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Volume No. 3
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U.S. DEPARTMENT OF TRANSPORTATION
Urban Mass Transportation Administration
Office of Transit Management
Washington, DC 20590

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THE ADMINISTRATOR

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

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

It is intended that this general reference source serve as an index to reports generated under contract to UMTA. The 298 reports abstracted can be obtained through the National Technical Information Service.

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

If you have questions regarding this publication or the reports cited in it, please contact UMTA's Transit Research Information Center, 2100 2nd Street, S.W., Washington, D.C. 20590.

Sincerely,

A handwritten signature in black ink that reads "Robert E. Patricelli". The signature is written in a cursive style with a large initial "R".

Robert E. Patricelli

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FOREWORD

This reference document was prepared by the Urban Mass Transportation Administration (UMTA) as a guide to 298 reports generated under contract to UMTA. It is a reflection of UMTA's continuing commitment to the dissemination of technical report information to government, State and local transportation planning bodies, private industry, and the general public.

All reports in this document are available for sale at the:

National Technical Information Service (NTIS)
U.S. Department of Commerce
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Springfield, Virginia 22161

Each abstract contains an NTIS order number and price for paper copy. Most documents are also available in microfiche for \$2.50 each. NTIS PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE. Therefore, it is advisable that you verify prices before ordering. All orders to NTIS must be prepaid and contain the report order number.

Volumes I and II of the URBAN MASS TRANSPORTATION ABSTRACTS are available at NTIS. The order number for Volume I (October 1972) is PB 213-212 and the order number for Volume II (September 1973) is PB 225-368.

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

For additional information about any of the reports in this volume, contact the Transit Research Information Center of the Urban Mass Transportation Administration, 2100 2nd Street, S.W., Washington, D.C. 20590.

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TITLE: A SHORT-RANGE TRANSIT DEVELOPMENT STUDY

AUTHOR: Harland Bartholomew and Associates (prepared for
Tuscaloosa County Parking and Transit Authority)

DATE: March 1974

PROJECT NO.: AL-09-0003

KEYWORDS:

1. Planning
 2. Bus, shuttle
 3. Universities
-

The study area that is the focus of this report includes the cities of Tuscaloosa and Northport, Alabama, and the unincorporated areas of Holt and Cottondale.

Community and operational transit desires and requirements were set forth in the form of goals and objectives; and transit recommendations have been made in accordance with them. These recommendations include a five-year transit development program, an analysis of long-range transit potential in Tuscaloosa, and recommendations for a shuttle bus system on the University of Alabama campus.

Important recommendations of this study include: (1) a replacement of all vehicular equipment now owned or leased by the Authority and the construction of new office and garage facilities; (2) an increase in all transit service and route coverage; (3) the implementation of a transit program that is cognizant of public attitudes; and (4) a shuttle-bus system on the University campus to meet present short-range needs.

The existing conditions and the reestablishment of transit service in the area served by the Tuscaloosa County Parking and Transit Authority are discussed. Census and other available demographic data were used to locate those persons most likely to require public transportation service and an on-board bus survey was conducted to identify the present users and their travel demands

Transit organization and operation are discussed and a recommended transportation program delineated. Priorities, financial implications and funding alternatives are among topics considered in the program.

Appendices include survey results, description of recommended route locations and the University proposed bus shuttle schedule. Tables, figure and maps are numerous.

A report entitled "A Short Range Transit Development Study - Technical Memoranda" (PB 232-333) is also available.

TITLE: A SHORT-RANGE TRANSIT DEVELOPMENT STUDY
Technical Memoranda

AUTHOR: Harland Bartholomew and Associates (prepared for
Tuscaloosa County Parking and Transit Authority)

DATE March 1974

PROJECT NO.: AL-09-0003

KEYWORDS:

1. Planning
 2. Bus, shuttle
-

These memoranda provide background and supporting information pertaining, among other things, to the existing transit system in the Tuscaloosa, Alabama, urban area. The procedures and assumptions used in the development of performance indices and other data contained in the final report are identified. Peak-period directional passenger counts showing present patronage trends are discussed, and a table is presented showing transfer volume on the existing system. These transfer volumes are valuable in identifying travel demand which might serve more directly through transit service modifications.

Also presented is the analysis and evaluation procedure used to develop the proposed transit system described in the final report. The parameters and constraints unique to Tuscaloosa which influenced route selection are outlined. Alternatives are analyzed.

