising alternatives, will be selected and developed into site-specific project designs.

Service for Special User Groups

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	EVALUATION	TECHNICAL CONTRACT
Research on the Transportation Problems of the Transportation Handicapped	NY-06-0054	$1,800,000	April 1976-Jan. 1979	Grey Advertising, Inc.		Patricia Cass 426-4984
Expansion of a Transit System for the Elderly and Handicapped	CT-06-0003	$1,187,250	June 1971-June 1977	Valley Transit District (Connecticut); RRC International, Inc., J. Ferrigno 203-735-6824	TSC & Cambridge Systematics, Inc. contractor	Lynn Sahaj 426-4984
Accessibility Programs						
Evaluation of Accessible Full-Size Bus Services	MA-06-0049	$ 275,000 (est.)	Feb. 1977-Jan. 1980		TSC	Lynn Sahaj 426-4984
Total Accessibility Demonstration, Palm Beach County Florida	FL-06-0015	$ 689,000	June 1977-Jan. 1980	Palm Beach County Transportation Authority; J. Pippin 305-686-4555	TSC & Multisystems, Inc.	Lynn Sahaj 426-4984
Total Accessibility Demonstration, Champaign-Urbana, IL	IL-06-0039	$ 502,404	July 1977-Sept. 1979	Champaign-Urbana Mass Transit District, William Vok 217-284-8188	TSC	Larry Bruno 494-4984
An Elderly and Handicapped Service Approach for a Medium-Size City	OR-06-0004	$ 916,768	June 1975-June 1978	Tri-County Metropolitan Transp., District of Oregon	TSC; Crain Assoc.	Lynn Sahaj 426-4984
Coordinated Services						
Elderly and Handicapped Social Service Coordination Demonstration	NJ-06-0008	$ 195,960		Mercer County, NJ, D. Chapman 503-238-4379	TSC	Lynn Sahaj 426-4984

Service for Special User Groups

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	EVALUATION	TECHNICAL CONTRACT
Coordinated Services (Continued)						
Coordinated Services for the Handicapped, New York City	IT-06-0154	$ 109,340	Oct. 1976-Oct. 1978	Tri-State Regional Planning Com.; City Planning Com. NYC, I. Widawsky		Larry Bruno 426-4984
Large City Demonstration Planning for the Mobility Limited	IL-06-0033	$ 65,956	July 1975-Nov. 1976	City of Chicago, Dept. of Public Works		Lynn Sahaj 426-4984
Planning and Analysis for Special Service Transportation Coordination	TX-06-0025	$ 79,306	Sept. 1977-Sept. 1978	City of Dallas, J. Gonzalez 214-741-5851	TSC	Lynn Sahaj 426-4984
Coordination of Human Service Transportation	MA-06-0078	$ 40,000	March 1977-July 1977	Brockton Area Transit, M. Padnos 617-588-2240	TSC	Larry Bruno 426-4984
Vera Institute Experimental Transportation for the Elderly and Disabled	NY-06-0053	$ 175,000	Jan. 1977 Dec. 1978	Vera Institute of Justice, C. Haga 212-986-6910	TSC, ARI, Inc.	Lynn Sahaj 426-4984
Community Broker Transportation Service for the Elderly	CA-06-0002	$ 152,675 (UMTA&HUD)	July 1975-Feb. 1977	Stanford Un., Dept. of Engineering-Econometric Systems	TSC, Crain & Assoc.	Ronald Fisher 426-4995
Ride-Sharing Paratransit Agency Study	PA-06-0035	$ 139,980	May 1976-Dec. 1978	Carnegie-Mellon University, A. Blumstein 412-578-2175		James Bautz 426-4984

Service for Special User Groups

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	EVALUATION	TECHNICAL CONTRACT
User Subsidies						
User-Side Subsidy Demonstration	IL-06-0034	$ 977,000	June 1975- July 1979	City of Danville, IL	TSC & Crain Associates (contractor)	Lynn Sahaj 426-4984
User-Side Subsidy for the Elderly and Handicapped	AL-06-0003	$ 965,449	Nov. 1976- April 1979	City of Montgomery, AL	TSC	Lynn Sahaj 426-4984
User Subsidy for the Elderly	MA-06-0076	$ 422,061	Oct. 1976-	City of Lawrence, MA	TSC & Charles River Assoc. (contractor)	Lynn Sahaj 426-4984
User Subsidy for the Elderly and Handicapped	NC-06-0063	$ 213,529	May 1977- May 1979	City of Kinston, NC	TSC & Charles River Assoc. (contractor)	Lynn Sahaj 426-4984
Other Projects						
West Virginia TRIP Program	WV-06-0008	$ 720,000	Aug. 1976- Aug. 1977	West Virginia Dept. of Welfare	TSC & Crain Associates (contractor)	Lynn Sahaj 426-4984
Study of Inner City Transportation	IT-06-0153	$ 150,000	Feb. 1976- Aug. 1976	Transportation Assistance, Inc.	TSC	Larry Bruno 426-4984

Bibliography

This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

Study of the Transportation Problems of the Transportation Handicapped - Off-Peak Half-Fare Study—
Inventory Report
Proj. NY-06-0054
July, 1976 — PB 268-867/AS

Study of the Transportation Problems of the Transportation Handicapped - Off-Peak Half-Fare Study—
Ten Case Studies
Proj. NY-06-0054
Grey Advertising, Inc.
October, 1976 — PB 263-868/AS

Valley Transit District: Operations, Fare System and Vehicle Design—
Proj. CT-06-0003
RRC International, Inc.
September, 1975 — PB 252-668/AS

Proceedings: TSC Workshop on Attitudinal Surveys for Transportation Planning and Evaluation—
Proj. MA-06-0049
Transportation Systems Center
November, 1975 — PB 248-898/AS

Service and Methods Demonstration Program Annual Reports—
Proj. MA-06-0049
Transportation Systems Center
November, 1975 — PB 251-325/AS
April, 1977 — PB 270-673

Evaluation Guidelines for Service and Methods Demonstation Projects—
Proj. MA-06-0049
Transportation Systems Center and CACI, Inc.
February, 1976 — PB 251-891/AS

Incidence Rates and Travel Characteristics of the Transportation Handicapped in Portland, Oregon—
Final Report
Proj. OR-06-0004
Crain Associates
April, 1977 — PB 269-859

TRI-MET: Automated Fare Billing System—
Proj. OR-06-0004
The MITRE Corporation/METREK Division
December, 1977 — PB 275-661/AS

Transportation Problems of the Transportation Handicapped—
Proj. CA-06-0092
Crain and Associates
August, 1976
Volume I: The Transportation Handicapped Population Definition and Counts — PB 258-579/AS
Volume II: The Roles of Government and the Private Sector in the Provision of Mobility Systems for the Transportation Handicapped — PB 258-580/AS
Volume III: Alternative Planning Methodologies — PB 258-581/AS
Volume IV: Transportation Solutions for the Handicapped — PB 258-582/AS

Coordinating Transportation for the Elderly and Handicapped - A State of the Art Report—
Proj. DC-06-0106
The Institute of Public Administration
November, 1976 — PB 265-079/AS

Special Transportation Services for the Elderly and Handicapped Demonstration Project - Baton Rouge, Louisiana—
Proj. LA-06-0001
CACI, Inc.
November, 1976 — PB 263-904/AS

Handicapped and Elderly Vertical Movement Assessment Study—
Proj. MA-06-0047
Transportation Systems Center
February, 1976 — PB 252-516/AS

Fort Berthold Indian Reservation Bus Demonstration Project—
Proj. ND-06-0001
Crain & Associates
January, 1975 — PB 245-211/AS

Lincoln Experimental Transportation Demonstration Project—
Final Evaluation Report
Proj. NE-06-0002
Applied Planning and Management & Associates
October, 1975 — PB 248-735/AS

City of Cleveland Neighborhood Elderly Transportation (N.E.T.) Project—
Quarterly Report
Proj. OH-06-0018
City of Cleveland
March-May, 1975 — PB 248-903/AS

City of Cleveland Neighborhood Elderly Transportation Project - Dial-A-Bus—
Interim Report
Proj. OH-06-0018
City of Cleveland
January, 1976 — PB 253-237/AS

Cleveland Neighborhood Elderly Transportation Demonstration Project—
Final Report
Proj. OH-06-0018
Crain & Associates
April, 1977 — PB 269-860

Cranston Transvan—
Proj. RI-06-0006
Duffy & Shanley, Inc.
February, 1975 — PB 244-639/AS

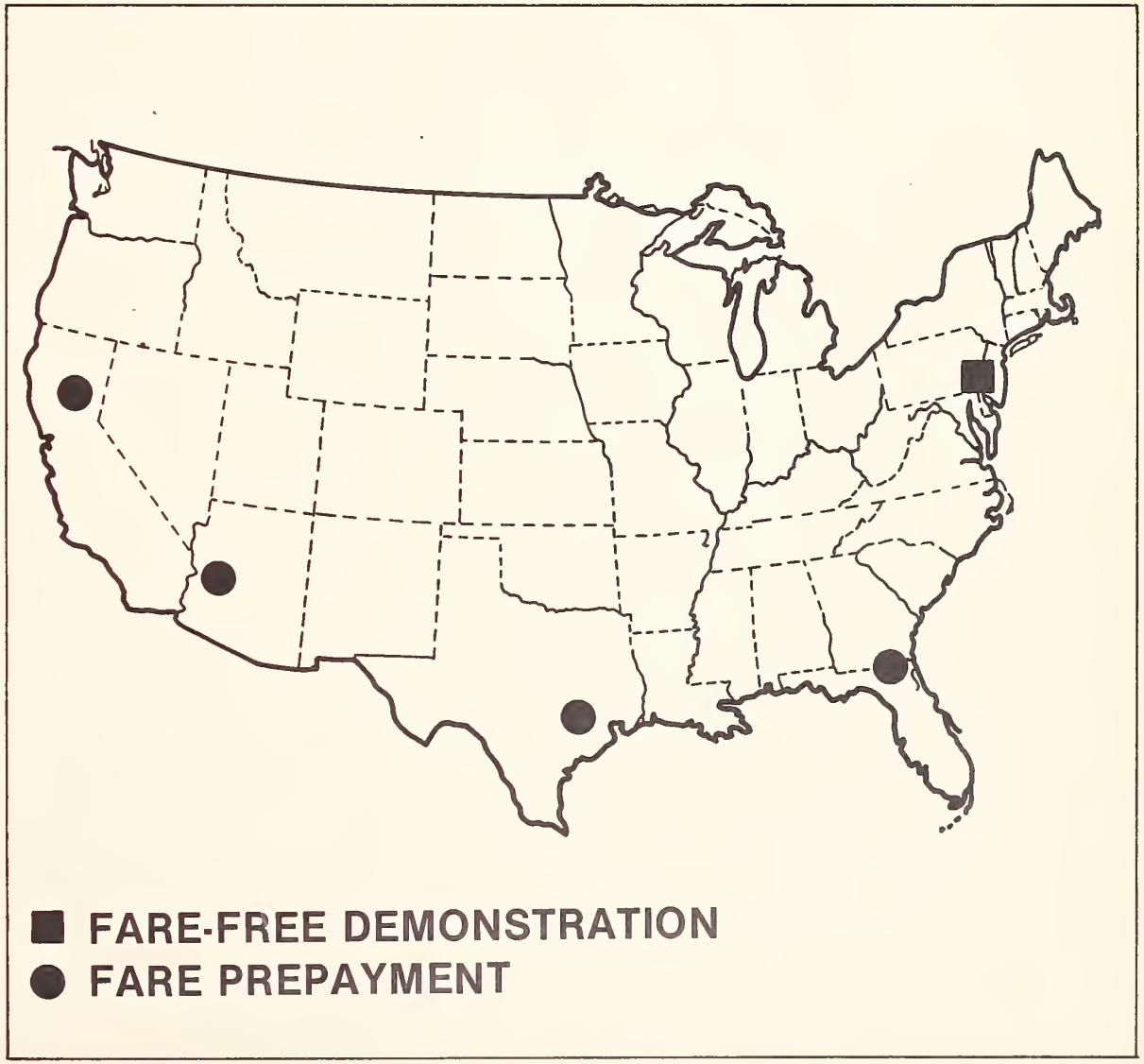
TRANSIT FARE AND SERVICE INNOVATIONS STUDIES

FARE PREPAYMENT

FARE-FREE TRANSIT

TRANSFER POLICY AND COST STUDY

ATTITUDE MEASUREMENT



Distribution of Fare-Free and Fare Prepayment Demonstrations

Adjusting fares and providing special service options are two ways transportation planners can increase public transportation ridership. UMTA is demonstrating a number of special fare plans to determine their effect on the number of people using public transportation and to provide better service to more people. These plans include fare prepayment, subscription bus service, and even fare-free transit service.

Transit Fare and Service Innovations Studies

Underlying much of the work done in the transit fare prepayment field was a study completed early in the fiscal year. The Transit Fare and Service Innovations project developed the transit fare prepayment and reduced price promotion campaigns which are now being tested in Austin, Texas and Phoenix, Arizona. The study also did much of the groundwork for the fare-prepayment-through-employers concept that is being demonstrated in Sacramento and Jacksonville.

In the spring of 1977, the Urban Institute assisted UMTA in soliciting local communities for their interest in participating in the pricing demonstration program. About 70 cities submitted statements of interest. These responses will be used to develop program plans and assist in budget requests for future funding for fare-free transit and other fare and service innovations.

This project has prepared two documents on the current understanding of general transit pricing and service policies and the relative cost-effectiveness of low fares as a ridership stimulant. A report presenting case studies of the recent experience of 35 transit agencies operating low-fare or fare-free services has also been developed.

Another outgrowth of the study is the fare-free, off-peak experiment in Trenton, NJ which will begin a one-year operation in 1978 and is discussed next.

Overall the program tried to assess many of the factors that affect ridership including reduced fares, expanded service hours, shortened headways, greater marketing and promotion, and expanded seating capacity. These and other factors were balanced against the costs associated with these changes so that transit operators can assess the relative cost-effectiveness of different policy options for increasing patronage.

FARE PREPAYMENT PROGRAMS

Fare prepayment offers a number of advantages both to the passenger and to the operator of a public transportation system. It is easier, for example, for the passenger not to have to hunt for change; the extra convenience might encourage the regular rider to use public transit more often and provide an incentive to people who do not usually travel by public transportation. Prepayment also gives the transit operator a cash flow advantage and even a better public image as a modern, efficient business using up-to-date marketing techniques.

Prepayment With Reduced Fare Promotion

UMTA is demonstrating several different prepayment programs. (Please see the chart.) In Austin, Texas and Phoenix, Arizona, transit fare prepayment is being promoted through a reduced fare plan. In Austin, discounts of twenty and forty percent are being offered during 2 one-month sale periods. At the same time, the number of sales outlets is being expanded and a marketing campaign is being conducted to increase awareness of the transit system and encourage experimentation with the discounted transit fare prepayment plans.

Austin conducted its first advance sale of discounted tickets in October 1977. Discounts of about forty percent were offered on monthly passes and twenty-trip punch cards. Sales of the prepaid tickets that month were almost four times what they had been in the previous, non-discount month. Now Austin is analyzing the data to see if the discount promotion increased ridership. The second discount sale, offering a twenty percent discount, is scheduled for February 1978.

Phoenix, a rapidly growing, low-density, auto-oriented urban area is also beginning to experiment with the reduced price promotion in the sale of monthly passes, twenty-trip punch cards, and a ten-trip, tear-off ticket. Although the first reduced-price tickets will not go on sale until February of 1978, Phoenix worked hard last year to plan and develop a marketing campaign. The city subcontracted with a data collection firm and received technical assistance in the

Transit Fare Prepayment Programs

CITY	POPULATION AFFECTED	HOW OFFERED	VARIETIES OFFERED
Austin, Texas	general population	reduced price promotion for 1 one month periods: Oct. 1977 - 40% Mar. 1978 - 20%	unlimited monthly passes and 20-trip punch card unlimited commuter pass unlimited off-peak shopper pass
Phoenix, Arizona	general population	reduced price promotion for 2 one-month periods: Feb. 1978 - 20% Oct. 1978 - 40%	20-trip punch card 10-trip tear-off ticket unlimited monthly pass
Sacramento, California	employees of participating firms	through employers with 1 month price promotion - a 25% discount	monthly passes
Jacksonville, Florida	employees of participating firms	through employers; 1 month price promotion at 50% discount	monthly commuter pass unlimited weekly pass single-ride tickets annual pass

preparation of survey instruments so that it can evaluate the results of the reduced price promotion in transit fare prepayment sales.

Prepayment Through Employers

In Sacramento, California, UMTA is testing the sale of monthly transit passes through employers. It is hoped that by making the passes more easily available to a greater number of people, transit ridership will be increased. An additional benefit could be the development of a stronger relationship between the transit agency and the business community. Much of the work of the project is to gain the support of a large number of Sacramento area employers and then evaluating the results of the joint venture as well as any problems that may develop.

Jacksonville, Florida employers are also selling prepaid transit passes. A one-month discount will be offered. The intent in Jacksonville is to increase ridership on the existing bus service without major modification of the present services. The existing transit system in the area consists of 53 routes covering 840 square miles and serving 50,000 people on an average weekday.

The major work on this project includes the preparation for the data collection and contacting employers. Later, surveys will be taken of the employees of various companies and finally passes will be distributed with an emphasis on a payroll deduction plan. Data on travel behavior and on any operating information will be collected by the Jacksonville Transportation Authority.

Fare-Free Transit Service

Another way that UMTA is attempting to increase ridership in the public transit is to offer fare-free transit service in off-peak hours. In Trenton, NJ where this concept will be demonstrated beginning in March 1978, a half-fare program is already in effect from 10 AM to 2 PM and after 6 PM Monday through Saturday and all day Sunday and holidays. Senior citizens ride at half-fare for a slightly longer time period. In most cases the fare will be reduced from fifteen cents to no fare.

During 1977, data were collected on the existing fare structure and the New Jersey Department of Transportation will begin testing the impact of the fare-free system even before the completion of the demonstration. The hypothesized impacts are inceased use of transit by those who might not otherwise have traveled and those who would have used another way to travel, including those who would have walked;

shifts to off-peak travel periods; decreases in average trip length; decreases in boarding times; and increased activity in the centers being served. To the extent that these impacts are or are not observed this demonstration will serve as a planning guide for fare-free projects in other areas of the country.

Transfer Policy and Cost Study

Transit agencies across the country use a wide variety of transfer strategies and charges. This study is examining the reasons for implementation of the chosen transfer policies in the various areas, the advantages and disadvantages of the various policies, the rationale for selecting transfer charges, and the impacts on ridership and revenues and some alternatives such as routing, passes, and route simplification among others.

Data will be assembled from published reports, contacts with government agencies and industrial associations, and case studies of selected transit agencies. This project will also produce a report on current practices and analyses of experiences with different transfer policies and charges. A planning manual will be written offering guidelines on the cost-benefit factors, impacts and implementation issues resulting from any transfer policy chosen.

Attitude Measurement Techniques for Transportation Planning and Evaluation

This study is developing better analytical techniques for measuring public responses and attitudes towards transportation improvements and demonstrations. The study will have two final products. The first is a manual describing attitude measurement techniques for transportation planning and evaluation with enough information so that people unskilled in social science techniques could conduct attitudinal evaluations. The second is a technical report on the validity of attitude measurement techniques based on integration of information from a literature search, field experience, and analyses.

In order to develop these two final products, an interview literature search report has been prepared which documents the range of current applications of attitude measurement techniques with a transportation focus and suggests attitude research areas with potential transportation applicability. Additionally a second interim report has been prepared which is a plan for a multi-stage, non-site specific field data collection and analysis of attitudes and travel behavior. Guided by these two reports, this study began acquiring attitudinal data from on-going Service and Methods Demonstation site evaluations. It is expected that in 1978 additional data will be acquired and that the several sets will be extensively analyzed.

This study will have a two-fold impact. It will recommend to transportation planners and systems operators specific attitudinal measurement techniques which can be used to evaluate reponses to planned or implemented transportation innovations, and it also will validate the methodological bases of attitude measurement techniques, thereby designating the range of applications in which these procedures are useful.

Fare and Pricing Policies

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	EVALUATION	TECHNICAL CONTRACT
Transit Fare and Service Innovations Studies	DC-06-0120 DC-52-0002	$310;325	July 1975- May 1977	The Urban Institute		Bert Arrillega 426-4984
Fare Prepayment						
Transit Fare Prepayment	MD-06-0031	$ 64,133	August 1977- Oct. 1978	Ecosometrics Inc. (contractor) TSC	Ecosometrics Inc. (contractor); TSC	Bert Arrillega 426-4984
Transit Fare Prepayment with Reduced Price Promotion	TX-06-0021	$ 82,022	May 1977- July 1978	City of Austin, TX	TSC & Crain Associates (contractor)	Bert Arrillega 426-4984
Transit Fare Prepayment with Reduced Price Promotion	AZ-06-0002	$159,471	July 1977- Jan. 1979	City of Phoenix, AZ	TSC & Crain Associates (contractor)	Bert Arrillega 426-4984
Transit Fare Prepayment Through Employers	CA-06-0102	$101,800	May 1977- Nov. 1978	Sacramento Regional Transit	TSC & SYSTAN Inc. (contractor)	Bert Arrillega 426-4984
Demonstration of Various Transit Fare Prepayment Instruments Through Employers	FL-06-0016	$148,000	Sept. 1977- March 1979	Jacksonville Transp. Auth.	TSC	Bert Arrillega 426-4984
Fare-Free Off-Peak Transit Service	NJ-52-0001	$500,026	Nov. 1977- Oct. 1979	NJ Dept. of Transportation	TSC & DeLeuw Cather (contractor)	Bert Arrillega 426-4984
Transfer Policy and Cost Study	MA-06-0049	$ 50,000	Nov. 1977- Nov. 1978	TSC & Charles River Assoc. (contractors)		Bert Arrillega 426-4984
Attitude Measurement Techniques for Transportation Planning and Evaluation	DOT-TSC-1168	$177,456	July 1976- July 1978	Abt Assoc. Inc., TSC		Vincent Milione 426-4984

Bibliography

This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

The Consequences of Transit Fare and Service Policies - A Classified Bibliography—
Proj. DC-06-0120
The Urban Institute
April, 1976 — PB 253-101/AS

Low Fare and Fare-Free Transit: Some Recent Application by U.S. Transit Systems—
Interim Report
Proj. DC-52-0002
The Urban Institute
February, 1977 — PB 271-077

The San Diego Transit Corporation: The Impact of Fare and Service Changes on Ridership and Deficits, 1972-1975—
Proj. DC-52-0002
The Urban Institute
May, 1977 — PB 275-009/AS

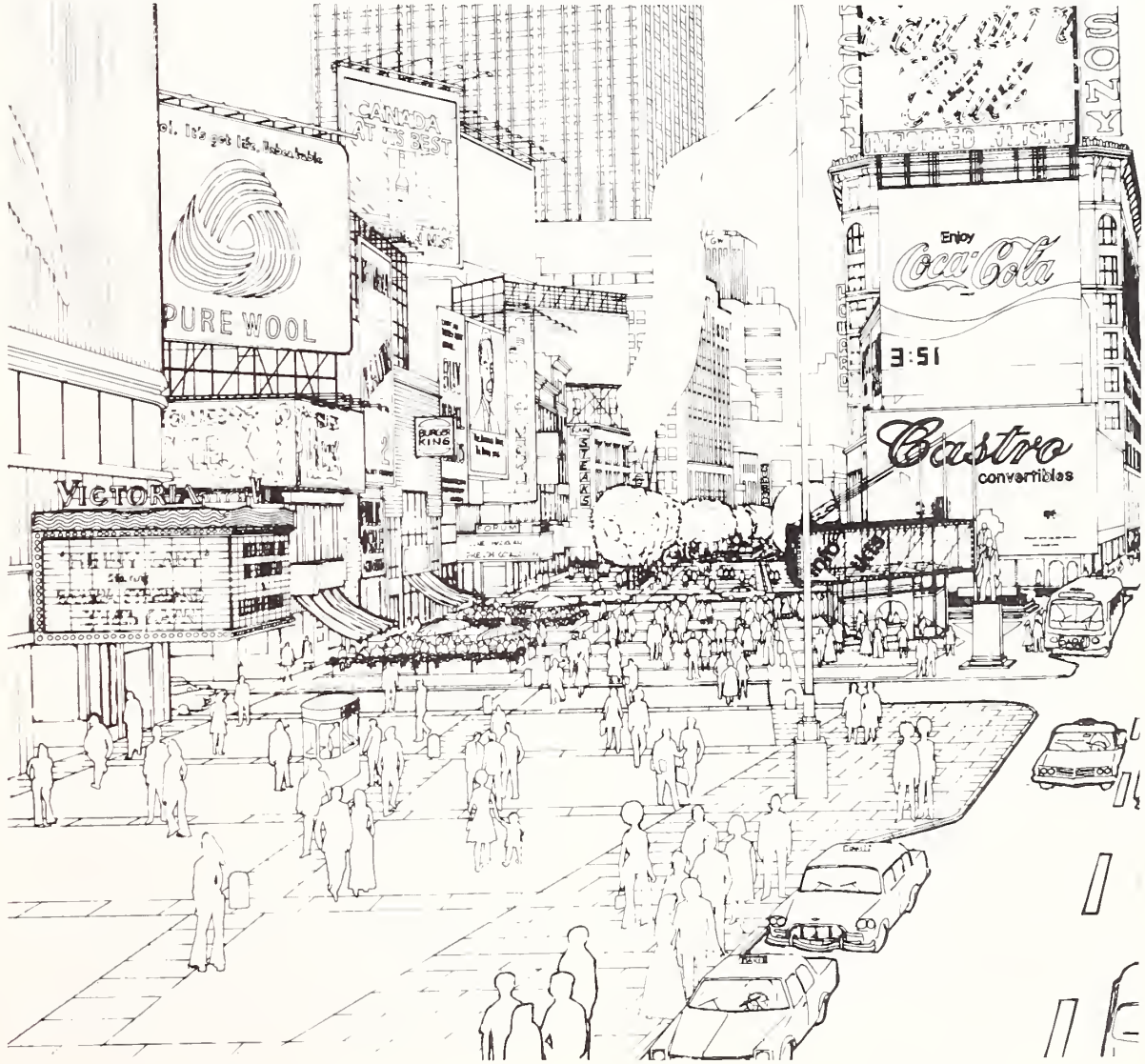
The San Diego Transit Study Data Base: Reference Manual—
Proj. DC-52-0002
The Urban Institute
June, 1977 — PB 275-010/AS

Transit Fare Prepayment—
Proj. MA-06-0049
The Huron River Group, Inc.
August, 1976 — PB 265-227/AS

Service and Methods Demonstration Program Annual Report—
Proj. MA-06-0049
Transportation Systems Center
November, 1975 — PB 251-325/AS
April, 1977 — PB 270-673

CHAPTER 10
CONVENTIONAL TRANSIT SERVICE INNOVATIONS

PRIORITY TREATMENTS
TRANSIT MALLS
SIMULATION FOR MANAGEMENT ANALYSIS
TRANSIT RELIABILITY
AUTO-RESTRICTED ZONES
VEHICLE INNOVATIONS
WATERBORNE MASS TRANSIT



The Service and Methods Demonstrations Program Includes Studies and Demonstrations of Auto-Restricted Zones and Transit Malls. Above is the Broadway Plaza Mall Planned for the Times Square Area.

The Conventional Transit Service Innovations are intended to provide more efficient transit service and to promote transit ridership in lieu of auto travel. By encouraging more people to leave their automobiles at home and use public transportation, scarce energy resources will be conserved, new and costly facilities for the automobile will not have to be built, and the urban environment will be improved.

PRIORITY TREATMENTS FOR TRANSIT AND OTHER HIGH-OCCUPANCY VEHICLES

Miami I-95/Northwest 7th Avenue Bus-Carpool Priority System

This two-phase project demonstrates a bus and carpool priority system in the Miami area. In Phase I, which was completed in February 1976, express commuter bus service was operated under four different combinations of mixed mode or reserved lane and signal preemption. Under Phase II, two lanes were added to the adjacent I-95 freeway and are reserved for buses and carpools for about 10 miles to and from downtown Miami. Additional bus service was added in the corridor to test the extent to which this type of bus preference will encourage both carpool formation and a modal shift to buses. Express bus service is running from the Golden Glades Interchange park-ride lots to the Miami central business district, airport, and Civic Center.

Between August 1974 and February 1976, five different bus operating techniques were tested on NW 7th Avenue and are illustrated with their average travel times in the accompanying table.

Express bus operations moved from N.W. 7th Avenue to the exclusive lanes on I-95 in March 1976. Bus ridership has increased slightly since the changeover, from around 1600 daily passengers in the fall to over 1750 passengers in September 1976.

Santa Monica Freeway Concurrent Flow, Reserved Bus, and Carpool Lane - Los Angeles, California

This project investigated the feasibility of reserving a concurrent flow freeway lane for the exclusive use of buses and other high-occupancy vehicles such as carpools. Besides reducing travel time for present transit and carpool travelers, the project was designed to improve the schedule reliability of the bus service and to increase transit productivity by more efficient use of buses with higher occupancies in uncongested lanes.

Under this project, the lanes next to the median shoulders in both directions of a 12.6 mile length of the Santa Monica Freeway (I-10) were reserved for buses and high-occupancy vehicles (3 or more persons) during seven peak hours. Access to and egress from the reserved lanes was accomplished by weaving across the unreserved lanes to or from the normal entry and exit ramps. Ramp meters were used to limit the congestion in the unreserved lanes. In addition, the Southern California Rapid Transit District (SCRTD) and the Santa Monica Municipal Bus Lines (SMMBL) operated 11 new bus routes between the west side of Los Angeles and Santa Monica, and the Los Angeles Central Business District (CBD). Three of these routes were from three newly established park-and-ride lots on the west side of Los Angeles and Santa Monica which could accommodate up to 1,300 automobiles.

Preferential treatment began on March 15, 1976. On April 9, a lawsuit against the preferential lane treatment was filed, claiming that the sponsors had failed to prepare environmental impact statements. On August 9, the U.S. District Court ruled that an environmental impact report must be filed under both national and state environmental laws. As a result the lane restrictions were cancelled after 21 weeks of operation.

During the last seven weeks of the project, the freeway carried 1.8% fewer people in 10.1% fewer automobiles. The number of carpools increased by 65% and bus ridership more than tripled. Carpool speeds were both faster and more consistent than before the demonstration. Freeway accidents were 2.5 times the preproject average. Freeway speeds for non-carpoolers were both slower and less predictable and delays at many of the metered ramps increased.

The media and public opinion however were opposed to the taking of a lane for high-occupancy vehicle use but favored ramp metering and increased bus service. Eighty-six percent of the corridor drivers

surveyed, including the majority of carpoolers, felt that the Diamond Lanes were either harmful or of no benefit whatsoever.

Corridor Improvements in Houston, Texas

This project is being implemented by the city of Houston as one of a number of improvements in the city's transportation system. These improvements are being funded from a variety of sources including the UMTA demonstration program, capital grant program and Section 5 operating funds; Federal Highway Administration programs and State and local funds.

These funds are also supporting an equipment acquisition program to refurbish and update the bus fleet, the development of new transit facilities, a carpooling program, a downtown circulation system, and an express bus service. The program of corridor improvements funded through this demonstration is being closely coordinated with other elements of the program funded by FHWA, State, and local funds.

The North Freeway contraflow lane is scheduled to begin operation in the fall of 1978. A park-and-ride lot capable of accommodating 750 automobiles and generating 26 to 30 bus trips per peak period is planned for the facility. Feasibility studies are underway for the implementation of transit preferential treatment along the Katy and Southwest Freeways. Planning for a major park-and-ride program along five freeways has begun. A demand-responsive and subscription service has been started for handicapped and elderly riders.

Transit Malls Retain Roadways for Public Transit Vehicles While Providing Expanded Areas for Pedestrian Use. Above is Chestnut Mall in Philadelphia.

TRANSIT MALLS

A transit mall is a street which has been improved for pedestrian use, but retains a roadway for transit vehicles integrated with the city-wide or regional transit system. These malls in many cases have made downtown areas more attractive and convenient for shoppers, more competitive with the suburban shopping malls, and, at the same time, made transit easier in the usually auto-congested downtown areas. Transit malls have become increasingly popular in the United States and at least three are now operational in major centers and many more are planned or are under construction.

Transit Mall Study

In this study the feasibility and cost-effectiveness of transit malls are being evaluated based on the experience and plans of several cities. The cities being studied are Madison, WI; Minneapolis, MN: Philadelphia, PA; Portland, OR; Denver, CO; New York, NY; and St. Louis, MO.

Transit malls are generally planned as part of a scheme of downtown redevelopment, often including transit improvements focusing on the mall, auto restrictions, and parking modifications. Major issues regarding transit malls include the environmental, aesthetic, and safety problems of mixing transit and pedestrian uses, the best physical designs for transit operations, the effects on automobile traffic, and the economic impacts on businesses located on or near the mall.

The evaluation relates the cost-effectiveness of the projects to explanatory factors in order to give guidance in the planning and design of future malls. Results are being examined against the following objectives of transit malls; improving transit service; increasing efficiency of transit operations; encouraging transit ridership; discouraging auto use; reducing conflicts among autos, transit, pedestrians, and trucks; creating or improving an environment for pedestrian and street activity; and promoting economic growth and activity.

Broadway Plaza Transit Mall

Times Square, among the most famous and busiest urban areas in the U.S., is the site of this proposed transit mall, pedestrian plaza, transit-priority street demonstration project. Broadway, an anomalous link in Manhattan's grid street pattern, will be redesigned for the improvement of transit service and for more socially and environmentally desirable pedestrian purposes.

The redesign of Broadway into Broadway Plaza will include complete street closings, progressive sidewalk widenings and a transitway on Broadway between 59th and 45th Streets. As streets are closed and private vehicles diverted, an open pedestrian plaza will be created, free of all but emergency vehicles and a transitway approaching and abutting the plaza.

Several benefits will be realized through the development of the Plaza and the transit and paratransit facilities. People coming into and moving through the area will be directly served by the transit and paratransit (mostly taxi) passenger loading areas at the Plaza. A Transit Information Center, with a coordinated transit graphics system will serve to make the Plaza a center for transit service and attract new patrons to the transit system. Tourists will especially benefit. The market for shops, services, and other business in the district will expand due to the pedestrian Plaza. The efficiency of all the transportation systems in the area will be increased.

INNOVATION STUDIES

Simulation for Traffic Management Analyses

Projects involving priority treatment for transit and other high occupancy vehicles must consider their effect on the other traffic on the roadways. Techniques are needed that increase the people moving value of the roadway without causing inconvenience to low-occupancy users beyond some tolerance level. Computer simulation of priority schemes can improve their chances of success by predicting their behavior before actual implementation in time to modify them before possible adverse public reaction is triggered or large capital investments are made.

A computer model, STRAP (Simulation of Traffic for Analysis and Planning), was developed to evaluate control strategies prior to field demonstration. Performance measures are computed for each street, bus stop, and bus route, as well as the entire network, from trajectories generated for each car, truck, and bus moving through the urban grid or freeway corridor. Bus trajectories can be shown by computer in graphic form.

STRAP and its predecessor SCOT have been used to model reserved lane bus service in the Minneapolis, MN, CBD, and predicted little change in resulting trip times. This was confirmed when the reserved lanes were subsequently installed although most bus riders did perceive a

faster, smoother trip. Fixed time traffic signal progressions and a control strategy that preempts a fixed-time control in favor of approaching buses have also been simulated and benefits compared. Studies to determine to what extent re-routing of general traffic can reduce the adverse impact of bus priority on it is underway.

Transit Reliability Study

Studies have shown that reliable transit service is even more important to travelers than mean travel time and travel cost. Service reliability is crucial in both demand and the cost of providing service and thus has a major impact on ridership and revenues. Simply, fewer people will use unreliable service and will use other more reliable forms of transportation, if available, even if the other forms cost more.

An in-depth analytical study is being conducted on service reliability and travel behavior, reliability from the transit operator's perspective, measures of reliability, causes of poor reliability, strategies to improve reliability, and future studies needed to gain a better understanding of the impact of reliability on travel operations and behavior.

An important finding of this study is that reliability is likely to be an important determinant of both mode choice and trip departure times behavior. In addition, it appears that traveler behavior is based on the user's preference for travel speed and reliability. This implies that failure to treat the variability of service attributes in demand model formulation will result in deficiencies in demand models used for travel forecasting.

Transit operators typically have a different view of service reliability than users, one that is related to schedule adherence rather than predictability of arrival. Thus, transit operators, in attempting to operate a cost-efficient service often do not account for the variation in the needs of travelers.

The importance of transit reliability to both travelers and operators indicates the need to identify and develop meaningful measures of transit reliability. Different measures are recommended for degrees of severity of the reliability problem.

Several causes of unreliability and strategies for improving reliability have been identified. Causes are primarily related to the configuration of the physical network, congestion effects, and the system concept. Once an initial deviation has occurred the problem becomes magnified as the bus proceeds further down the route, resulting in bunching. Priority, control, and operating strategies have been identified to treat different aspects of the reliability problem.

Auto-Restricted Zone, Multi-User Vehicle Systems Study

Auto-restricted zones are areas in congested portions of cities, such as the central business or shopping districts, where auto traffic is prohibited or restricted. A zone may range in size from a few blocks along adjacent streets to large portions of major activity centers and can be created through the use of parking restrictions, barriers to through traffic, or prohibition of all automobile traffic.

A multi-user vehicle system can be described as a user-operated taxi in which automobiles, electric autos, electric golf carts, bicycles and motor scooters, for example, can be used to transport people within a specific area. The type of system to be used depends on the number and location of access points and the types of trips permitted; there may be one of several specified terminals where users pick up and drop off vehicles or alternately they may be picked up and left at curbside anywhere throughout the service area (called ubiquitous access).

This project included analyses of auto restricted zones and multi-user vehicles plus an analysis of the multi-user vehicle system operating within an auto restricted zone. The multi-user vehicle system concept was not found to be feasible from a cost/benefit and operational standpoint and is, therefore, no longer being considered.

The following tasks were performed: analysis of the factors that help or hinder implementation and operation of these innovations; and development of site selection criteria and selection of potential demonstration sites for auto-restricted zones. Auto-restricted zone demonstration designs have been completed for Boston, MA; Providence, RI; Memphis, TN; and New York, NY. During 1978 and 1979 UMTA will provide financial support for the implementation of auto-restricted zones at these sites.

Double-Deck Bus Service Was Enthusiastically Received by the Public in Los Angeles and New York Where it was Demonstrated.

VEHICLE INNOVATIONS

Double-Deck Bus Project

The Double-Deck Bus Project demonstrated the UMTA objective of increased transit vehicle productivity. This project was designed to evaluate double-deck buses operating in daily revenue service in terms of public acceptance, rider safety, economic and service benefits. The project involved the purchase and operation of contemporary double-deck buses, eight in New York City and two in Los Angeles.

Two types of service were demonstrated. In New York the buses were operated in arterial service with heavy ridership, frequent boarding and exiting, and relatively short spacing between stops. In Los Angeles, the buses were used in express service with high average speeds, infrequent stops and a high level of passenger amenities in commuter and special service on the El Monte Busway and Los Angeles area freeways.

The project was hampered and delayed by problems related to the purchase of foreign vehicles. The problems caused by the prototypical nature of the vehicles have been solved, and it does not appear that repair and maintenance costs and reliability will differ significantly between bus types. Operating costs for the double-deck and conventional bus were nearly the same, as was boarding time per passenger. Passenger reaction was overwhelmingly positive.

New York City Waterborne Mass Transportation

The use of the nation's waterways, particularly to transport commuters, could serve to reduce the pressures on existing highways and mass transit facilities. This waterborne demonstration project will determine consumer and general community acceptance of such service in the New York City area. In addition, information will be provided on the economics of the service, operational problems, and recommendations for improvements in the design of the craft.

Three high speed Hovercraft-type vessels will be used to provide a variety of services. These services include:

Night Ferry Service — The substitution of smaller high-speed vessels for large ferries will substantially reduce operating costs for the City.

Peak Period Commuter Service — The demonstation will provide service between several locations and Manhattan.

Airport Service — Mid-day service will be furnished between Manhattan and La Guardia Airport.

Recreational Service — Summertime service between several recreation areas in New York and New Jersey is planned.

Conventional Transit Service Innovations

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	EVALUATION	TECHNICAL CONTRACT
Priority Treatments						
Miami I/95-Northwest 7th Ave. Bus-Carpool Priority System	FL-06-0006	UMTA R&D $1,407,000 UMTA other $1,400,000 FHWA $13,176,000 Local $2,030,000	Jan. 1972- Dec. 1976	Florida DOT, R. Lassiter 904-488-1586	Metropolitan Dade Co. Transit Authority; Univ. of Florida	Joseph Goodman 426-4984
Santa Monica Freeway Concurrent Flow Reserved Bus and Carpool Lane - LA, California	CA-06-0083 CA-06-0086	UMTA $927,800 FHWA $137,000 Local $2,300,000	June 1975- June 1977	Southern Calif. Rapid Transit District, G. McDonald 213-972-6990 Subcontractors SYSTAN, Inc.; CA DOT; Santa Monica Municipal Bus Lines	TSC	Joseph Goodman 426-4984
Corridor Improvements in Houston, Texas	TX-06-0018	$680,396	July 1975- June 1977	City of Houston, TX; Multisystems, Inc., R. Taube 713-222-5541	TSC; Multisystems, Inc. (contractor)	Marvin Futrell 426-4984
Transit Malls						
Broadway Plaza Transit Mall	NY-06-0056	$500,000		Administration & Management Research Associates of New York, Inc. (AMRA)	TSC	Joseph Goodman 426-4984
Transit Mall Study	DOT-TSC-0181	$111,000	April 1976- July 1977	TSC; Crain Assoc., R. Flahive 212-233-7954		Howard Simkowitz 617-494-2552

Conventional Transit Service Innovations

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	EVALUATION	TECHNICAL CONTACT
Innovation Studies						
Simulation for Traffic Management Analyses	MA-06-0049	$450,000	May 1974-Sept. 1978	TSC		Joseph Goodman 426-4984
Transit Reliability Study	MA-06-0049	$ 75,000	May 1976-April 1978	TSC, Multisystems, Inc.		Joseph Goodman 426-4984
Auto Restricted Zone/Multi-User Vehicle Systems Study	VA-06-0042	$600,000	July 1975-June 1977	Alan M. Voorhees & Associates, Moore-Heder, Cambridge Systematics, Inc. (subcontractors)		Joseph Goodman 426-4984
Vehicle Innovations						
Double Deck Bus	CA-06-0069 NY-06-0044	LA $334,375 NY $415,984	June 1974-June 1977	S. Calif. Rapid Transit District, NY Metropolitan Transit Authority	TSC, CACI, Inc. (contractor)	
New York City Waterborne Mass Transportation	NY-06-0055	$995,000	Sept. 1976-Sept. 1978	Tri-State Regional Planning Comm.	TSC	James Bautz 426-4984

Bibliography

This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

Service and Methods Demonstration Program
Annual Report—
Proj. MA-06-0049
Transportation Systems Center
November, 1975 — PB 251-325/AS
April, 1977 — PB 270-673

Streets for Pedestrians and Transit: Examples of Transit Malls in the United States—
Final Report - Phase I
Proj. MA-06-0049
Crain & Associates
August, 1977 — PB 278-487/AS

Final Report for the I-35W Urban Corridor Demonstration Project—
Proj. DC-06-0062
Metropolitan Council, St. Paul, MN
August, 1975 — PB 247-663/AS

The Evaluation of the Shirley Highway Express-Bus-on-Freeway Demonstration Project—
Final Report
Proj. DC-06-0110
National Bureau of Standards
August, 1975 — PB 247-637/AS

Urban Goods Movement Demonstration Project Design—
Proj. IL-06-0030
A.T. Kearney, Inc. and Alan M. Voorhees & Assoc., Inc.
December, 1975 — PB 249-318 SET

Urban Goods Movement Demonstration Project Design Phases I and II—
Executive Summary
Proj. IL-06-0030
A.T. Kearney, Inc.
May, 1976 — PB 254-854/AS