A description of typical route scheduling as envisioned for the recommended system is included along with an identification of major bus stops. A table is presented showing transit travel times, including transfer wait times.

The financial evaluation memorandum contains information pertaining to the procedures and estimates used in determining and analyzing the financial circumstances of the Tuscaloosa County Parking and Transit Authority. It is intended to provide a basis for the Authority to contrast and modify, if necessary, revenue and expenditure estimates for the recommended Five-Year Program.

Tables and maps complement the text.

The final report mentioned is entitled, "Short Range Transit Development Study" (PB 232-332).

TITLE: COORDINATED BUS STUDY
Final Report

AUTHOR: San Francisco Bay Area Rapid Transit District
Department of Planning

DATE August 1974

PROJECT NO.: CA-09-0011

KEYWORDS:

1. BART
2. Demand Responsive Systems, dial-a-ride
3. Planning
4. Bus, feeder

The purpose of this report, a summary of three individual consultant studies, was to analyze the need for local and feeder transit services in the East Bay communities of Contra Costa County, Livermore-Amador Valley, and the Tri-Cities of Fremont, Newark, and Union City, California. These three areas are inside the BART District but outside of the service area of the Alameda-Contra Costa Transit District, (AC Transit).

In each of the three study areas similar findings and recommendations were made. These include: transit service along the major corridors should be developed and expanded; local transit service by itself would not significantly reduce the dominance of the automobile; and, local transit should be provided to serve the limited mobility population.

Feeder and local services were recommended to improve mobility. Although only a minimum service level was recommended, it does provide the base upon which to develop expanded local transit service. The local and feeder systems proposed include conventional bus routes, flexibly routed buses and demand activated buses (dial-a-bus). In addition to dial-a-bus services in the Contra Costa study area, electrically powered, publicly owned automobiles (PAS) were suggested for development.

This report also provides an overview of the Bay Area setting for these studies, reviews the need for transit, summarizes recommendations regarding transit alternatives, gives a brief overview of the impacts of transit alternatives, and describes the implementation procedures, including the institutional, financial and management arrangements.

Maps, charts, tables and illustrations are included. The appendices contain the summary of consultant recommendations for each study area, school bus and public transit consolidation and regional review comments.

TITLE: THE METROPOLITAN TRANSPORTATION COMMISSION AND SANTA CLARA
COUNTY TRANSPORTATION INFORMATION PROGRAM - Final Report

AUTHOR: Development and Research Associates and
Corey, Canapary & Galanis

DATE: December 1972

PROJECT NO.: CA-09-0020

KEYWORDS:

1. Community Response
2. Government, county
3. Information Aids
4. Communications
5. Advertising and Promotion

The three principal objectives of this study are to formulate several alternative solutions to the escalating County-wide transportation problems, to communicate the problems and possible alternative solutions to the public, and to retrieve and analyze the public's reactions to the alternatives.

This report describes the communications techniques employed and the relative effectiveness of these techniques for carrying on public discussion. It also relates the major transportation concerns of the citizens of Santa Clara County, California. Communications techniques employed include: newspaper advertising and publicity, general and special public meetings, organizational mailings, and radio and television public service programming. There were also public opinion surveys interspaced between the various communications techniques so as to achieve the greatest possible measure of interaction between the County and the public in reference to transportation problems.

The various methods of introducing information to the public and the results of the community response are covered in depth.

Included in the appendices are an outline of the general transportation framework of Santa Clara County, the County transportation background and history including the possible alternatives for improved mass transit, and a list of organizations which support the study.

TITLE: SANTA ROSA TRANSIT STUDY
Final Report

AUTHOR: JHK & Associates

DATE: December 1972

PROJECT NO.: CA-09-0020

KEYWORDS:

1. Bus, intracity
 2. Bus, cost
 3. Routes and Routing
 4. Planning
-

This report summarizes the results of a study formulated to define an effective, economically feasible public transit system which would increase the mobility of Santa Rosa, California, residents. The principal purpose of the study was to develop the major elements of a public transit program including: management and operating procedures; a descriptive plan of proposed service to include routes, schedules and fare structure; an equipment procurement schedule and maintenance standard; a schedule for implementation which would define timing, phasing and responsibility for each proposed improvement; and an estimate of financial requirements and sources of funds.