The Shirley Highway Express Bus-on-Freeway Demonstration Project/A Study of Park-and-Ride—
Proj. IT-06-0024
National Bureau of Standards
March, 1975 — PB 253-123/AS

The Operation and Management of the Shirley Highway Express Bus-on-Freeway Demonstration Project—
Final Report
Proj. IT-06-0024
The Northern Virginia Transportation Commission
September, 1976 — PB 260-540/AS

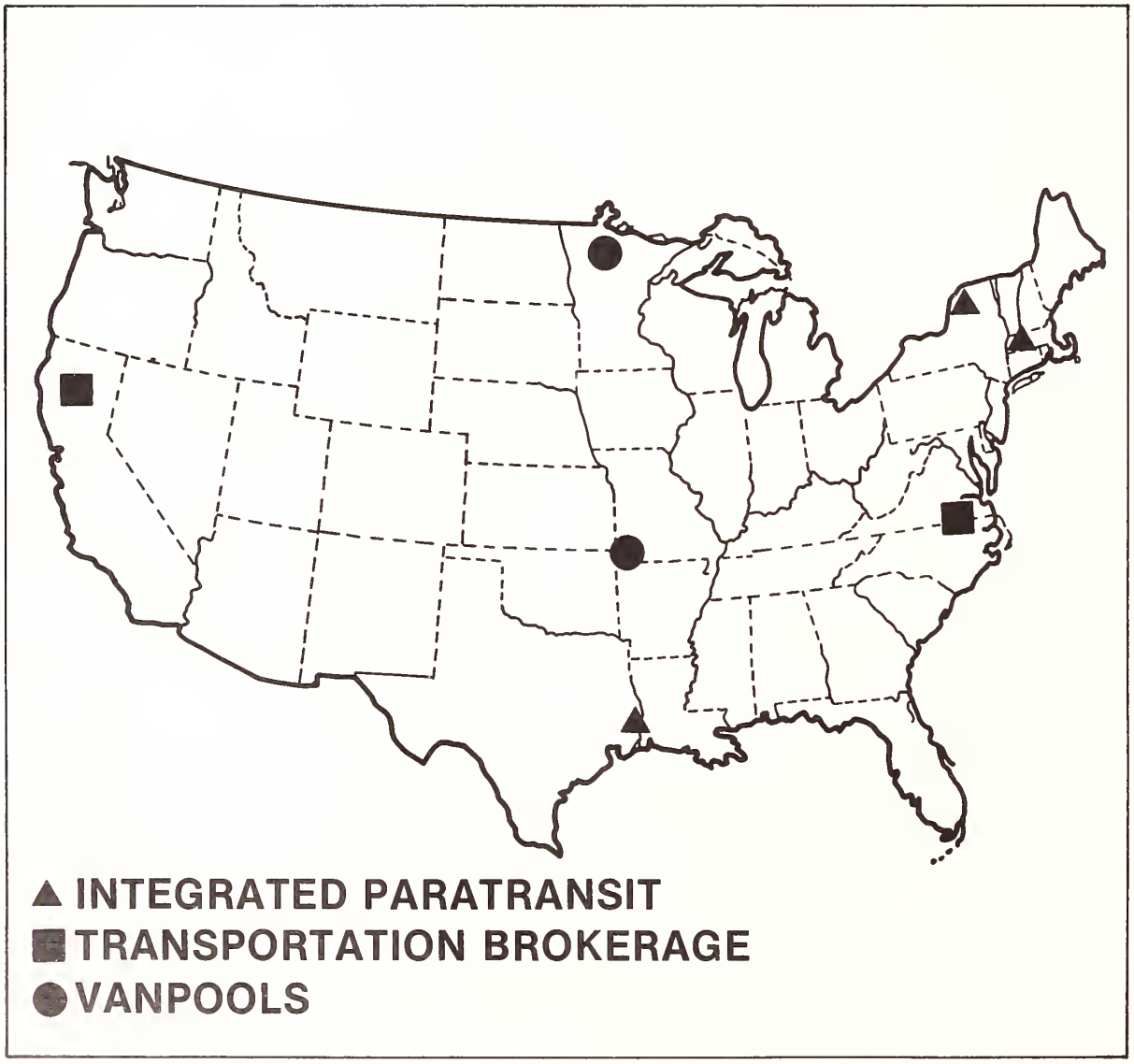
Unconditionally Preemptive Bus Priority System: Summary of Simulation Results—
Proj. VA-06-0026
The MITRE Corporation
July, 1975 — PB 247-976/AS

Simplified Estimators for Benefit Assessment of Bus Priority Systems—
Proj. VA-06-0026
The MITRE Corporation
August, 1975 — PB 247-795/AS

Bus Priority Systems: Simulation and Analysis—
Proj. VA-06-0026
The MITRE Corporation
February, 1976 — PB 251-246/AS

Overview of Experimental Bus Priority Systems—
Proj. VA-06-0027
The MITRE Corporation
March, 1975 — PB 247-742/AS

CHAPTER 11
PARATRANSIT



Distribution of Paratransit Demonstrations

PARATRANSIT INNOVATIONS

INTEGRATED PARATRANSIT FIXED-ROUTE SYSTEMS

COMMUNITY BASED TRANSIT SYSTEM

TRANSPORTATION BROKERAGE DEMONSTRATION

VANPOOLS

SUBSCRIPTION BUS

SHARED RIDE AUTO FEASIBILITY

JITNEY OPERATIONS

With greater public concern about air pollution, traffic congestion, energy consumption, and handicapped citizens, policy-makers have been looking more closely at the potential offered by paratransit services. These services are all those that fall between the private automobile and fixed-route, scheduled transit such as bus, trolley, and rapid rail service. In other words, the term, paratransit, refers to taxicabs, jitneys, carpools, vanpools, subscription buses, and dial-a-ride services.

Paratransit services are still another way planners can attempt to deal with many of the transportation problems facing urban areas today. UMTA is testing a number of ways paratransit can supplement and complement regular transit service or even provide service where none would otherwise exist. Paratransit is still, however, a relatively new area for research and study and the Service and Methods Demonstrations office is striving to form a more complete picture of what paratransit can do to improve transportation in our cities.

Paratransit Service Innovations

This project assessed and documented promising applications of paratransit services such as dial-a-ride using shared-ride taxis, subscription bus or commuter van services, feeder services to line-haul transit, and jitney service. Since considerable uncertainty exists about the benefits and potential difficulties of implementing these types of services, they are unlikely to be considered by policy-makers, planners, or regulators until their potential is much better understood.

Two comprehensive reports on home-to-work travel describing current experience with commuter vanpools have been prepared. Based on an analysis of more than 30 operations, these documents describe the planning, organization, and operation of this type of service and how to set up and administer employer-based programs. Two vanpool demonstration projects are described later in the chapter.

Reports are being developed on innovative services provided by taxi and limousine operators and will describe and illustrate new types of services, travel markets, and implementation issues. Particular attention is being paid to existing applications of shared-ride taxicabs for low-density travel in small towns or suburban areas and as feeders to conventional transit.

The project developed experimental demonstrations to investigate the effectiveness of integrating taxis with fixed-route bus service. One experiment in St. Bernard, Louisiana, described later, is being evaluated as part of this project. In this evaluation, service quality is being monitored and ridership response to the feeder service in different socio-economic sub-areas is being examined.

INTEGRATED PARATRANSIT—FIXED ROUTE SYSTEMS

One of the advantages of paratransit is its flexibility to provide transportation to people when and where they want to go. An integration of paratransit service with regular fixed route transit can help expand transportation services into areas that are too sparsely populated to support coverage by regular transportation systems. UMTA is now demonstrating the concept in three areas, i.e., in suburbs of Rochester, New York, in Westport, Connecticut and in St. Bernard Parish, Louisiana. The Rochester-area demonstration is integrating dial-a-ride bus service with fixed-route bus service, while the other two demonstrations are using shared-ride taxicabs with regular bus service.

The results of these demonstrations are being closely monitored; the successes as well as the difficulties encountered in these demonstrations will help transportation planners evaluate the potential for use in other areas.

Integrated Demand-Responsive, Fixed-Route Transit System

The Rochester Integrated Transit Demonstration (RITD) was a comprehensive project to demonstrate the integrated operation of fixed-route bus service with demand responsive and other personalized bus services to provide improved transit service. Significant integration innovations included route rationalization (i.e., providing fixed-route or demand-responsive service where and when each is most effective and efficient), and transfer coordination between demand-responsive and fixed-route services. Special prearranged services were available for workers, school children, and elderly and handicapped residents. Computerized scheduling and dispatching, in addition to digital communications equipment, were tested to determine their impact on service levels and productivities.

Use of Computer in Dispatching and Scheduling Operations in the Rochester PERT Demonstration Has Been Effective and Feasible. In Greece, NY, a Rochester Suburb, a Number of Fixed-Route Service Variations Were Experimented With in Order to Provide the Most Cost Effective Service.

PERT (PERsonalized Transit) service in the Rochester suburb of Greece predated the demonstration by more than a year and a half. PERT service was expanded to the suburb of Irondequoit on April 1, 1976 with a mixture of fixed and flexible-route bus services. In September, 1976, PERT service in Greece underwent a significant redesign. The many-to-many, (m-m) dial-a-bus zone was reduced in size by substituting a route deviation service into parts of the former m-m zone. A fixed-route shuttle service was instituted to connect high transit demand corridors with major retail facilities and fixed route transfer points. PERT introduced a zonal fare structure in both Greece and Irondequoit to coincide with the redesign of the Greece service.

There were serious problems facing the demonstration; for instance, it was continually plagued by vehicle failure and institutional problems. These problems, however, were rectified in early 1977, resulting in more efficient operations and better service quality. Dial-a-ride productivity, averaging around five passengers per vehicle hour, was far below the anticipated level. In addition, route rationalization and transfer coordination were not particularly successful in attracting new ridership or reducing travel or unit times.

On a more positive note, subscription service and special services for elderly and handicapped riders were quite successful. Computer dispatching was also implemented successfully and apparently provided a level of service comparable to manual dispatching.

The demonstration will be extended to allow for testing of modified demand responsive services in two other suburban communities in addition to the continued operation in Greece and Irondequoit.

Integrated Taxi and Fixed-Route Transit System

Public transit was initiated in Westport, Connecticut four years ago with the implementation of a series of fixed-route loop buses which meet at a timed transfer point in the center of town. Westport residents have heavily patronized the service and demands for new and expanded services prompted this demonstration which provides integrated transit services to the community.

With the Westport Transit District acting as the broker in negotiating and implementing the integrated services, the major features of the project include expanded fixed-route service, development of a shared-ride taxi service, implementation of a special advance-request, demand-responsive service for Westport's elderly and handicapped citizens and package delivery service for Westport businesses.

The Westport Transit District is contracting with a local taxi operator to provide paratransit services. Unfortunately, during the course of developing shared-ride service, legal proceedings were initiated by another local taxi operator. These matters are still being resolved in court.

Demonstration services began in April 1977, and shared-ride taxi ridership has been increasing steadily since then, with productivities of over 4 passengers per vehicle hour as of September 1977. An important finding has been that shared-ride taxi operation is providing a complementary rather than competing service to the fixed route service. Vehicle and service reliability have been exceptional. The demand for the package delivery service has also been increasing. In the future, the Westport Transit District plans to branch out and identify other special transportation markets which they can serve within the community.

Transportation Was Identified as a Major Key in Rebuilding Xenia, Ohio, After a Devastating Tornado.

Taxicab Feeder to Bus Service

A demonstration was begun earlier in St. Bernard Parish, Louisiana, (a suburban area of 100,000 people near New Orleans.) Like the Westport demonstration, this is an attempt to expand transportation service into a suburban area using shared-ride taxi services. The taxis act as a feeder service to line-haul bus transit and commuter subscription bus service. The feeder service is coordinated with bus schedules to minimize passenger waiting time. Other convenient features are provided such as joint fares and sheltered bus stops.

A prototype taxi feeder service that has been privately operated in a portion of the project area since 1974 is being expanded to cover the remaining areas along two parallel bus routes that extend from New Orleans. Two buses were added to the service as well as expanding the 21-vehicle taxi fleet by as many as 9 seven-passenger sedans. During the second year of the project a subscription taxi and bus service for New Orleans commuters will be introduced.

The evaluation of this project will measure the level of service and the costs of the integrated services and compare them to other systems that could be implemented such as expanded fixed-route service or dial-a-ride bus services. The economic impact on the bus and taxi operations will be determined, including whether the bus system is able to increase productivity or reduce costs because of the taxicab feeders, and whether regular taxicab revenue or operating costs are affected by the transfer service. The operational procedures that are developed for efficient coordination between the two systems will also be documented.

Community-Based Transit System

A small city transit demonstration was established as an integral part of a community redevelopment program following the April 3, 1974 tornado disaster in Xenia, Ohio. The project provides an example of how a typical Midwestern city of a 20,000 to 50,000 population range can provide responsive transit service for the entire community.

Shortly after the tornado, UMTA Service and Methods Demonstration funding plus a

capital grant allowed the city to establish a transit department, purchase vehicles, and operate a fixed route service known as the X-line. In July 1975, the city of Xenia received an UMTA demonstration grant to supplement fixed-route transit service with paratransit services; Sunday and holiday demand-responsive service has been operating since that time. However, other paratransit services did not begin until January 1976, when jitney service replaced the fixed route service.

The fixed route service proved to be very popular; it carries some 1000 riders daily. The City Commissioners, however, believed that the already strained city budget could not cover the cost of the system.

On March 1, 1976, the Xenia Taxi Company began operating the jitney service under contract to the city; full demand responsive service was substituted for the jitney service two months later. New taxi vehicles were introduced in July 1976 and the complete package of paratransit services, including the new fare schedule, was implemented at the end of February 1977.

The prime objective of the paratransit phase of the demonstration was to develop a system which provided transportation service to the community with a minimum subsidy level. The introduction of higher fares and the present form of service has improved the financial situation markedly with the current deficit less than half of the former fixed-route service. Ridership however, has suffered a severe decline with recent monthly totals reaching only 25 percent of the fixed-route levels. This combination of events has caused the net cost of service per passenger carried to increase from slightly over one dollar to nearly two dollars even though the total monthly subsidy required is much less. Recently a county transportation board has been created to organize and implement a more regionally oriented transportation system.

TRANSPORTATION BROKERAGE

The Transportation Broker concept is a technique for managing existing transportation resources in a more efficient manner. The function of the broker is to identify the transportation needs of various market segments in an urban area and then match these needs with the most appropriate transportation resources available. For example, a broker might modify existing transit service, coordinate social service agency transportation, contract with private bus, taxi or limousine operators, or arrange carpools, vanpools, or buspools. The broker will act in a coordinating role as far as providing service is concerned but will take an active role in removing barriers to the more efficient use of existing vehicles. It appears that the main barriers to increased efficiency are not operational but legal and institutional. By clearing away these barriers the way will be open to providing improved transportation to the public and better use of community resources at minimum cost to the public.

UMTA is conducting two brokerage demonstrations · one in the Minneapolis-St. Paul area which is concentrating on commuter services, and a more general demonstration in Knoxville, Tennessee.

Commuter Services Brokerage Demonstration

In this demonstration the Minneapolis-St. Paul Metropolitan Transit Commission is acting as a broker to coordinate a variety of ride-sharing services at each of three separate multi-employer work centers in the South Hennepin area of Minneapolis. The Share-A-Ride Commuter Services project, as it is called, structures, coordinates, and promotes carpooling, vanpooling, and subscription bus services as well as existing public transit at these sites in order to develop and implement a comprehensive ride-sharing program which will reduce the number of single-occupancy automobile work trips.

Before the demonstration, most of the participants of ride-sharing programs had been the employees of a few large firms because smaller firms simply do not have the number of people or the resources to support a significant number of matches and to participate individually in ride-sharing programs. This project makes ride-sharing services available collectively to employees of small, medium, and large companies, thus considerably expanding the market potential.

One feature of this demonstration which distinguishes it from other brokerage projects is that the vanpool service will be operated by a single vanpool provider under contract to MTC. The provider will operate

The City of Knoxville Has Promoted Van-pooling by Making Vans Available to Commuters, in Addition to Acting as a Transportation Broker Using Other Forms of Transportation.

all elements of the vanpool service including insurance, maintenance, and driver training. The vanpool provider would be offered public financial support to mitigate the risks of the program and to cover start-up costs.

The evaluation for this demonstration will focus on both employer and employee impacts as well as assessing the performance of the demonstration in light of its key design elements.

Transportation Brokerage Demonstration Project

The City of Knoxville, Tennessee is acting as a transportation broker to coordinate the travel demands of social service agency clients and other individuals, in addition to those of commuters, with public and private transportation providers. A major objective of the demonstration is to determine the effectiveness of transportation brokerage in stimulating the development of paratransit services and in achieving more efficient use of available transportation in meeting community needs.

The principal functions of the Knoxville brokerage system and its commuter arm, the Knoxville Commuter Pool during the two years of its existence have included surveying employers to identify prospective ride-sharers, matching riders, promoting van-pooling by making available a fleet of 51 *seed vans* and actively intervening to overcome institutional barriers to ride-sharing. A comprehensive program of incentives to encourage ride-sharing to and within the downtown area has also been initiated. In addition, assistance was provided to social service agencies to lower transportation costs. At present, 46 *seed vans* are in operation, transporting approximately 460 individuals to and from work daily. Ridesharing information (i.e., match lists) has been distributed to over 18,000 commuters, a small percentage of whom are estimated to have begun ridesharing. While the modal shift impacts of the project may not yet be large, the institutional accomplishments are judged significant for the future of paratransit both in Knoxville and the nation. Project leaders were instrumental in the passage of State legislation which reduced regulatory barriers to ridesharing, most notably the piece of legislation exempting from Public Service Commission regulation, vehicles carrying 15 or fewer persons to and from work. In addition, they convinced the Insurance Services Office to publish a specific rate structure for vanpools. This resulted in significantly lower rates in many cases, and presumably increased the nationwide availability of vanpool insurance.

VANPOOL DEMONSTRATIONS

Vanpools, like carpools, can reduce the number of single-occupant vehicles and increase transportation service in areas where expansion of regular transit service would be too expensive or impractical for the number of potential users. UMTA is conducting two vanpool demonstration projects - one along a major corridor leading to San Francisco, California, and the other in Norfolk, Virginia.

Vanpool Demonstration Program Golden Gate, Bridge, Highway and Transportation District

Faced with increasing congestion on the Golden Gate Bridge and U.S. Highway 101 north of San Francisco, an increasing need for the construction of additional bridge and highway facilities, the Golden Gate Bridge, Highway and Transportation District has decided to stimulate increased vanpooling to increase vehicle occupancy and ease the congestion.

Under the project, the District has purchased 35 vans and is leasing them to companies or groups of individuals interested in commuter van service. The District is conducting a promotion campaign to interest employers and individuals and is assisting in matching riders and drivers into pool groups. One particularly innovative feature of the Golden Gate project is the *seed van* concept. After a limited time period of approximately six months, the leased van will be returned to the District and the group is expected to secure its own van to continue operation of the pool. The original van would then be leased to another interested group also for a limited time period. The District will provide assistance to a pool group in arranging for the purchase or lease of its own van for the long-term continuation of the pool. The program began the operation of vanpools in October 1977.

Vanpool Demonstration Program Tidewater Transportation Commission (Norfolk, VA)

Subscription van service is one way of providing transportation in areas where population densities are not sufficient to support fixed-route, fixed-schedule transit service. Although this type of service has been successfully implemented in the past, particularly through employer-sponsored programs, these programs have limitations in the number of riders they can attract.

This project provides a publicly operated, self-financed (after initial start-up costs) subscription van program which complements and is integrated into existing transit services. The Tidewater Transportation District Commission of Norfolk, Virginia, working in conjunction with the U.S. Navy, administers a vanpool program which leases vans to drivers who carry commuters to the area's naval facilities. At present, the only transit service to the naval base is provided by small private operators, generally using old school or intercity buses driven by an employee of the naval facility. Consequently, most travel is by auto. The subscription service is not intended to compete with the existing services, but will complement them with the objective of shifting auto drivers into multiple occupant vehicles. Support to the private operators will be provided by the formation of an association which will endeavor to provide them with reduced-cost equipment, parts, gasoline, and insurance.

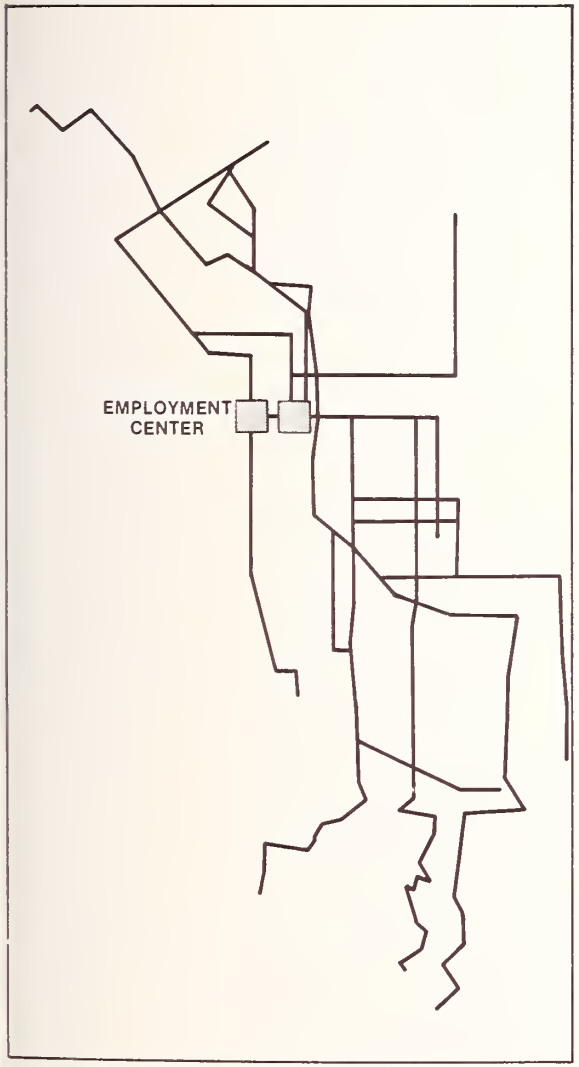
The program began this operation of vanpools in September, 1977, and is working at marketing to fill the remaining vans.

OTHER PARATRANSIT DEMONSTRATIONS

Subscription Service

A subscription bus service is now being organized for the El Segundo employment area of Los Angeles (please see map). In addition to signing up potential passengers and interested employers in the area, a special bus system involving 15 different routes is being established. Previous research found the El Segundo region to be especially suited for this service, which is short-haul bus service to a non-central business district with little or no existing transportation. Although past uses of a subscription bus service have necessitated a relatively long trip distance in order to use the driver and the bus economically while charging a reasonable fare, the scheduling of this service will make it cost effective. Multiple trips will be made in peak periods based on staggered work shifts among the employees.

Service will be provided along 15 routes of various lengths by 7 standard transit buses.



The El Segundo Employment Center Subscription Bus Demonstration.

The routes are designed to serve, principally the employees of two large firms with various work locations although other employers in the area are being encouraged to join. Each bus in the project will make several prearranged pickup stops to serve walking or park-and-ride customers and then travel express to the employment center. The bus will then travel empty to a second pick-up point and repeat the operation.

Shared Ride Auto Feasibility Study

One rather unusual idea that UMTA is investigating involves licensing commuters to carry passengers for a fee on the trip from home to work and back. Shared-ride auto transit (SRAT) has the potential of increasing auto occupancy in both urban and rural areas. The concept, however, is laden with potential operational, legal, institutional, and behavioral difficulties which this project investigated.

SRAT has several possible applications in urban and rural areas. It can provide sufficiently high service levels that moderate driver and rider participation is possible. However, concerns over personal security, reliability, and social acceptability will have to be met. Legal and regulatory problems can be overcome or avoided in most areas. Although a number of potentially serious institutional barriers to SRAT exist, by designing the system to reflect a site's particular institutional setting, it appears that in many cases these barriers can be overcome.

An Analysis of the Jitney Operation: An Example of An Inner City Paratransit Service

Jitney service is still another paratransit operation which is meeting travel demands in addition to and in lieu of conventional transit in some areas. Very little is known about jitney operation, however, because it is an unregulated industry. Jitneys, which usually carry fewer than 12 passengers, follow fairly regular routes and make stops along their routes as they are hailed by prospective passengers. Jitney services are operating in many inner city areas, apparently as neighborhood oriented transportation. Knowledge of the underlying factors inherent in jitney service is necessary to determine the impact of the jitney on an inner city transportation system.

The purpose of this study is to research and analyze an on-going inner city paratransit operation in a specific site. The project has three primary objectives: supply and demand analysis; alternate fare pricing and range of services analysis; and recommendations and preliminary analysis for future research. Four types of jitney service will be analyzed; jitney bus and airport terminal service, jitney station service, (call taking and dispatching center), flexible and fixed route jitney service, and jitney supermarket service.

Paratransit

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	EVALUATION	TECHNICAL CONTACT
Paratransit Service Innovations	DC-06-0120	$248,333	July 1975- May 1977	The Urban Institute		James Bautz 426-4984
Integrated Paratransit, Fixed-Route Systems						
Integrated Demand Responsive, Fixed Route Transit Systems	NY-06-0048	$298,000	April 1975- May 1979	Regional Transit Service, Inc., J. Silien 716-546-7310	TSC; MIT; SYSTAN, Inc. (contractor)	Paul Fish 426-4984
Integrated Taxi/Fixed Route Transit Systems	CT-06-0007-1	$610,000	July 1976- Dec. 1978	Westport Transit District, R. Bradley 203-226-0422	TSC; CACI, Inc. (contractor)	M. Churchman 426-4984
Taxicab Feeder to Bus Service	LA-06-0002	$325,350	June 1976- Sept. 1979	St. Bernard Parish Planning Commission	The Urban Institute	Paul Fish 426-4984 R. Courillon 504-279-5557
Community-Based Transit System	OH-06-0022	$655,000	July 1974- Dec. 1977	City of Xenia, OH	TSC; MultiSystems Inc.; Cambridge Systematics Inc. (contractors)	Lynn Sahaj 426-4984
Transportation Brokerage						
Commuter Services Brokerage Demonstration	MN-06-0008	UMTA $335,000 FAUS $560,000	April 1977- April 1979	Metropolitan Transit Commission, R. Pearson 612-221-0939	TSC; Cambridge Systematics, Inc. (contractor)	M. Churchman 426-4984
Transportation Brokerage Demonstration Project	TN-06-0006	$997,959	June 1975- June 1978	City of Knoxville, TN		Paul Fish 426-4984

Paratransit

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	EVALUATION	TECHNICAL CONTACT
Vanpool Demonstrations						
Vanpool Demonstration Program, Golden Gate	CA-06-0095	$684,096	Oct. 1976-Sept. 1978	Golden Gate Bridge Highway & Transp. District, J. Shellenberger 415-456-0977	TSC; Crain Assoc. (contractor)	Paul Fish 426-4984
Vanpool Demonstration Program, Norfolk	VA-06-0033	$490,000	Sept. 1976-Aug. 1978	Tidewater Transporta-Commission	TSC; CACI, Inc. (contractor)	Lynn Sahaj 426-4984
Other Paratransit Innovations						
Employment Center Subscription Service	CA-06-0109	$538,100	Nov. 1977-Oct. 1979	Southern CA Systems Rapid Transit District	TSC; Multi-Systems Inc; Cambridge Systematics Inc.	Paul Fish 426-4984
Shared Ride Auto Feasibility Study	IT-06-0144	$100,000	Oct. 1976-Sept. 1977	Cambridge Systematics, Inc.		James Bautz 426-4984
Analysis of the Jitney Operation: An Example of an Inner City Paratransit Service	PA-06-0041	$ 59,750	Jan. 1977-Jan. 1978	Carnegie-Mellon Univ., A. Blumstein 412-578-2175		James Bautz 426-4984

Bibliography

This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

Guidelines for the Organization of Commuter Van Program—
Proj. DC-06-0120
The Urban Institute
February, 1976 — PB 252-305/AS

Evolution of the Knoxville Transportation Brokerage System—
Interim Report
Proj. TN-06-0006
CACI, Inc.
October, 1976 — PB 270-103

Feasibility Study of the Employment Center Bus Service Concept—
Proj. CA-06-0084
The Aerospace Corporation
August, 1976 — PB 259-941/AS

Implementing Shared Taxicab Services: A Case Study in Arlington, Virginia—
Proj. DC-06-0093
The Urban Institute
February, 1975 — PB 245-645/AS

An Analysis of Commuter Van Experience—
Proj. DC-06-0120
The Urban Institute
February, 1976 — PB 252-304/AS

An Analysis of Taxicab Operating Characteristics—
Proj. IL-06-0029
International Taxicab Association
August, 1975 — PB 251-147/AS

A Compendium of Provisions for a Model Ordinance for the Regulation of Public Paratransit—
Proj. IL-06-0029
International Taxicab Association
February, 1976 — PB 253-182/AS

Program Taxistats: A Computerized System for Processing and Analyzing Taxicab Company Statistics—
Proj. IL-06-0029
International Taxicab Association
June, 1975 — PB 250-997/AS

Small City Transit—
Proj. MA-06-0049
Transportation Systems Center
March, 1976
Characteristics: An Overview - PB 251-501/AS
Free-Fare, Student-Operated Transit in a University Community - Amherst, Massachusetts - PB 251-502/AS
Pilot Dial-A-Ride Project in a Sector of the City - Ann Arbor, Michigan - PB 251-503/AS
Privately Operated Subscription Bus Service to an Industrial Site - Bremerton, Washington - PB 251-504/AS
Public Transit Serving a University and Town - Chapel Hill, North Carolina - PB 251-505/AS
Free-Fare Transit in a High Density, Industrialized Area - East Chicago, Indiana - PB 251-506/AS
City-Wide Shared Ride Taxi Service - El Cajon, California - PB 251-507/AS
Extensive County-Wide Transit Coverage - Eugene/Springfield, Oregon - PB 251-508/AS
A Low Subsidy Transit Service - Evansville, Indiana - PB 251-509/AS
Dial-A-Ride Transit in an Agricultural Community - Merced, California - PB 251-510/AS
Point Deviation Service in a Rural Community - Merrill, Wisconsin - PB 251-511/AS
A Short-Lined Suburban Transit Service - Sudbury, Massachusetts - PB 251-512/AS
Comprehensive Transit in an Affluent Suburban Community - Westport, Connecticut - PB 251-513/AS
A Transit Service for a Rebuilding City - Xenia, Ohio - PB 251-514/AS
Summary of State Aid Programs - PB 251-515/AS

Service and Methods Demonstration Program Annual Reports—
Proj. MA-06-0049
Transportation Systems Center
November, 1975 - PB 251-325/AS
April, 1977 - PB 270-673

Evolution and Operations of the Reston Virginia Commuter Bus Service—
Final Report
Proj. MA-06-0049
CACI, Inc.
August, 1977 — PB 275-792/AS

Pre-Demonstration Activities of the Westport Integrated Transit System—
Interim Report
Proj. MA-06-0049
CACI, Inc.
July, 1977 — PB 271-998/AS

Com-Bus: A Southern California Subscription Bus Service—
Final Report
Proj. MA-06-0049
CACI, Inc.
May, 1977 — PB 272-470/AS

CHAPTER 12
TRANSPORTATION PLANNING AND MANAGEMENT

Interactive Graphics Makes Using the Computerized Urban Transportation Planning System (UTPS) Easier and Faster.

Urban transit in America is largely provided by new, public-sector agencies. These providers must create organizational structures and management systems, develop programs for major capital investments, plan and introduce new services, and at the same time, maintain day-to-day operations with obsolete equipment and aging facilities. Experienced transit management teams are in short supply, yet are badly needed. Unfortunately, the risk of error is high.

In this critical area, UMTA sponsors research and development aimed at improving both the return on capital investments and the productivity of day-to-day operations. Practical assistance from the Federal government includes:

Planning and management tools which have a common utility but which no single transit operator can afford or has expertise, to develop.

Systems and approaches which are new to the transit industry or are needed to implement new Federal policies.

Information about practical solutions developed at the local level but which can be applied nationally.

In the fields of planning and management, smooth implementation and successful adoption of innovations is as important as development of the methods themselves. UMTA's programs include, therefore, substantial components for preparation of manuals and training aids, for technical support, and for dissemination of local experiences.

PLANNING METHODS AND SUPPORT

This work is conducted jointly with the Federal Highway Administration. It responds to the problem area which is consistently reported as the highest priority near-term need of State and local agencies; that is, for people and tools which can come to grips with the highly complex variables and constraints involved in transportation planning. The information and information handling requirements for estimating demand, evaluating alternatives, and assessing energy, environmental, and economic impacts have grown to the point that, for metropolitan areas, computer aids are becoming essential.

The collection of desk-top and computer-aided planning techniques being developed by UMTA and FHWA is called the Urban Transportation Planning System (UTPS).

UTPS desk-top techniques can be used for quick-response approximations and for less complex planning problems. They consist of equations, graphs, and curves to forecast or estimate impacts. The aids include:

Methodology for transit route evaluation

Methodology for estimating parking accumulation

Derivation and use of automobile availability for estimating travel demand

Transit corridor analysis

Estimating fringe-parking site requirements

Transit demand, system design, and financial analyses for small cities

Estimating annual ridership and operating expense for fixed-route bus systems in small urban areas.

The UTPS computer-based package is a simulation model that makes it possible to answer "what would happen if..." about changes to the highway or transit environment. The package was originally designed to do long-range transit planning, but subsequent additions make it possible to do highway and short-range planning. The initial time and cost required to install the package is far greater than for a hand analysis, but the resulting information is much more detailed.

Capabilities of the computer package include estimation of long-range land development impacts, transportation system costs, travel demand forecasts, major facility and corridor travel volumes, energy use, major air quality effects, and accidents. The package can also be employed to answer questions at a detailed street-by-street level for short-range problems, but at a much greater level of effort and increased cost.

The computer package is made up of a number of integrally-linked programs. Each program represents a separate step in the

standard transportation planning process of network preparation, travel demand estimation, and assignment of travel to the network. At each step modifications can be made to model the change that is to be tested. For example, roads or transit lines might be added or deleted from the network in the first step, land use changed to generate more trips in the second, and highway capacities changed in the third. There are also several programs which can be used to prepare plots, tables, or graphs to compare results from different alternatives.

Results of research and development of UTPS fall into three general categories: training for local professionals, manuals to aid planners and operators, and the computer programs with accompanying documentation. To date, over 50 courses in UTPS usage have been conducted by UMTA and FHWA. Numerous manuals and reports have been published and new or improved modules of the computer-package are being written continually and tested in the field. At the present time, there are over 300 users of the computer programs.

Because of the large number of individual tasks and products involved in this program, a special communications network has been established for users and developers of the system. R&D projects underway are too numerous and would be most difficult to meaningfully synopsize here. However, introductory information, a variety of manual planning method handbooks, and the computer readable programs (with installation manual) may be obtained by writing to:

Dr. Robert B. Dial, Director (UPM-20)
Office of Planning Methods and Support
Urban Mass Transportation Administration
U.S. Department of Transportation
Washington, DC 20590

Materials are provided without charge to non-profit organizations.

SPECIAL PLANNING STUDIES

Authorized by Section 9 of the Urban Mass Transportation Act of 1964, the Technical Studies program is designed to assist local areas in conducting a wide range of transportation planning studies. This program is administered by UMTA's Office of Planning Assistance. Each year, a portion of the funds available for Section 9 grants is set aside for use in a variety of Special Studies designed to address key issues in the implementation of the Technical Studies planning program.

Priorities of the planning program form the basis for the choice of Special Studies research program areas. Major UMTA policy directions, such as transportation for elderly and handicapped persons and Transportation System Management have played a large role in setting program priorities. Large capital requirements for new rail rapid transit systems suggest the need for better information on the effects of such systems. These three key areas which comprise the bulk of the Special Studies Program, are to be reported on here,

Rail Rapid Transit Impact Studies

Planning for Transportation for Elderly and Handicapped Persons

Transportation System Management Planning.

During FY77, more than half of the studies were undertaken by local transportation planning agencies. These projects were conducted under grants supplementing the funds normally received from the Section 9 program, to allow for the study of local issues with national significance or for the development of procedures and methods with general utility.

RAIL RAPID TRANSIT IMPACT STUDIES

The Urban Mass Transportation has provided an increasing amount of funds for the development of new rail rapid transit systems. A key issue for this part of the Capital Grant program is the extent to which the benefits anticipated for these new systems are actually realized. This also impacts on the requirement for an Analysis of Alternatives prior to the approval of further new systems and the planning methods necessary to meet this requirement. In order to address these issues and to provide input for future UMTA decisions and local planning in this area, a program of new-system Rail Rapid Transit Impact Studies has been initiated.

Bay Area Rapid Transit (BART) Impact Program

In 1962, the San Francisco Bay Area embarked upon the development of the first

New Systems such as BART can be Expected to have Far-Reaching Societal Impacts.

new rail rapid transit system in quite some time. During the later stages of system construction, it became apparent that a complete assessment of the impacts of BART on the Bay Area could prove useful for a variety of purposes. Hence, during 1972, the Urban Mass Transportation Administration (UMTA), the Office of the Secretary of Transportation (OST), and the Department of Housing and Urban Development (HUD) first contracted with the Metropolitan Transportation Commission (MTC) to initiate the BART Impact Program.

Efforts during FY77 concentrated on concluding work in most of the impact areas studied. Efforts in studying Transportation System and Travel Behavior impacts concentrated on completing study of the effects of full system operation. Work during FY77 on Environmental impacts looked primarily at the responses of residents to the impacts identified earlier. Research planning completed earlier allowed for significant progress on studies of Land Use and Urban Development. Work was concluded on the assessment of Institutions and Life Styles. Work was also concluded on the study of the impacts on Economics and Finance. Finally, work was initiated on the analysis of impacts of BART on Bay Area Public Policy.

Washington Metropolitan Area Transit Authority (METRO) Impact Study

This study has several special features due to the institutional environment and nature of the implementation of METRO itself. Among these is the incremental opening of METRO. The effects of this will be carefully monitored to detect changes at each stage of opening. In addition, the impact study effort will be integrated to the extent possible with the ongoing regional transportation process. The contractor (grantee) is in fact the agency responsible for this process in the Washington area. The study thus will be able to use secondary data sources in order to minimize cost and data collection efforts.

During FY 77, three major impact assessments were begun. The Travel Behavior studies are designed to make short range estimates of changes in commuting patterns as well as to compare the results with those derived from existing forecast models. Mid-Day travel changes and "induced" travel are also to be addressed. The Activity and Development study will monitor changes in such indicators as population and employment, retail sales, property transfers, and value and land development with an eye towards relating these changes to the presence of METRO. Finally, the Policy Interpretation study will

attempt to catalogue goals and expectations for transit in the minds of citizens, planners, and local elected officials.

Metropolitan Atlanta Rapid Transit Authority (MARTA) Implementation Management Experience

The purpose of this study is to analyze and document significant elements of MARTA's experience in planning, financing, engineering, constructing, and administering the development of its rail rapid transit system.

Topics to be covered include the relationship of MARTA to its Board, to Labor, its organizational structure, to local governments, to EEO requirements, to the Business Community, and to its engineering consultants. In addition, the way in which MARTA dealt with the construction phase, with utility relocation, and with its own bus system will also be covered. Finally, the problems involved in ensuring adequate financing will be discussed.

It is expected that a series of reports, each addressing one of the subject areas noted, will be produced.

Strategies for Conduct of the Rail Rapid Transit Impact Program

As originally conceived, the Impact Studies Program was to involve the conduct of individual studies in each city by local planning agencies. In order to provide an assessment of the future direction for the Program, a set of three small contracts were awarded to provide an assessment of the potential costs and transferability of the studies and to provide an independent recommendation on the proper course for the future of the program.

PLANNING FOR TRANSPORTATION FOR ELDERLY AND HANDICAPPED PERSONS

Section 16(a) of the Urban Mass Transportation Act declares that it is "national policy that elderly and handicapped persons have the same right as other persons to utilize mass transportation services (and) that special efforts shall be made in the planning and design of mass transportation facilities and services so that the availability to elderly and handicapped persons of mass transportation which they can effectively utilize will be assured."

Despite the issuance of implementing planning regulations, several issues vital to effective planning remain for which little information is available. Problems include data which are expensive or inadequate for effective planning, existing services which are redundant or have serious gaps, a lack of a clear understanding of the effectiveness of various types of services foe elderly and handicapped people and a need for further information on progress in planning and implementing such transportation services. Objectives for studies begun in FY-77 are described below.

Objectives identified for FY 77 studies include: 1) the identification of cost-effective approaches to the collection of data required for adequate planning in this area, 2) development of procedures for accomplishing the coordination of services, and 3) assessment of the effectiveness of various existing transportation service strategies.

Use of Existing Data in Elderly and Handicapped Transportation Planning

Regulations covering accessibility for elderly and handicapped people recommend that existing and secondary sources of planning data be used in identifying the location and transportation needs of wheelchair users and semi-ambulatory handicapped persons. Such data sources include private organizations which serve or represent specific groups of handicapped persons and public agencies which are sponsored by Federal, State, and local programs, as well as public transportation providers.

Objectives of this project include 1) identification and description of specific sources of useable data; 2) delineation of steps required to correct problems prior to use of such data; 3) identification of planning data required not likely to be obtainable through existing services and 4) development of a manual for use of secondary sources for planning services for elderly and handicapped persons.

Planning for the Coordination of Elderly and Handicapped Transportation Services

In many urban areas, a wide range of transportation services exist to serve elderly and

handicapped persons. Yet, because these services have not in the past been operated in a coordinated manner, the level of service provided is not commensurate with the resources being applied. Services in some cases are duplicative; elsewhere, gaps in service area or clientele mean that some persons are not served. Clearly, better coordination would go a long way in many areas toward providing much improved service at little additional cost.

This project will be conducted by HEW to provide case studies and a summary analysis of five demonstrations which are currently underway under HEW sponsorship. Coordination concepts will be examained to assess their feasibility, potential impact on productivity and implementation techniques.

Analysis of Existing Elderly and Handicapped Transportation Services

The issuance of regulations in this area has led to an acceleration of efforts to improve services particularly those designed to accommodate wheelchair users and semi-ambulatory persons. The overall goal of this project is to determine what has been accomplished in this field and to gain some insight into the reasons underlying the description of a variety of accessible service types, determination of their costs and operational impacts, to generalize the response of users to implemented services, and to identify implications of past experience for future planning.

The approach will consist of an assessment of 20 urbanized areas in which significant improvements have been made. Service changes will be described in detail, and an estimate of the consequences on cost, street traffic, fares, organizational arrangements, financing and service levels, will be made. The response of user groups to the implemented services will also be described.

TRANSPORTATION SYSTEM MANAGEMENT PLANNING

Transportation System Management (TSM) is a concept which calls for the planning, programming, and implementation for low-capital, short-range improvements designed to enhance the efficiency of existing transportation systems. Besides serving the goal of fiscal economy by providing alternatives to major capital investments and reducing operating costs, TSM also may serve goals of energy conservation, the environment, and urban revitalization.

The goal of the TSM Planning Special Studies is to enhance local capabilities for TSM Planning in order to bring about the implementation of a wide range of TSM strategies which increase the efficiency of the transportation system. Key objectives include 1) the identification of institutional arrangements which facilitate effective TSM planning and programming, 2) the identification of factors important in the implementation of TSM projects, and 3) the development of technical tools for use in TSM planning.

Portland, Oregon TSM Prototype Planning Study

The purpose of the TSM Prototype Planning Study in Portland is to formulate, apply and evaluate procedures for systematic TSM Planning in an urban area and provide a basis for the ongoing process. Specifically, the TSM process to be developed is to include a clear statement of goals and objectives, evaluation of existing conditions, a set of proposed actions, and justification for inclusion of those actions in the area's Transportation Improvement Program. Work tasks include rigorous technical analyses of a wide variety of transportation problems.

Kansas City TSM Prototype Planning Study

The goals of this study are to develop a set of procedures for TSM planning, to demonstrate these procedures in a set of subareas and to delineate the means by which the results of these demonstrations can be integrated into the overall planning process in the Kansas City area.

Products of the study include the developed TSM planning process, a problem description for each study area, a set of proposed projects addressing problems identified, and a project report describing how the process would be integrated into a region's ongoing transportation planning process.

Tri-State TSM Prototype Planning Study

The New York Metropolitan Area, for which the Tri-State Regional Planning Commission (TSRPC) is the Metropolitan Planning Organization, is made up of a total of 26 counties in three States. Each county acts as its own local planning agency with TSRPC serving to coordinate and provide an overall regional perspective.

The distinguishing feature of this study is its use of a TSM Planning Task Force for each problem sub-area studied. Upon establishment of a set of general goals for TSM in the Middlesex County, a set of Demonstration Sub-Areas will be identified. For each area chosen, a Task Force will be set up made up of local jurisdiction staff and MPO Staff. County Staff will monitor the local transportation system with an eye towards identifying future problem or opportunity areas. This process, together with the results of the localized efforts will be used in relating the Task Force approach to subsequent TSM planning in the County.

Seattle TSM Prototype Program

The general goal of this study is to formulate, develop and evaluate a management program for the transportation system in the King County Sub-region of the Seattle Metropolitan Area such that immediate low-capital improvements may be accomplished that improve the system and resolve special problems. A key feature of this study will be the creation of the position of TSM coordinator responsible for initiating and supporting the TSM process and for coordinating implementation of TSM projects throughout the sub-region.

Expected products include the development of an accepted technical and institutional process in the local area, evaluation of the feasibility of TSM Coordinator concept and an improved TSM plan for the Sub-Region.

Development of Methods for Evaluating TSM Alternatives

The purpose of this research is to assist UMTA in improving the capabilities of MPO's, transit operators, and other agencies in assessing the effects of alternative TSM-type strategies. By assessment, it is meant 1) the capability to predict the consequences of alternative actions and 2) the capability to evaluate alternative actions by systematically comparing their estimated consequences.

The focus of the research will be on simple techniques, easily implemented without extensive computer capabilities. In developing alternative techniques, every effort will be made to provide a range of choices, with primary emphasis on simplicity, ease of use of existing data, and practical relevance to the issues to be resolved. A key element of the research will also be to identify and summarize innovative methods that may be developed or applied by local agencies in their own planning and programming activities.

TRANSIT MANAGEMENT

UMTA's Transportation Management Program is designed to provide the nation's mass transit operators with demonstrations and development of new and improved management techniques. In the past these have included such diverse projects as new testing procedures for the recruitment of bus operators, computerized programs for the assignment of bus driver work schedules, and pilot marketing programs designed to increase transit ridership. The Transportation Management Program is also ready to assist those transit properties which would like to implement a demonstrated technique into their day to day operations.

Blue Collar Training

Using transit systems in the 13-state Appalachian region as a laboratory, a set of training programs will be drawn up and tested for all basic *blue collar* occupations in the bus transit field. During the three-years of the project, over 1800 individuals will actually undergo job training. At its conclusion, the project will have produced a battery of validated training materials that can subsequently be used throughout the country.

Public Transit Risk Management

Risk management has lately become yet another crisis point for transit operators. This project is producing a handbook that

Aggressive Marketing is One Way to increase Ridership.

will be especially useful for those properties where risk management has received only cursory or informal attention. It contains a systematic review of all facets of the subject and will be of assistance for any transit system anxious to review its efforts in this field.

Marketing Demonstration

This effort -- a major marketing demonstration -- should be seen together with two other projects wherein actual marketing programs were conducted in two U.S. cities, Baltimore (MD-06-0021) and Nashville (TN-06-007).

The plan was to identify potential transit uers through market research, adjust and adapt the transit system in the light of this research, develop and use promotional programs aimed at the identified target market, and then measure the success of the effort.

From this two-city demonstration, transit marketing professionals can learn how to develop similar programs for their own systems.

Automated Run Cutting

Currently being enhanced as a result of actual implementation in over a dozen U.S. transit systems, the so-called RUCUS program provides transit operators with an automated system for vehicle scheduling and driver run cutting. Its utilization by a bus system results in improved management information, a capability for using a single automated data source for a variety of related tasks -- e.g. the automated printing of public timetables -- and, most importantly, the optimum use of vehicles and manpower. Implementation of the RUCUS system normally results in a transit operator's being able to cover all route assignments with fewer vehicles and manpower.

Urban Mass Transportation Industry Uniform System of Accounts and Records and Reporting System

Section 15 of the Urban Mass Transportation Act of 1964, as amended, requires the development, testing, and prescription of a reporting system to accumulate public mass transporatation financial and operating information by uniform categories and a uniform system of accounts and records.

Section 15 also requires the creation of a central processing agency to accumulate, store, and process public mass transportation financial and operating information.

Transportation Planning and Management

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Planning Methods and Support					
Planning Methods and Support-Urban Transportation Planning System (UTPS)	Various	$13,025,000	Continuing	Bureau of Census; TSC; NBS; PRC Systems; DeLeuw Cather & Co.; Peat, Marwick, Mitchell & Co.	Robert B. Dial 426-9271
Special Planning Studies					
Bay Area Rapid Transit (BART) Impact Program	CA-09-0042	$500,000	March 1977-March 1978	Metropolitan Transportation Commission	James T. McQueen 426-2360
Washington Metropolitan Area Transit Authority (METRO) Impact Study	IT-09-0086	$210,090	May 1977-July 1978	Metropolitan Washington Council of Governments	James T. McQueen 426-2360
Metropolitan Atlanta Rapid Transit Authority (MARTA) Implementation Management Experience	GA-09-0037	$ 71,592	Sept. 1977-Oct. 1978	Atlanta Regional Commission	James T. McQueen 426-2360
Strategies for Conduct of the Rail Rapid Transit Impact Program	IT-09-9005 DC-09-9007 MA-09-9004	$ 25,000	April 1977- Jan. 1978	Science Applications, Inc.; The Urban Institute; Cambridge Systematics, Inc.	James T. McQueen 426-2360
Use of Existing Data in Elderly and Handicapped Transportation Planning	MD-09-9001	$ 30,000	June 1977-July 1978		Kathleen M. Koss 426-2360
Planning for the Coordination of Elderly and Handicapped Services	DC-09-9006	$ 60,000		Office of Human Development, Department of Health, Education & Welfare	Kathleen M. Koss 426-2360
Analysis of Existing Elderly and Handicapped Transportation Services	IT-09-9006	$250,000	Sept. 1977-Jan. 1979	To be selected	Richard Steinmann 426-2360

Transportation Planning and Management

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Special Planning Studies (Continued)					
Portland, Oregon Transportation Systems Management Planning Prototype Study	IT-09-0068-	$ 60,000	Nov. 1976- March 1978	Columbia Regional Association of Governments	Richard Steinmann 426-2360
Kansas City TSM Prototype Planning Study	IT-09-0078	$ 50,000	Jan. 1977- March 1978	Mid-America Regional Council	Richard Steinmann 426-2360
Tri-State TSM Prototype Planning Study	IT-09-0089 (portion)	$ 60,000	July 1977- Oct. 1978	Tri-State Regional Planning Commission	Richard Steinmann 426-2360
Seattle TSM Prototype Program	WA-09-0018	Sept. 1977-	Sept. 1978- Jan. 1979		Richard Steinmann 426-2360
Development of Methods for Evaluating TSM Alternatives	MA-09-9003	$ 80,000	Sept. 1977- June 1978	MIT Center for Transportation Studies	Brian E. McCollom 426-2360
Transit Management					
Blue Collar Training	WV-06-0011	$3,530,723		AFL-CIO Appalachian Council	Frank Enty 426-9274
Public Transit Risk Management	IT-06-0173	$ 134,982		Fred S. James & Co.	A.B. Hallman 426-9157
Marketing Demonstration	IT-06-0078	$1,010,000		Grey Advertising, Inc.	Carol Eisen 426-7274
Automated Run Cutting	MA-06-0046	$ 350,000		TSC & MITRE Corp.	A.B. Hallman 426-9157
Sect. 15 Uniform System of Accounts and Records and Reporting System	IT-06-0094	$ 716,543	Jan. 1976- May 1978	Arthur Anderson & Co.	A.B. Hallman 426-9157
Development of Sect. 15 Central Data Bank Software	IT-06-0201	$ 154,929	June 1978- March 1979	International Business Services, Inc.	A.B. Hallman 426-9157

Bibliography

This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

Urban Mass Transportation Abstracts—
Volume No. 4
Proj. TRIC-77-1
Urban Mass Transportation Administration
December, 1977 — PB 278-646/AS

Urban Mass Transportation Abstracts—
Volume No. 3
Proj. TRIC-76-1
Urban Mass Transportation Administration
July, 1976 — PB 264-905/AS

A Selected Bibliography and Reference Document in Urban Public Transportation—
Proj. DC-06-0114
JHK & Associates
July, 1976 — PB 266-252/AS

Characteristics of Urban Transportation Systems—
A Handbook for Transportation Planners
Proj. IT-06-0049
DeLeuw, Cather & Company
The Urban Institute
May, 1975 — PB 245-809/AS

Software Systems Development Program/Model User's Guide with Case Studies—
Proj. IT-06-0050
R.H. Pratt Associates, Inc.
February, 1976 — PB 258-320/AS

UMTA Transportation Planning System Reference Manual—
Proj. IT-06-0050
Urban Mass Transportation Administration
June, 1975 — PB 246-187/AS

A Generalized No-BART Alternative Transportation System—
Proj. CA-09-0042
McDonald & Smart
May, 1975 — PB 242-438/AS

Photo Survey of Development and Activities in the Vicinity of BART Stations—
Technical Report
Proj. CA-09-0042
David L. Christensen
July, 1975 — PB 248-313/AS

Photo Survey of Development and Activities in the Vicinity of BART Stations—
User's Guide
Proj. CA-06-0042
David L. Christensen
July, 1975 — PB 247-768/AS

A History of the Key Decisions in the Development of the Bay Area Rapid Transit (BART)—
Proj. CA-06-0042
McDonald & Smart, Inc.
September, 1975 — PB 245-617/AS

Environmental Impacts of BART—
Interim Service Findings
Proj. CA-09-0042
Gruen Associates and DeLeuw, Cather & Co.
January, 1976 — PB 257-498/AS

Impacts of BART on the Social Invironment—
Interim Service Findings
Proj. CA-09-0042
Gruen Associates and DeLeuw, Cather & Co.
March, 1976 — PB 257-510/AS

Impacts of BART on Visual Quality—
Interim Service Findings
Proj. CA-09-0042
Gruen Associates
March, 1976 — PB 257-509/AS

Transportation and Travel Impacts of BART—
Interim Service Findings
Proj. CA-09-0042
Peat, Marwick, Mitchell & Co.
April, 1976 — PB 261-017/AS

Impacts of BART on Bay Area Health Care Institutions—
Proj. CA-09-0042
Jefferson Associates
March, 1977 — PB 266-614/AS

BART Impacts on Highway Traffic & Transit Ridership—
Proj. CA-09-0042
Peat, Marwick, Mitchell & Co.
May, 1977 — PB 267-675/AS

Impacts of BART on Bay Area Political Institutions—
Proj. CA-09-0042
Jefferson Associates
May, 1977 — PB 273-389/AS

Impacts of BART on Bay Area Institutions of Higher Education and Their Students—
Proj. CA-09-0042
Dr. Terry Lunsford
May, 1977 — PB 273-396/AS

The Impact of BART's Bond Issue on Regional Public Financing—
Proj. CA-09-0042
Raymond K. O'Neil, Charles A. Long
August, 1977 — PB 273-387/AS

Impacts of BART on the Competitive Advantage & Efficiency of Bay Area Business Operations—
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McDonald & Smart, Inc.
August, 1977 — PB 273-485/AS

Rail Transit Car Costs—
A Review, Analysis and Projections
Proj. CA-09-0035
Southern California Association of Governments (SCAG)
May, 1975 — PB 255-835/AS

New York City Transit Authority Design Guidelines—
Proj. IT-09-0014
Tri-State Regional Planning Commission
March, 1975 — PB 251-641-SET

Urban Densities for Public Transporation—
Proj. IT-09-0023
Tri-State Regional Planning Commission
May, 1976 — PB 256-636/AS

The School Bus: A Transportation Resource for Northeastern Illinois—
Proj. IT-09-0026
Northeastern Illinois Planning Commission
January, 1975 — PB 255-544/AS

Directory of Special Transportation Services in the Metropolitan Washington Area—
Proj. IT-09-0033
Metropolitan Washington Council of Governments
June, 1975 — PB 250-689/AS

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Proj. IT-09-0058
Simpson & Curtin
December, 1976 — PB 269-054/AS

Rider Behavior on an In-Line Accelerating Walkway—
Proj. IT-09-0126
Johns Hopkins University Applied Physics Laboratory
September, 1977 — PB 277-677/AS

An Analysis of Transportation Planning Effectiveness—
Final Report
Proj. MA-09-9003
Transportation Systems Center
July, 1977 — PB 272-756/AS

Transit Mobility for Elderly and Handicapped Persons—
Proj. KS-09-0005
Wichita-Sedgewick County Metropolitan Area Planning Department
May, 1977 — PB 272-443/AS

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Proj. MN-09-0010
DeLeuw, Cather & Company, Inc. and Bather-Ringrose-Wolsfeld, Inc.
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Proj. PA-09-0028
Simpson & Curtin
January, 1977 — PB 270-214

Increasing Efficiency in Bus Maintenance Operations—
Final Report
Proj. PR-09-0004
University of Puerto Rico
September, 1976 — PB 270-919

1974 Texas Transit Operations (Statistics and Analysis)—
Proj. TX-09-8001
Texas Mass Transportation Commission
May, 1975 — PB 256-308/AS

Evaluating Transit Service to Minorities—
Proj. VA-09-0013
Virginia Polytechnic Institute and State University
September, 1975 — PB 253-041/AS

1973 Transit Patron Origin and Destination Survey—
Final Report
Proj. WA-09-0006
Puget Sound Council of Governments
March, 1975 — PB 272-362/AS

A Survey of Mass Transit Alternatives to Interstate 90—
Proj. WA-09-0010
Puget Sound Council of Governments
Phase I: July, 1975 - PB 269-909
Phase II: December, 1975 - PB 270-377

Magic Carpet Evaluation Study—
Final Report
Proj. WA-09-0012
Municipality of Metropolitan Seattle
May, 1977 — PB 271-214

Urban Mass Transportation Industry Uniform System of Accounts and Records and Reporting System—
Proj. IT-06-0094
Arthur Andersen & Company
January, 1977
Volume I: General Description - PB 264-877/AS
Volume II: Uniform System of Accounts and Records - PB 264-878/AS
Volume III: Reporting System Forms and Instructions Required - PB 264-879/AS
Volume IV: Reporting System Forms and Instruction -Voluntary - PB 264-880/AS

A Program for Improving Transit Industry Management Information Systems—
Proj. IT-06-0094
Arthur Andersen & Company
September, 1976
Volume I: Information Systems Improvement Plan Summary - PB 264-524/AS
Volume II: Systems Development Work Programs - PB 264-525/AS
Volume III: Systems Design Reference Manual - PB 264-526/AS
Final Report - PB 264-523/AS - SET

A Public Transportation Improvement Plan for the Amherst-Five College Area—
Proj. MA-06-0006
University of Massachusetts
December, 1975 — PB 258-146/AS

Service, Inventory and Maintenance System Computer System Description—
Proj. VA-06-0004
The MITRE Corporation
December, 1975
Volume I: Service/Unit Change System - PB 249-058/AS
Volume II: Inventory System - PB 249-059/AS
Volume III: Repair Cost System - PB 249-060/AS

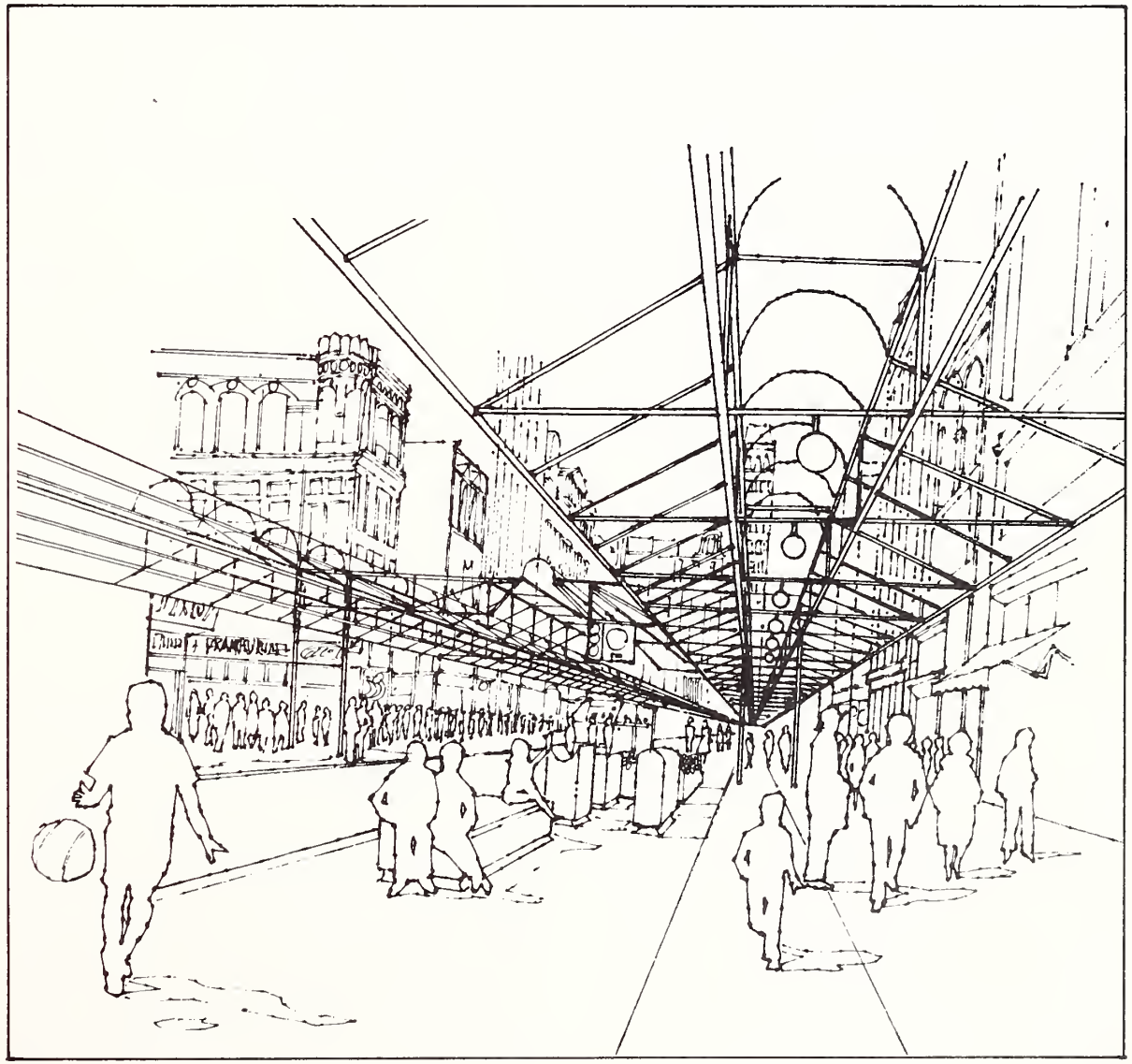
RUCUS Implementation Manual—
Proj. VA-06-0004
The MITRE Corporation
July, 1975 — PB 247-754/AS

Bus Maintenance Facilities—
A transit Management Handbook
The MITRE Corporation
November, 1975 — PB 250-475/AS

CHAPTER 13

POLICY AND PROGRAM DEVELOPMENT

POLICY DEVELOPMENT
PROGRAM EVALUATION
POLICY RESEARCH



UMTA is Studying Ways to Revitalize Center-City Environments by Means of Public Transportation.

The purpose of UMTA's policy research work is to promote a better understanding of the emerging urban transportation issues, needs, and objectives; to monitor and evaluate the impact and effectiveness of UMTA programs; and to aid in the formulation of new policies and program directions.

UMTA's Office of Policy and Program Development is responsible for coordinating the development, planning, and evaluation of the UMTA program. This office also performs short-term and long-range policy analysis and plays a major role in the development of legislative proposals, new policies, regulations, and directives. The Office also administers the UMTA University Research Program. (See Chapter 14.)

Projects described in this chapter reflect UMTA's continuing efforts to introduce a more deliberate approach toward policy development and program evaluation.

OFFICE OF POLICY DEVELOPMENT

Policy Analysis Support

In carrying out the broad range of functions assigned to it, UMTA requires many kinds of support. This project was concerned with the analysis of two major issues related to fixed guideway transit, i.e., technological upgrading and system extension. It was further concerned with the very broad issue of analyzing the development and implementation of Mass Transportation Policy.

Non-Urbanized Area Transit Assistance Requirements Funding for Capital and Operations

This project will forecast the range of Federal funds for non-urbanized areas under varying assumptions of transit demands and conditions. It will also estimate non-Federal resources available and study the impact on such resources made by Federal grant policies. The inflationary effects of the availability of Federal funds will also be studied.

The County Role in the Provision of Public Transportation in Non-Urbanized Areas

A profile of county duties and responsibilities were developed and an assessment made of the present role as well as an outline of a future role of the county as a transportation planner, provider, coordinator, and administrator.

Survey of Public Transportation Services in Small Urban Areas, 10,000-200,000 Population

This effort will assemble the basic data on the availability, ownership, regulations, ridership, revenues, and costs of local bus transit, taxis, specialized paratransit, and intercity bus service for places in this population range. The information will be made compatible with the similar, earlier research project on places under 10,000.

Assessment of Conventional and Innovative Methods for Financing Public Transportation Systems

This study will assess the various ways in which public transit systems can be financed, such as through tax increment assessment, value capture, joint development, etc. This report will provide interested local officials with important guidelines for evaluating and implementing potentially attractive methods for funding transit programs. Reports from this project are not yet available.

An Assessment of State Use of Section 9 Funds

A case study approach will be used to determine how these funds (planning assistance) have been programmed to date, to assess the effectiveness of the actual planning effort in terms of UMTA's stated goals, and to compare the results of planning in different States to determine the extent different techniques and philosophies influence the results. The results of the study will be used by UMTA in determining what new policies, if any, should be implemented and what additional guidance is required to obtain maximum use of Section 9 funds by the States.

Joint Development/Value Capture Project

The coordinated development of land occupied by transit facilities in order to maximize the financial return and optimize the

use of community land is called joint development/value capture. This project will establish a team of specialists in the legal, financial, and planning aspects to assist cities in achieving the necessasry cooperation and coordination of the many elements of government.

Conference on Joint Development and Multi-Agency Funding

The conference will promote a better understanding of joint development opportunities among both public and private agencies through the exchange of information and the issuance of papers outlining the problems.

Liability and Casualty Insurance for Paratransit

The objective of this project is to collect the present information that will depict the insurance situation facing paratransit operators and insurers. An advisory Board will be established with representatives from DOT, ITA, the insurance and paratransit industries, and regulatory agencies. The Board will structure the study and the subsequent review of reports and recommend alternative approaches to insurance problems.

Paratransit Implementation Guidance and Reference

The objective of this project is to provide sources of information and guidance for local planning agencies, elected officials, and public and private operators in broadening the scope of local transportation planning and programming. It will focus on issues such as private participation planning, regulatory change, competition between potential service providers, contractual arrangements, and coordination of special services. A case book of exemplary paratransit services and a bibliography will also be prepared to serve as guides for those interested in paratransit operations.

Support of Regional Workshops on Paratransit Implementation

This project will conduct a series of one-day workshops sponsored by UMTA, AOTA, and ITA to acquaint a variety of local officials, transit operators, social service agencies, and planners with the problems which may be encountered in establishing paratransit services.

OFFICE OF PROGRAM EVALUATION

The Office of Program Evaluation is responsible for evaluating the effectiveness of UMTA programs, and for monitoring urban transportation performance. The office is actively developing new approaches to transportation performance evaluation, applying them to selected systems and UMTA grant programs, and testing the utility of various indicators. Studies are also underway in such areas as transit costs, operating (expense/revenue) ratios, transit efficiency and productivity. A major survey of work trip data is also underway, in cooperation with other federal agencies, to establish the basis for analysis of trends of national significance.

Survey of Travel-to-Work 1975-1976
Survey of Travel-to-Work 1976-1977
Survey of Travel-to-Work 1977-1978

Each of these studies is a supplement to the Department of Housing and Urban Development's Annual Housing survey of the years indicated. The first includes a national sample of 170,000 households, as well as 200,000-household sample from 21 standard metropolitan areas. The second and third studies each include samples from 20 additional SMSA's.

National Personal Travel Survey

This is a supplement to the 1977 Survey of Travel to Work Survey which will collect different data on Travel and Trip purpose. It will be similar to a 1967 study in order to analyze changes.

Improving Transportation System Productivity

This project was to prepare for and conduct a conference on improving productivity. The specific objectives were to describe concepts and definitions and suggest approaches to the measurement of productivity, as well as to give examples of some practical steps to increase productivity. The conference was held September 18-21, 1977. The report of this conference is now

available; Proceedings of the First National Conference on Transit Performance, January 1978 (UMTA-DC-06-0184-77-1).

OFFICE OF POLICY RESEARCH

The Office of Policy Research plans and coordinates UMTA's research policies and programs and defines the R&D goals, objectives, needs, and requirements. The policy oriented research conducted by this Office consists of studies and analyses designed to advance the understanding and resolution of critical transportation problems and to aid in policy formulation and resource allocation decisions at the Federal level.

This Office also administers the UMTA University Research and Training Program.

Means for Reducing Light Rail Transit Cost Through Standardization of System Elements

Standardization of many components of LRT systems would result in considerable savings. Components such as power distribution subsystems, signals and controls, at-grade intersections, switches, stations, and lesser elements would cost less if manufactured in quantity; maintenance cost would be lower, and reliability could be increased. This study will identify possible components and procedures for standardizing them.

Study of Methods of Improving LRT Service

Several methods will be studied to improve LRT service or reduce its cost; a self service fare system could reduce trip time and manpower and permit different fare structures. Pre-emptive signaling, curbing, pedestrian malls, and improved flow will also be investigated.

Light Rail Transit Study

This is a comprehensive assessment, covering the last 20 years, of LRT throughout the world. There are detailed descriptions of 12 systems in Europe and North America and cover such topics as rights-of-way, guideways, vehicles, economics, power, vehicle control, operations, and costs.

State of the Art in Transportation System Management

This is an updating and restructuring of an earlier report *Joint Strategies for Urban Transportation, Air Quality and Energy Conservation* to produce a current state-of-the-art handbook on Transportation Systems Management.

TSM Institutional and Planning Research

Two contractors were selected to prepare documents from different but complementary points of view. The objectives are to document institutional arrangements useful in Transportation System Management planning, to document planning methods for better TSM, and to develop new approaches and methods to meet the demands of TSM.

Analysis of the Application and Impact of Transportation System Management (TSM) Techniques in Revitalizing Select Urban Areas in Europe

This project will document the application and effectiveness of various Transportation System Management practices in Europe which make more efficient use of existing highway and Transit Systems and which encourage the revitalization of declining urban centers.

National Academy of Sciences/ Transportation Research Board FY1977 Contract

Under this contract the TRB undertook activities which encouraged communities and members to expand their focus and activities on current transportation issues. In particular the following activities were conducted.

National Conferences

1. Light Rail Transit Conference
2. Urban Transportation Service Innovations (including paratransit)

Workshops, Seminars, Studies

3. Small and Medium Sized Communities
4. Elderly and Handicapped

5. Transit Finance
6. Socio-economic Impact of AGT
7. Transportation Land Use and City Forms
8. Urban Transportation Reporting Systems
9. TSM Activity
10. Technological Analysis Techniques
11. Alternative Analysis Techniques
12. Consumer Workshop
13. Energy, Efficiency, and Transportation
14. Transit Marketing Workshop or Conference

Conference on Urban Revitalization

Research was conducted on the effect of low-cost improvements in Transportation on neighborhood conservation and urban revitalization. Emphasis was given to preservation efforts that involve Transportation oriented projects. DOT and other agencies' assistance programs were studied as were some successful projects. This led to a conference of practitioners and grass-roots organizations who want to improve their local environment.

Improving Center City Environment and Transportation

This study focused on ways to improve the center city environment and transportation by working with local officials to assess the potential of such concepts as:

Auto-restricted zones, parking restrictions, selective closure of streets to traffic, bans of truck deliveries.

Pedestrian streets and malls, pedestrian skywalks, underground concourses, and other kinds of pedestrian walkway systems.

Transitways, downtown minibus services, attractive displays of route and schedule information, and other improvements in center city transit service.

Moving walkways, people movers, and other mechanized pedestrian assists for downtown circulation.

Landscaping, use of outdoor art and street furniture (benches, shelters, lighting), creation of vest pocket parks, and other downtown beautification projects.

Assessment of Present and Future Paratransit Potential

This three-part project will assess the potential for paratransit through three tasks: Conduct of a background survey of previous research, current research, and system implementation results; assessment of the existing state-of-the-art of paratransit development; and identification of future potential for paratransit.

Assessment of Paratransit Service in Europe and North America

Within the past few years there has been a growing interest in the potential of paratransit service in Europe and North America. Because of the rapid pace of this development, this study was jointly sponsored with Canada, Australia, France, and Germany to provide a broad perspective of progress on both continents so that innovative ideas can be shared and comparisons can be made.

Developing Intra-Neighborhood Transportation Systems

This project will identify, study, and evaluate approaches and financial mechanisms for innovative transportation at the neighborhood level. The effort will broaden neighborhood organizations in the formulation of area needs assessments, system designs, and studies of various self-help approaches to financing these services.

Casebook on Joint Development Practices

This project will produce a casebook of joint development (multiple use of transit land) practices and projects from experiences across North America that would serve as guidelines for public and private organizations contemplating joint development projects.

Study to Identify Relevant Criteria for Selection of Sites for Fixed Guideway Systems

This project will develop and evaluate criteria and methodology for selecting cities and corridors within such cities which can

support fixed guideway systems such as line haul, rail rapid transit, light rail transit, and downtown people movers. Using this methodology and criteria, 8 to 10 cities will be selected for further study.

Communication Program: Urban Transportation Innovations Abroad

A newsletter and a clearinghouse will be established to facilitate the exchange of information on international developments in public transportation. Emphasis will be on advancing the interrelationships between the transportation environment and planning.

Impacts of Foreign Rail Car Competition on the U.S. Economy and the Financial Health of Domestic Suppliers

The objective of this study was to analyze the impact of foreign rail car manufacturers on the financial health and competitive position of U.S. in both foreign and domestic rail car markets, and to study secondary economic impacts on trade deficit and unemployment ratios as well as to consider the implications for Federal Transit policies.

Electric Trolley Bus Feasibility Study

This project will prepare a guide for planners covering the state-of-the-art in electric tolley buses, likely advances in the arts, suitability for some specific locations, and any changes which might be called for in Federal policies.

Policy and Program Development

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Policy Development					
Policy Analysis Support	MA-06-0053-02	$160,000	June 1976-Sept. 1977	TSC	Larry Schulman 426-4060
Non-Urbanized Area Transit Assistance Requirements: Funding for Capital and Operations	IT-06-0159	$ 50,000	June 1976-Dec. 1977	Ecosometrics, Inc.	Douglas Gurin 426-4060
The County Role in the Provision of Public Transportation in Non-Urbanized Areas	IT-06-0160	$ 75,000	July 1976-Oct. 1977	National Assocation of Counties	Douglas Gurin 426-4060
Survey of Public Transportation Services in Small Urban Areas, 10,000-200,000 Population	DC-06-0155	$ 55,000	July 1976-June 1978	The Urban Institute	Douglas Birnie 426-4060
Assessment of Conventional and Innovative Methods for Financing Public Transportation	IT-06-0127	$ 90,000	Sept. 1976-June 1978	Institute of Public Administration, Gladstone Associates	Michael Steadham 426-4060
An Assessment of the State Use of Section 9 Funds	DC-06-0132	$ 35,859	Sept. 1976-Dec. 1977	Nat'l League of Cities/ U.S. Conf. of Mayors	Jim Davis 472-6973
Joint Development: A Value Capture Project	NY-06-0047	$ 60,000	Sept. 1976-Dec. 1977	Administration and Management Research Associates of New York, Inc. (AMRA)	Green Miller 426-4058
Conference on Joint Development and Multi-Agency Funding	DC-06-0214	$ 80,838	Dec. 1977-Dec. 1978	Public Technology, Inc.	Douglas Gurin 426-4060
Liability and Casualty Insurance for Paratransit Providers	MD-06-0030	$ 67,812	Feb. 1977-April 1978	International Taxicab Association	James Stratton 426-4060

Policy and Program Development

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Policy Development (Continued)					
Paratransit Implementation Guidance and References	MD-06-0034	$ 53,695	June 1977-March 1978	International Taxicab Association	James Stratton 426-4060
Support of Regional Workshops on Paratransit Implementation	DC-06-0210	$ 62,000	Sept. 1977-Oct. 1978	The Urban Institute	Douglas Birnie 426-4060
Policy Evaluation					
Survey of Travel-to-Work	DC-06-0124	$1,195,000 UMTA $ 300,000 DOT $ 244,500 FHWA	June 1975-April 1977	Bureau of the Census	Gary Ceccucci 426-4060
Survey of Travel-to-Work 1976-1977	DC-06-0144	$1,025,000 UMTA $ 25,000 FHWA	July 1976-April 1978	Bureau of the Census	Gary Ceccucci 426-4060
Survey of Travel-to-Work	DC-06-0189	$1,110,000	FY-1975 (Continuing)	Bureau of the Census	Gary Ceccucci 426-4060
Paratransit Reporting System	IL-06-0035	$ 100,000	July 1976-Oct. 1977	International Taxicab Association, Subcontractors: Wells Research Company	Bryan Green 426-4060
National Personal Travel Survey	DC-06-0174	$ 219,500	Jan. 1977-June 1978	FHWA	Gary Ceccucci 426-4060
Improving Transportation System Productivity	DC-06-0184	$ 82,420	Feb. 1977-Dec. 1977	Public Technology, Inc.	Bryan Green 426-4060

Policy and Program Development

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Policy Research					
Means for Reducing Light Rail Transit Cost Through Standardization of System Elements	IT-06-0103-03	$ 55,000	Sept. 1976-June 1978	DeLeuw Cather, Inc.	James Yu 426-4058
Study of Methods of Improving LRT Service	IT-06-0103-02	$ 53,000	Sept. 1976-Feb. 1978	DeLeuw Cather, Inc.	James Yu 426-4058
Light Rail Transit Study	IT-06-0103	$170,000	June 1975-Oct. 1976	DeLeuw Cather, Inc.	James Yu 426-4058
State-of-the-Art in Transportation Systems Management	RI-06-0008	$ 90,000	March 1975-Sept. 1976	INTERPLAN Corp.	Milton Brooks Richard Cohen 426-4058
TSM Institutional and Planning Research		$142,500	June 1976-March 1978	System Design Concepts; Alan M. Voorhees, Inc.	Milton Brooks Richard Cohen 426-4058
Analysis of the Application and Impact of Transportation System Management Techniques in Revitalizing Select Urban Areas in Europe	FN-06-0003	$ 16,968	Sept. 1977-June 1978	Ecoplan International	James Yu 426-4058
National Academy of Sciences Transportation Research Board, FY 77 Contract	DC-06-0216	$400,000		National Academy of Sciences, Transportation Research Board	Yvonne Griffin 426-4058
Conference on Urban Revitalization	DC-06-0188	$ 81,063	April 1977-March 1978	The Conservation Foundation	Richard Cohen 426-4058
Improving Center City Environment and Transportation	DC-06-0163	$ 55,000	Sept. 1976-Feb. 1978	Public Technology, Inc.	James Yu 426-4058

Policy and Program Development

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Policy Research (Continued)					
Assessment of Present and Future Paratransit Potential	DC-06-0150	to be announced	June 1976-	To be selected	James Yu 426-4058
Assessment of Paratransit Service in Europe and North America	FN-06-0002	$ 15,000	March 1976- Jan. 1977	Ecoplan International	James Yu 426-4058
Developing Intra-Neighborhood Transportation Systems	DC-06-0203	$ 90,000	July 1977- Mary 1978	National Center for Urban Ethnic Affairs	Richard Cohen 426-4058
Casebook on Joint Development Practices	DC-06-0138	$ 85,000	Jan. 1977- March 1978	Urban Land Institute	James Yu 426-4058
Study to Identify Relevant Criteria for Selection Sites for Fixed Guideway Systems	NY-06-0061	$ 85,000	Jan. 1977- Feb. 1978	Regional Plan Association, Inc.	James Yu 426-4058
Communications Program: Urban Transportation Innovations Abroad	DC-06-0207	$ 50,000	Nov. 1977- Nov. 1978	Council for International Urban Liaison	Yvonne Griffin 426-4058
Impacts of Foreign Rail Car Competition on the US Economy and the Financial Health of Domestic Suppliers	DC-06-0213	$ 40,000	Nov. 1977- Feb. 1978	Richard J. Barber, Associates, Inc.	Brian Day 426-4058
Electric Trolley Bus Feasibility Study	IT-06-0193	To be announced		To be selected	Yvonne Griffin 426-4058

Bibliography

This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

A Comparison of Methods for Evaluating Urban Transportation Alternatives—
Proj. MA-06-0053
Transportation Systems Center
February, 1975 — PB 245-313/AS

Light Rail Transit: State of the Art Review—
Proj. IT-06-0103
DeLeuw, Cather & Company
Spring, 1976 — PB 256-821/AS

Transportation System Management: State of the Art—
Proj. RI-06-0008
INTERPLAN Corporation
September, 1976 — PB 266-953/AS

Transportation System Management: State of the Art—
Proj. RI-06-0008
February, 1977

Center City Environment and Transportation: Local Government Solutions—
Proj. DC-06-0163
December, 1977

A Study of Minority Business Participation in the Urban Mass Transportation Industry—
Proj. DC-06-0146
One America, Inc.
July, 1977
Volume I: Analysis of Minority Business Participation - PB 274-773/AS
Volume II: Developing Successful Minority Business Enterprise Programs for Public Transit Properties: A Manual - PB 274-774/AS
Volume III: Public Transit Contracting Opportunities for Minority Business Enterprises: A Manual - PB 274-775/AS

Proceedings of the First National Conference on Transit Performance—
Proj. DC-06-0184
Public Technology Inc.
January, 1978

Transit Station Area Joint Development: Strategies for Implementation—
Proj. NY-06-0047
Administration and Management Research Association of New York City, Inc.
February, 1976
Economic Case Studies - PB 268-104/AS
Final Report - PB 268-103/AS

Increasing Transit Ridership: The Experience of Seven Cities—
Proj. UP-5
Urban Mass Transportation Administration
November, 1976 — PB 271-071

Transportation System Management—
A Bibliography of Technical Reports
Proj. UPP-L
Urban Mass Transportation Administration
May, 1976 — PB 256-273/AS

CHAPTER 14

UNIVERSITY RESEARCH AND TRAINING GRANT PROGRAM

TRANSPORTATION ANALYSIS, PLANNING, AND EVALUATION

TRANSPORTATION/LAND USE INTERACTIONS

TRANSPORTATION FINANCING AND PRICING

TRANSPORTATION SYSTEM MANAGEMENT

PUBLIC TRANSPORTATION SYSTEMS AND SERVICES FOR LOW DENSITY AREAS

IMPROVING TRANSIT PRODUCTIVITY AND EFFICIENCY

EDUCATION/TRAINING

Systems and Services for Low-Density Areas are Being Emphasized in New University Research Projects.

The University Program encourages and supports transportation research in the academic community to aid in understanding and resolving urban transportation problems and needs. More specifically, it promotes research and training in the needs of UMTA and strengthens Federal, State, and local abilities to plan, design and operate transportation systems. It also promotes greater interaction between universities and local transportation authorities as well as assisting the universities to become sources of advice and centers for disseminating the experience of the transportation community at large. It further helps universities in the training of practicing professionals and in the encouragement of young people to enter the transportation profession.

In FY-77 preference was given to proposals which were directed toward one or more of the following topics:

Transportation Analysis, Planning, and Evaluation

Transportation/Land Use Interactions

Transportation Financing and Pricing

Transportation System Management

Improving Transportation in Center Cities

Public Transportation Systems and Services for Low Density Areas

Improving Transit Productivity and Efficiency

Education/Training

Because the University grants program is so diverse, it is difficult to summarize. Nevertheless, approximately 300 reports coming from Research and Training Grant Projects are available at the National Technical Information Service (NTIS) an estimated 26,000 copies have been purchased, while many copies have been supplied directly to urban transportation organizations by the universities themselves. Approximately 150 new courses in urban transportation have been added to the universities' curricula, while about 100 full-time faculty and research positions have been added to the staffs. Many urban transportation students (425) have taken positions in transportation planning organizations, departments of transportation, transit operators, equipment suppliers, and consulting firms.

This publication lists and gives brief descriptions of the project grants awarded in FY 1977 in support of the foregoing objectives. Reports from these new projects are not yet available. Reports from earlier projects which were entered into the NTIS system during FY-77 are listed at the end of the chapter.

The program is authorized and funded under Section 11 of the Urban Mass Transportation Act of 1964 as amended.

Feel free to write or call the individuals who are shown as technical monitors, or contacts, should you have questions.

TRANSPORTATION ANALYSIS, PLANNING, AND EVALUATION

Organizational Alternatives for Metropolitan Transportation Services CA-11-0001

Transportation regulations are in many cases barriers to transportation improvements. Desirable improvements will not become realities until incentives are increased or restrictions modified. The study hopes to use the San Francisco Bay Area systems to establish a basis for policies which would improve the atmosphere for innovations.

Los Angeles County Transportation Commission Public Policy Impact Study CA-11-0002

The study will evaluate the effectiveness of this recently established Transportation Commission, as well as evaluating the

impact of the regulations and policies of departments and agencies of concern to the new Commission.

Evaluation of the Impacts of Federal Transportation in Small Urban Areas IA-11-0001

Case studies will be used to analyze the effect on transportation investment decisions of small urban areas caused by federal and state investment programs. Federal programs are largely oriented to large communities hence there is little data available concerning smaller centers. Three areas will be studied which have population of 50,000 to 300,000.

The Development of a Transportation Needs Assessment Methodology for Neighborhood Preservation Areas MD-11-0003

This study will develop an instruction manual also containing information sources and guidelines for use by neighborhood organizations in neighborhood preservation areas in making transportation needs assessments.

Long Range Directions for Urban Public Transportation: A Study in Context NY-11-0017

Long range transportation planning must be done in the context of a long range view of society and its needs. Hence this study will project several alternative views and then analyze the transportation needs of those alternative societies. The result will be a case study book for planners.

The Development of Simplified Transportation Planning and Assessment Methodologies for Low Density, Small to Medium Sized Cities VA-11-0007

This project will develop simplified methods for relating land use and transit operations and for assessing the transportation needs for low density, small to medium size cities (50,000 to 300,000 pop.). It will be done with cooperation of Pentran, PTDC, and the Planning Departments of Hampton and Newport News.

An Investigation of the Influence of Knowledge and Information on Mass Transit Utilization VA-11-0008

This study will create a model by which transit operators can educate the public as to the benefits of using mass transit. It will identify the reasons why more people do not use transit, and determine what kinds of information are effective.

Visualizing Congestion Patterns: A Policy-Oriented Feasibility Assessment WA-11-0002

This study will develop several data display techniques to study the properties of transportation congestion. It will then make recommendations for testing the most promising for their cost effectiveness. This could then provide the basis for further congestion policy studies.

TRANSPORTATION/LAND USE INTERACTIONS

The Feasibility of Joint Development in Selected Transit Station Locations in the Detroit Area MI-11-0003

This study will explore the problems and strategies which are inherent in or necessary to accomplish joint development planning in the establishment of five stations along proposed transit corridors. Joint planning means the cooperation of all agencies concerned with highway planning, land use regulations, tax policies, investment policies, environmental issues as well as transportation in order to realize the optimum benefit to the community.

TRANSPORTATION FINANCING AND PRICING

An Examination and Evaluation of Selected Funding Issues in Urban Mass Transportation MA-11-0030

From previous work, two areas will be studied; 8-10 case studies of the ways transit fiscal issues have evolved and been dealt with, and a review of available funding sources in one area for supporting special transit services. Three in-depth studies will also be made of the effects of Federal and State assistance on the local decisions.

Possible revisions of Federal and State assistance policies will be developed and recommended.

Fare Elasticities and Performance in the Taxi Industry NC-11-0006

This project will develop and test techniques for evaluating taxi services and then estimate demand elasticities for operations in various size cities. It will produce a comprehensive report, a technical report dealing with fare elasticity, and a guide to help local officials evaluate taxi services.

Evaluation of Ridership, Revenue and Equity Implications of Distance-Based Fares for Transit Systems in Medium Sized Urban Regions NY-11-0016

Fares based on distance rather than zones may be more equitable. This project will develop a simulation model and software to be used to analyze a variety of fare schemes based on distance and to allow the study of revenue, number of riders, and other factors.

Implementation of Joint Development/ Value Capture (JD/VC) Techniques TX-11-0006

From the literature this study will prepare a catalogue of Joint Development-Value Capture techniques and report them in such a way as to be the most useful to local and state governments. It will also create a team of legal, financial, and planning specialists which will then study three to six cities and report to those cities a program of options. It will then help those cities in studying the key problems and recommendations for action. The team will report on the progress within those cities during the life of the project to serve as guides for other cities. The study will also conduct three seminars and two conferences to aid the academic and professional communities in understanding Joint Development-Value Capture.

Public Transport Investment and Policy Analysis PA-11-0004

Because modern, economic analyses are not well understood, this project will develop instructional material and improved techniques for analyzing transportation investments and for conducting benefit-cost and cost effectiveness studies as aids to policy analysts in allocating available funds.

TRANSPORTATION SYSTEM MANAGEMENT

Area Responses to Transportation System Management (TSM) Requirements MA-11-0008

The project will study two areas found to be critical to a Transportation System Management Program; namely, the role of transportation agencies within a group of integrated agencies and Transportation System Management Process development (with particular emphasis on funding and monitoring).

The Development of an Evaluation Framework for Transportation System Management Strategies NE-11-0001

The Department of Transportation requires a Transportation System Management aspect in urban planning. This project will develop and test a method for evaluating TSM strategies incorporating performance measures related to the TSM objectives.

Planning and Design Guidelines for Transportation System Management (TSM) PA-11-0006

Transportation System Management requires the consideration of the entire array of transportation and transportation-related systems and facilities. This is complex and not well implemented in spite of much effort. This project will produce a manual to assist planners in understanding, evaluating and implementing TSM.

Monitoring, Assisting and Evaluation and Evolution of Urban-Region Transportation System Management and Coordination Organization WA-11-0001

The Puget Sound Council of governments has proposed a Transportation System Management - Coordination Demonstration. The purpose of the study reported here is to monitor, assist, and evaluate this demonstration. It will also report on similar demonstrations in three other cities, all with

the intent of making the experiences available to other cities.

IMPROVING TRANSPORTATION IN CENTER CITIES

Evaluating Radial Corridor, Auto Restraint, and Transit Priority Measures MA-11-0031

This study will investigate the political and institutional feasibility of implementing several schemes to reduce the number of automobiles or to give priority to buses and car pool vehicles. This will be done in the context of one or two radial corridors in Boston.

SYSTEMS AND SERVICES FOR LOW DENSITY AREAS

Monitoring the Implementation of Innovative Transportation Services IL-11-0012

This project will devise methods for monitoring innovative transit schemes by testing and evaluating two northern Illinois areas.

Integrated Paratransit Transportation-Planning for Low Travel Densities IL-11-0023

This project will produce a paratransit planning manual for low-density areas including help in implementation and marketing. It will also produce a computer program to simulate some aspects and aid in choosing cost effective modes. It will concentrate on the non-work trip.

Regulatory and Institutional Barriers to Paratransit Services and the Ways of Overcoming Those Barriers NC-11-0007

This project will study four innovative paratransit systems to learn the roles of regulatory bodies, methods of overcoming regulatory problems, agreements, charters, certificates, insurance, and ridership changes.

Paratransit Service Planning Workshops OK-11-0001

This project will develop instructional materials for use in workshops to aid faculty and transportation planners in understanding planning for paratransit services. Workshops will be conducted, one with the purpose of stimulating faculty to use the materials in the classroom.

Development of Integrated Transit Services for a Rural Suburban County VA-11-0006

This study will cover the transit needs of Albermarle County and develop an implementation program; including various paratransit concepts, or organizational strategies, and integration with existing services in urban Charlottesville.

IMPROVING TRANSIT SYSTEM PRODUCTIVITY

Effect of Organization Size on Transit Productivity and Satisfaction CA-11-0016

This project will study the characteristics and employees of a variety of transit organizations in California to learn the effect of several size-related structural attributes on the employee satisfaction and job performance.

A Comprehensive Analysis of Transit Efficiency and Productivity IN-11-0003

This project will develop a set of indicators to analyze the efficiency and productivity of transportation systems. Such indicators will then be tested to provide better analyses than present indicators.

Measuring the Influence of Subsidies on Transit Productivity and Efficiencies NE-11-0002

This research project will analyze data from several transit systems in order to test hypothetical relationships between subsidies and efficiency and productivity. The results should be useful to policy planners at all levels of government.

Increasing Efficiency in Bus Maintenance Operations PR-11-0002

This project will devise workable measures of productivity as a first step toward helping management formulate policies to improve productivity.

Identification and Resolution of Labor Relations Problems of Union and Management Municipal Transit Representatives WI-11-0005

This project will provide a forum for labor and management to identify labor relations, on which both groups are willing to work for solutions. A planning committee will set the format for one or more conferences of the appropriate people to work toward solutions for consideration by senior management, labor, and government officials.

EDUCATION AND TRAINING

Administrative Experiences and Innovation in Urban Mass Transportation Systems GA-11-0006

This study will create a number of case studies of the Metropolitan Atlanta Rapid Transit Authority's experience. The intent is to avoid typical histories and prepare instructive studies showing management processes, operational innovations, critical incidents, and interfaces with political and technical aspects.

Minorities in Transportation Engineering GA-11-0007

The program intends to encourage minority, including women, students to enter transportation engineering through the Atlanta University Center - Georgia Tech Dual Degree program. A summer intern program will be an important part of the five-year program.

An Intern Program for Transportation Studies HI-1-0001

This is a continuing project to develop intern programs in transportation at local agencies, by the University of Hawaii. By the nature of the student body many minority students will be involved. Bi-monthly colloquia are a special feature of the program.

The Use of Non-Print Media for Improved Communication of Public Transportation Decision-Making Information TN-11-0001

This project will prepare seven tape cassettes, each with accompanying projection slides, in an effort to improve the communication of urban transportation research results to potential beneficiaries. The subjects will include; marketing, service alternatives, elderly and handicapped persons, goals and objectives, airport access transport, costs, and paratransit.

Improving the Productivity of the Urban Transportation System NY-11-0019

This project will select a number of mass transit productivity problems, evolve corrective measures, and present these in the form of handbooks. Solutions will be sought from many areas, e.g., housing and law enforcement.

University Research and Training Grant Program

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Transportation Analysis, Planning, and Evaluation					
Organizational Alternatives for Metropolitan Services	CA-11-0001	$63,702	June 1977-Sept. 1978	U. of Calif. Berkeley, Prof. Melvin Webber	C.K. Orski UPP-1 (202) 426-4050
Los Angeles County Transportation Commission Public Policy Impact Study	CA-11-0002	$69,176	June 1977-Aug. 1978	Calif. State Univ., Long Beach, Prof. Peter L. Shaw	C.K. Orski UPP-1 (202) 426-4050
Evaluation of the Impacts of Federal Transportation Programs in Small Urban Areas	IA-11-0001	$73,347	June 1977-Aug. 1978	Univ. of Iowa, K.J. Dueker and D.B. Lee	D.P. Gurin UPP-10 (202) 426-4060
The Development of a Transportation Needs Assessment Methodology for Neighborhood Preservation Areas	MD-11-0003	$76,495	June 1977-June 1978	Univ. of Maryland, Profs. Robert Bish and Thomas Molinazzi	R. Cohen UPP-31 (202) 426-4058
Long Range Directions for Urban Public Transportation: A Study in Context	NY-11-0017	$62,602	June 1977-Aug. 1978	Polytechnic Inst. of N.Y., L. J. Pignataro and A. J. Weiner	J. Yu UPP-3 (202) 426-4058
The Development of Simplified Transportation Planning and Assessment Methodologies for Low Density, Small to Medium Sized Cities	VA-11-0007	$53,218	July 1977-July 1978	Hampton Institute, Profs. James Hall and D. Aichbhaumik	J. McQueen UTP-20 (202) 426-2360
An Investigation of the Influence of Knowledge and Information on Mass Transit Utilization	VA-11-0008	$67,492	July 1977-July 1978	Virginia Union College, J. B. Gunnell and J. C. Sharpe	R. Mason UCR-10 (202) 426-2285
Visualizing Congestion Patterns: A Policy-Oriented Feasibility Assessment	WA-11-0002	$26,353	June 1977-Sept. 1978	Univ. of Washington, Prof. J. B. Schneider	G.E. Paules UTP-10 (202) 426-9271

University Research and Training Grant Program

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Transportation/Land Use Interactions					
The Feasibility of Joint Development in Selected Transit Station Locations in the Detroit Area	MI-11-0003	$ 57,799	June 1977-Aug. 1978	Wayne State Univ., Prof. S. Khasnabis	G. Miller UPP-10 (202) 426-4058
Transportation Financing and Pricing					
An Examination and Evaluation of Selected Funding Issues in Urban Mass Transportation	MA-11-0030	$ 51,783	June 1977-Oct. 1978	Mass. Inst. of Technology, Prof. J. Womack	C.K. Orski UPP-1 (202) 426-4050
Fare Elasticities and Performance Measures in the Taxi Industry	NC-11-0006	$ 51,958	June 1977-Aug. 1978	Univ. of North Carolina, Prof. G. Gilbert	J. Bautz UMD-10 (202) 426-4984
Evaluation of Ridership, Revenue and Equity Implications of Distance-Based Fares for Transit Systems in Medium Sized Urban Regions	NY-11-0016	$ 49,099	June 1977-Aug. 1978	S.U.N.Y. Albany, Profs. L. Mohan and D. Ballou	B. Arrillage UMD-20 (202) 426-4984
Implementation of Joint Development/Value Capture (JD/VC) Techniques	TX-11-0006	$319,995	June 1976-June 1978	Rice Center for Community Design & Research, C.P. Sharpe	G. Miller UPP-10 (202) 426-4058
Public Transport Investment and Policy Analysis	PA-11-0004	$ 38,671	June 1977-June 1978	Carnegie-Mellon Univ., Prof. M. Wohl	F.B. Day UPP-31 (202) 426-4058
Transportation System Management					
Area Responses to Transportation System Management (TSM) Requirementss	MA-11-0008	$ 74,175	June 1977-Oct. 1978	Mass. Inst. of Technology, Profs. R. Gakenheimer and D. Roos	R. Cohen UPP-31 (202) 426-4058

University Research and Training Grant Program

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
The Development of an Evaluation Framework for Transportation System Management Strategies	NE-11-0001	$ 57,315	June 1977- Aug. 1978	Univ. of Nebraska, Prof. P. M. Lima	R. Cohen UPP-31 (202) 426-4058
Planning and Design Guidelines for Transportation System Management (TSM)	PA-11-0016	$78,855	June 1977- Aug. 1978	Univ. of Penn., Prof. Vukan R. Vuchic	F.B. Day UPP-31 (202) 426-4058
Monitoring, Assisting, and Evaluating the Evolution of the Urban Region Transportation System Management and Coordination Organization	WA-11-0001	$47,939	June 1977- June 1978	Univ. of Washington, Prof. E.M. Horwood	R. Cohen UPP-30 (202) 426-4058
Improving Transportation in Center Cities					
Evaluating Radial Corridor Auto Restraint and Transit Priority Measures	MA-11-0031	$89,910	June 1977- Sept. 1978	Harvard Univ., Prof. G. Fauth	B. Arrillaga UMD-20 (202) 426-4984
Systems and Services for Low Density Areas					
Monitoring the Implementation of Innovative Public Transportation Services	IL-11-0012	$89,994	Oct. 1976- Oct. 1977	Northwestern Univ., Profs. J. Hauser and F. Koppelman	J. Bautz UMD-20 (202) 426-4984
Integrated Paratransit Transportation-Planning for Low Travel Densities	IL-11-0023	$75,882	June 1977- Aug. 1978	Univ. of Ill. Chicago Cir., Profs. A. K. Sen and C.M. Johnson	R. Scott UPP-10 (202) 426-4060
Regulatory and Instituional Barriers to Paratransit Services and the Ways of Overcoming those Barriers	NC-11-0007	$54,954	June 1977- July 1978	North Carolina A&T State Univ., Prof. D. McKelvey	D. Birnie UPP-10 (202) 426-4060
Paratransit Service Planning Workshops	OK-11-0001	$71,748	June 1977- June 1978	Univ. of Oklahoma, Prof. C. Barb, Jr.	J. Stratton UPP-10 (202) 426-4060

University Research and Training Grant Program

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Development of Integrated Transit Services for a Rural-Suburban County	VA-11-0006	$79,109	June 1977-July 1978	Univ. of Virginia, Profs. L. Hoel and M. J. Demetsky	M. Steadham UPP-10 (202) 426-4060
Improving Transit Productivity					
Effect of Organization Size on Transit Productivity and Employee Satisfaction	CA-11-0016	$61,234	July 1977-Sept. 1978	Univ. of Calif., Irvine, G. J. Fielding	J.E. Sale UPP-20 (202) 426-4060
A Comprehensive Analysis of Transit Efficiency and Productivity	IN-11-0003	$68,842	June 1977-Aug. 1978	Purdue Univ., Prof. K. C. Sinha	G. Ceccucci UPP-20 (202) 426-4060
Measuring the Influence of Subsidies on Transit Productivity and Efficiency	NE-11-0002	$40,960	Aug. 1977 Sept. 1978	Univ. of Nebraska, Omaha, Prof. J. M. Gleason	C. Burbank UPP-20 (202) 426-4060
Increasing Efficiency in Bus Maintenance Operations	PR-11-0002	$69,014	June 1977-Sept. 1978	Univ. of Puerto Rico, Prof. L.A. Martin-Vega	B. Green UPP-20 (202) 426-4060
Identification and Resolution of Labor Relations Problems of Union and Management Municipal Transit Representatives	WI-11-0005	$51,106	July 1977-Aug. 1978	Univ. of Wisconsin, Madison, Prof. J. L. Stern	E. Barkley UPP-20 (202) 426-4060
Education and Training					
Administrative Experiences and Innovations in Urban Mass Transportation Systems	GA-11-0006	$74,751	June 1977-Sept. 1978	Univ. of Georgia, Prof. R.R. Golembiewski	J. McQueen UTP-20 (202) 426-2360
Minorities in Transportation Engineering	GA-11-0007	$83,502	June 1977-Aug. 1978	Atlanta Univ. Center, C. Espy	P.G. Hughes UPP-35 (202) 426-0080
An Intern Program for Transportation Students	HI-11-0001	$47,926	June 1977-Aug. 1978	Univ. of Hawaii, Profs. P. Hin Pung Ho and C.S. Papacostas	P.G. Hughes UPP-35 (202) 426-0080

University Research and Training Grant Program

PROGRAM TITLE	NUMBER	FUNDING	SCHEDULE	CONTRACTOR/ GRANTEE	TECHNICAL CONTACT
Improving Transit Productivity					
The Use of Non-Print Media for Improved Communication of Public Transportation Decision Making Information	TN-11-0001	$79,880	June 1977- Aug. 1978	Univ. of Tennessee, Prof. R. G. Mundy	P.G. Hughes UPP-35 (202) 426-0080
Improving the Productivity of the Urban Transportation System	NY-11-0019	$49,276	July 1977- July 1978	John Jay Coll. of Criminal Justice, M. Holzer	F.B. Day UPP-31 (202) 426-4058

Bibliography

This list of reports contains those published from January 1975 to the latest available. Others are being published continually, including the majority of those projects reported in this volume. Call or write the Technical Contact person listed after the project of interest to you to inquire for other reports to which he might refer you.

The two numbers shown with most entries are; first, the project number, and second, the National Technical Information Service (NTIS) document number.

Order blanks are included in the Appendix for your convenience.

UMTA University Research and Training Program Abstracts for University Research Projects—
Proj. UPP-35
Urban Mass Transportation Administration
February, 1978 — PB 278-646/AS

Analysis and Policy Research

Accessibility Appplications in Urban Transportation—
Proj. VA-11-0002
Virginia Polytechnic Institute and State University
January, 1977 - PB 269-240

Assuming Responsibility for Mobility of Elderly and Handicapped: The Role of Transit Properties, Transit Planners, and Social Service Agencies in Small Cities—
Proj. NC-11-0004
North Carolina A&T State University
July, 1976 — PB 267-231

Transit's Role in the Creation of the Polycentric City: An Initial Assessment—
Proj. WA-11-0005
University of Washington
August, 1977 — PB 275-043

Urban Corridor Trip Distribution Models: A Study of the Chicago Area Using the Census UTPP Data—
Proj. IL-11-0008
University of Illinois at Chicago Circle
September, 1977 — PB 275-161

Taxicab Utilization by Lower Income Groups—
Proj. NC-11-0004
North Carolina A&T State University
October, 1976 — PB 269-581

Transit Performance Measures: Their Significance in Local Funding Allocation—
Proj. WA-11-0005
University of Washington
June, 1977 — PB 276-141/AS

Development of Performance Indicators for Transit—
Final Report
Proj. CA-11-0014
University of California
December, 1977 — PB 278-678/AS

Potential for Betterment District Financing and Joint Development Applications to Surface Transit—
Proj. WA-11-0005
University of Washington, Seattle
July, 1977 — PB 274-618/AS

Employer Vanpool Programs: Factors in their Success or Failure—
Proj. WA-11-0005
University of Wshington
June, 1977 — PB 276-955/AS

Urban Transportation Planning

Management of Vehicular Traffic Facilities for Better Transit Movement: Some Aspects—
Proj. NY-11-0009
Polytechnic Institute of New York
December, 1976 — PB 267-942

User Documentation for the Metropolitan Accessibility Program—
Proj. VA-11-0002
Virginia Polytechnic Institute and State University
January, 1977 — PB 269-239

Methodology for Identifying Urban Transportation Technology Alternatives—
Proj. IL-11-0008
University of Illinois at Chicago Circle
March, 1977 — PB 271-225

RAM: A Normative Tool for Transit Route Planning—
Proj. NY-11-0009
Polytechnic Institute of New York
September, 1977 — PB 275-213

Utilizing Geographic Basefiles for Transportation Analyses: A Network Basefile System—
Proj. WA-11-0005
University of Washington
June, 1977 — PB 275-586/AS

Establishing Innovative Taxicab Services: A Guidebook—
Proj. NC-11-0005
University of North Carolina
August, 1977 — PB 278-647/AS

Transit Management

Improving Urban Mass Transportation Productivity—
Proj. MA-11-0026
Harvard University
February, 1977 — PB 266-920

Design for a National Urban Transportation Reporting System—
Proj. PA-11-0002
University of Pennsylvania
1976 — PB 259-002

The Role of Security in Marketing Urban Mass Transportation—
Proj. IL-11-0008
University of Illinois at Chicago Circle
February, 1977 — PB 271-224

Factors Influencing the Adoption of Management Innovation in the CTA—
Proj. WI-11-0002
Marquette University
July, 1976 — PB 226-154

Estimation of the Operating Cost of Mass Transit Systems—
Proj. NY-11-0012
State University of New York at Stony Brook
September, 1976 — PB 262-729/TBS

Transit Authority Boards of Directors: Membership, Organization, Functions, and Performance—
Proj. PA-11-0010
Pennsylvania State University
October, 1976 — PB 265-744

Labor Relations

The Effects of Labor Strikes on Bus Transit Use—
Proj. IN-1-0001
Purdue University
December, 1976 — PB 267-077

Labor Relations in Urban Transit—
Proj. WI-11-0004
University of Wisconsin - Madison
August, 1977 — PB 274-059

The Legal Framework for Collective Bargaining in the Urban Transit Industry—
Proj. WI-11-0004
University of Wisconsin - Madison
November, 1976 — PB 266-110

Urban Transportation Technologies

Vehicle Follower Longitudinal Control for Automated Guideway Transit—
Proj. MN-11-0002
University of Minnesota
February, 1977 — PB 264-554/TBS

Analysis and Design of Steering Controllers for Automated Guideway Transit Vehicles—
Proj. MA-11-0023
Massachusetts Institute of Technology
September, 1976 — PB 261-327

APPENDICES

Appendix 1:
Availability of Information on Federal Research and Development in Urban Mass Transportation

Annual Description of Research and Development Projects

The volume to which this is an appendix is UMTA's primary medium of dissemination of information about its R&D activity. The reports produced as important by products of these projects may be obtained by ordering them from the principal repository and disseminating agency for reports emanating from R&D performed by or for Federal agencies — the National Technical Information Service (NTIS). Reports are ordered directly from NTIS by the order numbers indicated in the report listings. The lack of an order number means that the report had not yet been entered into the NTIS depository system when this publication went to press. Inquiries about the availability or price of completed reports should be addressed to NTIS, not to the Urban Mass Transportation Administration. The NTIS Order Desk telephone number is: (703) 321-8543. Copies of the form used for ordering NTIS documents are reproduced on the last page; photocopies may be used for orders. Payment must accompany orders. Prices vary in proportion to the size of the document for copies on paper with eye-legible text (hard copy) and at present can be ascertained only by inquiries directed to NTIS. Most reports in NTIS are also made available on microfiche. Microfiche copies have a uniform price: $2.25 per volume for orders sent within the United States or $3.75 if sent abroad.

Payment for either standard or microfiche copies is acceptable in cash, by check, postal money order, GPO coupons, or charge to an American Express Card. Postage stamps are not valid as payment. It is possible to establish a deposit account at NTIS, from which payments for ordered documents are withdrawn. The purchase price includes postage at the fourth class rate. Three to 5 weeks must be allowed for delivery. Much faster delivery is provided by NTIS's Rush Order Service (703-321-8948), with an additional charge of $10.00 per document.

Abstracts

UMTA publishes an annual guide to its research reports entitled *Urban Mass Transportation Abstracts.* These volumes contain descriptive abstracts of reports sponsored by UMTA which are available from the National Technical Information Service, along with complete indices by author, title, project number, and subject. These abstracts and indices cover reports of UMTA's research, development and demonstration plus technical studies projects, and reports produced under the university research and training program. The following volumes are available from NTIS: Volume 1, October 1972 (466 abstracts), PB-213-212; Volume 2, September 1973 (195 abstracts), PB-225-368/OAS; Volume 3, July 1974, PB-264-905/AS; Volume 4, December 1975, PB-278-646/AS.

The Transit Research Information Center (TRIC)

Another repository is the Transit Research Information Center (TRIC), which operates within UMTA's Office of Transportation Management and Demonstrations. TRIC maintains a full collection of all UMTA-sponsored reports and can provide information related to these reports and their findings. Although TRIC does not stock copies of reports for distribution, it will provide a one-page technical abstract of any report upon request. One can also request, preferably in writing, abstracts of reports on specific subjects that have been sponsored by the Urban Mass Transportation Administration. TRIC also publishes and distributes monthly abstracts of new UMTA reports. Anyone wishing to receive these abstracts on a regular basis should address a request to: Urban Mass Transportation Administration, Office of Transportation Management and Demonstration, Transit Research Information Center, 2100 Second Street, SW., Room 6412, Washington, D.C. 20590.

UMTA's Public Information Services

UMTA also conducts an active and continuous information program. All significant projects are announced when contracts are awarded, when important milestones have been reached and when completed, usually through press releases issued by the Office of Public Affairs. This Office also has available, and will send on request, brochures on various UMTA programs and policies.

UMTA's activities also are reported regularly in a magazine published by the Department of Transportation (DOT) and available from the Superintendent of Documents, entitled *Transportation USA.*

Those who wish to receive press releases may request this service by writing to UMTA's Office of Public Affairs.

Congressional Hearings

Each year UMTA, like all other agencies of the Federal Government, appears before appropriation committees of both the House and the Senate to request funds for the following fiscal year, justifying the request with an abundance of factual and statistical data concerning its present program and its plans for the future. Committee members elicit additional information and an explanation by questions. The entire transcript, constituting a rather comprehensive record of UMTA's activities, is published and made available on request addressed to the committees: Subcommittee on Transportation, Committee on Appropriations, United States Senate, Washington, D.C. 20510 and Subcommittee on Transportation, Committee on Appropriations, House of Representatives, Washington, D.C. 20515.

The Department of Transportation (DOT) Library

DOT's library contains approximately 500,000 volumes and pamphlets, 170 drawers of vertical file material, and receives more than 1,500 periodical titles. The library began operation in 1969 when the Washington libraries of the Bureau of Public Roads, Coast Guard, and Federal Aviation Administration were consolidated.

The Bureau of Public Roads' library had extensive materials on urban mass transportation and the collection has been substantially enriched since it was taken over by DOT. The library contains all reports produced by UMTA's R&D program. Most library materials are available for interlibrary loan to other libraries.

Information About Contracts

Most requests for information on R&D activities relate to contracts. Numerous firms are interested in providing goods or services for various R&D projects and wish to bid or negotiate for contracts or subcontracts. Some information may be obtained through relatively informal channels by correspondence or oral communication with DOT officials and staff but the prescribed procedures for negotiating a contract require the Federal Government to disclose a considerable amount of detailed information about projects.

Most procurements for the Federal Government are accomplished either by formal advertisements or by negotiation. The former are initiated by issuance of "invitation for bids" (IFB) which contain specifications describing the actual minimum needs of the Government. The negotiation process, the method most

frequently employed by UMTA, involved Requests for Proposals (RFP) which are designed to generate competition that will obtain industry's best efforts toward achieving UMTA's objectives. Each UMTA RFP also is designed to enable potential suppliers to compete on an equal basis; each includes such items as scope of work, delivery schedules, type of contract, closing date, technical evaluation factors, and expected terms and conditions.

IFB's or RFP's estimated at $5,000 or more are synopsized in the *Commerce Business Daily*. In addition to this dissemination, UMTA's Procurement Division will notify by mail a large number of businesses on its Bidders' Mailing List when an IFB or an RFP involving the specialties of those firms has been issued. (See Section: *RFP's and Bidders' Mailing List,* page 80.) The Commerce Business Daily is also a source of information about contract awards involving $25,000 or more. These are published, in large part, for the benefit of potential subcontractors.

UMTA Files

In conformance with the Freedom of Information Act (80 Stat. 140), UMTA has established a "Document Inspection Facility" within the Office of Administration. This facility is open to the public only during regular working hours (8:30 a.m. to 5 p.m.).

The Administrator also maintains, at the same place and under the supervision of the same official, a document inspection facility where the general files of the Administration are kept, and where the following records are located and available:

- Any final opinions and orders made in the adjudication of cases and issued within the Administration;
- Any policy or interpretation issued within the Administration, if that policy or interpretation can reasonably be expected to have precendential value in any case involving a member of the public;
- Any administration staff manual or instruction to the staff which affects any member of the public; and
- An index to the material described above.

Any person desiring to inspect such a record or to obtain a copy thereof must submit his request in writing, specifying the record, to the Associate Administrator for Administration, Department of Transportation Building, 400 Seventh Street, SW., Washington, D.C. 20590. Each request for a copy must be accompanied by the appropriate fee prescribed in 49 C.F.R., Part 7, Section 7.85. The fees prescribed may be paid by check, draft or postal money order, payable to the Treasurer of the United States.

Any person to whom a record is not made available within a reasonable time after his request, and any person who has been notified that a record he has requested cannot be disclosed, may apply, in writing, to the Administrator, Urban Mass Transportation Administration, for reconsideration of his request. The decision of the Administrator is final.

Correspondence with UMTA

UMTA also is responsive to letters of inquiry. Letters addressed to the Administrator will be routed to the appropriate offices for reply.

UMTA's addresses

The headquarters and most offices of UMTA are located at 400 Seventh Street, SW, Washington, DC 20590. The Office of Civil Rights, the Office of Transportation Management and Demonstrations, two divisions of the Office of Administration and the Office of Technology Development and Deployment are located at 2100 Second Street, SW, Washington, DC 20590.

The Office of the Secretary of Transportation and the Department library are located at 400 Seventh Street, SW, Washington, DC 20590.

MAIL ORDER TO:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road
Springfield, Va. 22161

TELEX 89-9405
Telephone (703) 321-8543

Date _____

PURCHASER:

SHIP TO: (Enter if different from address at left)

Name _____

Organization _____

Address _____

Attention: _____

City, State, ZIP _____

- ☐ Charge my NTIS deposit account no. _____
- ☐ Send me an application for an NTIS deposit account.
- ☐ Purchase order no. _____
- ☐ Check enclosed for $ _____
- ☐ Bill me. See reverse for costs (not applicable to foreign customers).
- ☐ Charge to my American Express Card account number:

☐☐☐ ☐☐☐ ☐☐☐ ☐ ☐☐☐

Signature _____

Wherever a foreign sales price is NOT specified in the listings, all foreign buyers must add the following charges to each order:

$2.50 for each document
$1.50 for each microfiche

FOR DDC USERS ONLY

DDC User Code _____

Contract Number _____
(Last 6 characters only)

Allow 3-5 weeks for delivery on your order. If ordering without a document number, by title only, allow an additional 2 weeks.

DOCUMENT NUMBER [If ordering by title or if item ordered is a magnetic tape, please see reverse side.]	USER ROUTING CODE (see reverse)	Quantity			Unit Price	Total Price
		Paper Copy	Micro-fiche	Other (specify)		
					Enter Grand Total	$

FORM NTIS-173 (REV. 2-75)

USCOMM-DC 6367-P75

USER ROUTING CODE: NTIS can label each document for routing within your organization. If you want this service put your routing code in the box marked USER ROUTING CODE. (Limit eight characters)

SHIP & BILL SERVICE: NTIS appreciates prepayment for documents through the use of an NTIS Deposit Account, check, or money order. Should this not be convenient, NTIS will mail your order and bill you about 15 days after shipment. The handling charge for ordering documents is $5.00 per order (not line item); $5.00 per NTISearch ordered; $2.50 per subscription ordered. NTIS does not bill customers for magnetic tapes or shipments destined for outside the United States.

ORDERING MAGNETIC TAPE: (check mode) ☐ 9 track (odd parity) ☐ 1600 BPI ☐ 800 BPI ☐ 7 track ☐ 200 BPI ☐ 556 BPI ☐ 800 BPI ☐ odd parity ☐ even parity

ORDERING BY TITLE: If ordering without document number, by title only, allow an additional 2 weeks.

TITLE #1		
Sponsor's Series #	Contract or Grant Number of Report	Date Published
Originator (Give specific laboratory, or division and location.)		Personal Author
Turn to other side. Write "1" in the Document Number block and complete the rest of the line.		

TITLE #2		
Sponsor's Series #	Contract or Grant Number of Report	Date Published
Originator (Give specific laboratory, or division and location.)		Personal Author
Turn to other side. Write "2" in the Document Number block and complete the rest of the line.		

TITLE #3		
Sponsor's Series #	Contract or Grant Number of Report	Date Published
Originator (Give specific laboratory, or division and location.)		Personal Author
Turn to other side. Write "3" in the Document Number block and complete the rest of the line.		

TITLE #4		
Sponsor's Series #	Contract or Grant Number of Report	Date Published
Originator (Give specific laboratory, or division and location.)		Personal Author
Turn to other side. Write "4" in the Document Number block and complete the rest of the line.		

TITLE #5		
Sponsor's Series #	Contract or Grant Number of Report	Date Published
Originator (Give specific laboratory, or division and location.)		Personal Author
Turn to other side. Write "5" in the Document Number block and complete the rest of the line.		

FORM NTIS-173 (REV. 2-75) GPO 886-993 USCOMM-DC 6367-P75

MAIL ORDER TO:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road
Springfield, Va. 22161

TELEX 89-9405
Telephone (703) 321-8543

Date _____

PURCHASER:

SHIP TO: (Enter if different from address at left)

Name _____

Organization _____

Address _____

Attention: _____

City, State, ZIP _____

- ☐ Charge my NTIS deposit account no. _____
- ☐ Send me an application for an NTIS deposit account.
- ☐ Purchase order no. _____
- ☐ Check enclosed for $ _____
- ☐ Bill me. See reverse for costs (not applicable to foreign customers).
- ☐ Charge to my American Express Card account number:

☐☐☐ ☐☐☐ ☐☐☐ ☐ ☐☐☐

Signature _____

Wherever a foreign sales price is NOT specified in the listings, all foreign buyers must add the following charges to each order:

$2.50 for each document
$1.50 for each microfiche

FOR DDC USERS ONLY

DDC User Code _____

Contract Number _____
(Last 6 characters only)

Allow 3-5 weeks for delivery on your order. If ordering without a document number, by title only, allow an additional 2 weeks.

DOCUMENT NUMBER [If ordering by title or if item ordered is a magnetic tape, please see reverse side.]	USER ROUTING CODE (see reverse)	Quantity			Unit Price	Total Price
		Paper Copy	Micro-fiche	Other (specify)		
					Enter Grand Total	$

FORM NTIS-173 (REV. 2-75)

USCOMM-DC 6367-P75

USER ROUTING CODE: NTIS can label each document for routing within your organization. If you want this service put your routing code in the box marked USER ROUTING CODE. (Limit eight characters)

SHIP & BILL SERVICE: NTIS appreciates prepayment for documents through the use of an NTIS Deposit Account, check, or money order. Should this not be convenient, NTIS will mail your order and bill you about 15 days after shipment. The handling charge for ordering documents is $5.00 per order (not line item); $5.00 per NTISearch ordered; $2.50 per subscription ordered. NTIS does not bill customers for magnetic tapes or shipments destined for outside the United States.

ORDERING MAGNETIC TAPE: (check mode) ☐ 9 track ☐ 1600 BPI (odd parity) ☐ 800 BPI ☐ 7 track ☐ 200 BPI ☐ 556 BPI ☐ 800 BPI ☐ odd parity ☐ even parity

ORDERING BY TITLE: If ordering without document number, by title only, allow an additional 2 weeks.

TITLE #1		
Sponsor's Series #	Contract or Grant Number of Report	Date Published
Originator (Give specific laboratory, or division and location.)		Personal Author
Turn to other side. Write "1" in the Document Number block and complete the rest of the line.		

TITLE #2		
Sponsor's Series #	Contract or Grant Number of Report	Date Published
Originator (Give specific laboratory, or division and location.)		Personal Author
Turn to other side. Write "2" in the Document Number block and complete the rest of the line.		

TITLE #3		
Sponsor's Series #	Contract or Grant Number of Report	Date Published
Originator (Give specific laboratory, or division and location.)		Personal Author
Turn to other side. Write "3" in the Document Number block and complete the rest of the line.		

TITLE #4		
Sponsor's Series #	Contract or Grant Number of Report	Date Published
Originator (Give specific laboratory, or division and location.)		Personal Author
Turn to other side. Write "4" in the Document Number block and complete the rest of the line.		

TITLE #5		
Sponsor's Series #	Contract or Grant Number of Report	Date Published
Originator (Give specific laboratory, or division and location.)		Personal Author
Turn to other side. Write "5" in the Document Number block and complete the rest of the line.		

FORM NTIS-173 (REV. 2-75) GPO 886-993 USCOMM-DC 6367-P75

Appendix 2:
Federal Grant and Procurement Contracts for Research and Development in Urban Mass Transportation

Introduction

The Department of Transportation issues a publication entitled *Contracting with the Department of Transportation* (DOT P 4200.1)* which provides information intended for organizations desiring to do business with the Government. While neither that pamphlet nor this one is a substitute for the legislation and the official rules and regulations governing procurement, they should provide useful background information and serve as initial guides in a somewhat complex field.

Methods of Funding

Most of UMTA's research and development is performed by organizations equipped with expert staff and appropriate instruments and tools. If the organization is another Federal agency, its services are paid for by the interagency transfer of funds. If it is a public body (e.g., a city, a public or private university, or a nonprofit institution), the funding is usually made under a grant contract. To engage the services of private industry or commercial establishments, UMTA enters into procurement contracts in accordance with Federal procurement regulations.

Grant Contracts

The award of grant contracts is, essentially, a two-step process involving the Administrator's approval of the project and the amount of the grant deemed necessary to accomplish it, followed by the execution of a grant contract which becomes the basic document describing the mutual obligations of the Government and the grantee with respect to the project. Interagency transfer of funds involves only the Administrator's approval and the execution of an interagency working agreement. These methods of funding are relatively uncomplicated; the project work can begin, with assurance of funding, as soon as the grantee or other agency is notified of the approval.

*Available, free of charge, from the Procurement Operations Division (TAD—432), Office of the Secretary, Department of Transportation, 400 Seventh Street, SW, Wash. D.C. 20590

Contract Procurement

The contract procurement process is more complex, since it is circumscribed by an extensive body of Federal contract law, the Federal and DOT's Procurement Regulations, decisions of the Comptroller General, and numerous court decisions. The purpose of these is to assure that the basic principle of fair and open competition for Government contract work is maintained. As UMTA's R&D program has moved more and more to emphasize new and improved technology and systems, it has tended to look more to private industry sources for its project work and to greater use of the contract funding method.

Procurements for the Federal Government are accomplished either by formal advertising or by negotiation. Most UMTA procurements for R&D programs use the latter. The negotiation process involves Request for Proposals (RFP), designed to generate competition that will obtain industry's best efforts toward achieving UMTA's objectives. Each UMTA RFP is also designed to enable potential suppliers to compete on an equal basis; each includes such items as scope of work, delivery schedules, type of contracts, closing date, technical evaluation factors and expected terms and conditions.

RFP's and Bidders' Mailing List

RFP's estimated at $5,000 or more are synopsized in the *Commerce Business daily*. In addition to this dissemination, the Procurement Division, UMTA, will notify by mail a large number of businesses on its Bidders' Mailing List when an RFP involving the specialties of those firms has been issued. Any company (or individual) may have its address placed on the "Bidders' List" upon request. Copies are available at all Government procurement offices and a copy is attached to the DOT pamphlet *Contracting with the Department of Transportation.* The completed form should be mailed to: Procurement Division (UAD-70), Urban MassTransportation Administration, Department of Transportation, 400 Seventh Street, SW, Washington, D.C. 20590.

No one whose address is on the "Bidders' List", however, should feel assured that he will receive notification of all RFP's that may be of interest to him. Notifications are made selectively to firms which have claimed special skills or resources closely related to the topic(s) covered by the RFP, and there is much latitude in interpretation and even nomenclature of the thousands of specializations that may be involved in various R&D projects directed toward the problems of urban mass transportation.

Unsolicited Proposals

UMTA's R&D program has been formulated after several years of study and experience. It is the product of a thorough planning process which continually updates and refines the programs. Each project is part of a unified program which is translated into a budget months in advance of execution of any project.

For these reasons, the lead time between the birth of a concept and the initiation of a project implementation is lengthy. It is, therefore, improbabe that even a highly competent and very promising unsolicited proposal would fit immediately into UMTA's R&D program or that there would be uncommitted funds to finance it.

The above recital of impediments in the proposal-to-project path are not intended to discourage serious and well qualified applicants. On the contrary, every proposal will be reviewed and responded to as promptly as possible. It must be recognized, however, that budgetary and program constraints make it necessary to select for further consideration only the most promising projects which appear to be soundly conceived and most relevant to the needs of the budgeted program. Proposals selected for further consideration will usually require substantial documentation as the basis for detailed review including, as appropriate, a comprehensive analysis of engineering and economical implications.

UMTA's Evaluation of Proposals

The primary criteria employed in evaluating proposed R&D projects (both solicited and unsolicited) are:

- Potential contribution to R&D program plan and objectives;
- Potential for wide national application;
- Extent of the potential information to be developed;
- Degree of innovation incorporated; and,
- Potential for eventual funding support by UMTA's Capital Assistance Program (capital facilities and equipment only).

UMTA has drawn up a set of guidelines for the content and format of applications. These will be mailed, on request, to potential applicants.

Subcontracting

Another possible means of participating in UMTA's procurements is by subcontracting, in many instances, an UMTA prime contractor wishes to use another firm for professional services, construction or equipment. Thus, if a firm considered itself well qualified to perform one aspect or part of a project for which another firm has been chosen, the first mentioned firm could approach the prime contractor and offer its goods or services on a subcontract basis.

The *Commerce Business Daily* is a source of information about contract awards. These are published, in large part, for the benefit of potential subcontractors.

Cost Sharing

In some cases when a grant or procurement contract is awarded, financial participation by the performing organization may be required. This is intended to serve the mutual interests of the Federal Government and the performing organization by helping to assure efficient utilization of the resources available for the conduct of research projects and by promoting sound planning and prudent fiscal policies by the performing organizations. The requirement for cost sharing is determined on an individual project basis. The proportion of Federal funding support to be supplied to an authorized R&D project is determined by the Administrator of the Urban Mass Transportation Administration.

University Research and Training Grants

University Research and Training (URT) Grants may be made to public and private non-profit institutions of higher learning performing research and offering training in Urban Transportation fields such as economics, the social sciences, engineering, the physical sciences, law, public administration, urban or metropolitan planning.

Colleges offering 2-year programs of training leading to subprofessional employment in urban transportation fields are eligible only if they are associated with universities undertaking comprehensive programs of research in urban transportation.

URT Proposals

In the late summer UMTA will normally issue an announcement in the *Commerce Business Daily* inviting submittal of grant proposals. This announcement will provide any specific or yearly policy guidance necessary. It will also provide a deadline submittal date.

A formal proposal must be submitted outlining in detail the proposed research or training program, as well as a sufficiently detailed delineation of organization, staff, faculty and budget. When necessary, UMTA personnel can provide informal assistance in interpreting the guidelines and preparing the formal application. UMTA prepares each year an Announcement brochure and also has a circular (C 7100.1) Application Instructions for University Research and Training Program, both of which can be requested from UMTA. They include a suggested format and detailed instructions for preparing an application.

Proposal must be submitted to:

Department of Transportation
Urban Mass Transportation
University Research and Training Division
2100 Second Street, S.W.
Washington, D.C. 20590

Evaluation of URT Proposals

Proposals submitted to UMTA will be reviewed and evaluated by persons selected from within the Department of Transportation. It is essential that proposals be complete and organized according to the specified format as set forth in the above-mentioned brochure to permit equitable evaluation. Each proposal will be reviewed as an entity, but elements of the budget may be negotiated with the applicant. Thus, amounts less than those requested may be approved.

Evaluation of the following points will assist, but not necessarily govern, UMTA's decision in awarding grants:

- Relevance of the program to urban transportation
- Merit of the scientific and technological aspects of the research program, if involved, and research methodology;
- Compatibility of the program with the institution's long-range goals and DOT needs to meet future manpower requirements in urban mass transportation;
- Quality of the performing staff;
- Consistency of budgetary estimates with the type and level of the proposed work;
- Geographical location of the applicant institution (an effort will be made to encourage the establishment of research and training programs throughout the country to insure broad relevance to metropolitan problems);
- Extent to which oportunities are provided for participation of minority groups and colleges and universities serving minority groups;
- Degree of involvement with local urban transportation problems; and
- Extent to which the institution is willing to share the costs of the project.

A proposal that does not result in a grant may be retained by UMTA. However, it will not be made available outside UMTA without the consent of those who signed the proposal or their successors in office, except to the extent that disclosure thereof may be required by a court of competent jurisdiction. Proposals may be withdrawn by the applicant at any time prior to final action by UMTA.

Additional information may be obtained by calling (202) 426-0080.

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INDEX II: Project Index

A number of Section 11 projects will be found in the Project Table at the end of Chapter 14.

Index III: Subject Index

Prepared by
Technology Sharing Program Office
U.S. DEPARTMENT OF TRANSPORTATION
Research and Special Programs Administration
Transportation Systems Center
Kendall Square
Cambridge, MA 02142
(617) 494-2486