Although Santa Rosa is relatively affluent, large segments of the population including the elderly, the poor, the young and the handicapped are not adequately served by the automobile-oriented transportation system. Excessive use of the automobile has also created problems with air pollution and traffic congestion. These problems could be solved by creating a public transit system which would be convenient enough to lure people away from their automobiles.

The report is divided into six sections: (1) introduction, which includes objectives, history and background; (2) existing conditions, which outlines present land use, population, service, equipment, and methods of financing; (3) transit improvement criteria, which discusses the results of meetings held with public officials, community leaders, and interested citizens; (4) near term transit improvements, including patronage estimates, routes and schedules, fare and funding, and management and operations; (5) long range planning alternatives; and (6) recommendations.

An addendum is included in the report.

TITLE: COMMUTER RAILROAD FEASIBILITY STUDY
On Selected Lines in the Los Angeles Metropolitan Area

AUTHOR: Southern California Association of Governments
(Carl R. England, Jr.)

DATE: January 1974

PROJECT NO.: CA-09-0022

KEYWORDS:

1. Rail, commuter
-

The objective of this report was to explore the feasibility of installing and operating a limited scope rail commuter service over one Southern Pacific and two Santa Fe routes into Los Angeles, California. Data are provided on the operational and physical characteristics of the rail lines under consideration.

The concerned railroad companies have stressed that their facilities were not designed to handle a rail commuter operation. Their primary focus has always been on freight movement supplemented by a relatively limited intercity passenger operation. According to the authors, however, in light of the growing need for improved public transportation, due consideration should be given to the conceivable courses of action for easing current people-movement problems.

This report has concentrated on the course of action to employ rail commuter service, to the extent possible, either experimentally or as a temporary stopgap pending the development of better solutions for longer-haul commuter movement. It is believed that it is possible to inaugurate a limited commuter service at a relatively early date, employing Santa Fe trackage on the Santa Ana and Los Angeles route and the San Bernadino - Los Angeles route via Pasadena.

A summary of the principal statistics of the proposed rail routes is presented. Findings are delineated and include projected annual deficits, projected ridership and the conclusion that low capital outlays for facilities would be required for the Santa Ana startup.

Chapters of the report are devoted to the operational status of the railroads, marketing aspects, operational and capital costs and implementation of the service.

Tables and illustrations are included. Appendices include developing estimates of possible commuter rail patronage for the various lines, station inspections and station photographs.

TITLE: PUBLIC TRANSPORTATION FOR FLORIDA'S GOLD COAST
Summary Report

AUTHOR: Simpson & Curtin
(Prepared for Dade, Broward and Palm Beach Counties and Florida
DOT)

DATE: September 1974 PROJECT NO.: FL-09-0001

KEYWORDS:

1. Personal Rapid Transit
 2. Bus
 3. Planning
-

This report is the culmination of a four-year transit planning effort, in which the entire Florida Gold Coast was viewed from a comprehensive regional perspective. In a series of 22 technical reports (described in the Appendix) the need, feasibility and detailed description of the following Florida Gold Coast transit improvements were documented: (1) short range bus system improvements for Dade, Broward and Palm Beach Counties involving 46% expansion, and an increase in the Tri-County bus fleet; (2) 79 miles of rapid transit line extending from Dixie Highway in south Dade County through Miami and Miami Beach, then into Broward County as far north as Commercial Boulevard along the FEC Railroad corridor, with a rapid transit branch directed west from Fort Lauderdale; and (3) 56 miles of personal rapid transit (PRT) consisting of a two-loop system in central and north Broward County and a PRT circulator in the West Palm Beach area, with engineering to proceed upon demonstration of a reliable PRT system which can be constructed and operated within a budget constraint.

Although recommended transit improvements have been organized on a county-by-county basis to facilitate implementation, the mass transit system has been designed to optimize regional travel throughout the Florida Gold Coast. This regional perspective enabled the location of rapid transit to accommodate heavy travel demand across the Dade-Broward line. Also, the South Palm Beach/North Broward County local travel market was considered as a unit for dial-a-ride bus service. Transit from Palm Beach County to Broward and Dade Counties is recommended by interfacing express buses with regional rapid transit.

Maps, tables, and figures complement the text.

\$3.75

TITLE: ORLANDO URBAN AREA SHORT RANGE TRANSIT IMPROVEMENT PROGRAM

AUTHOR: ATE Management and Service Co., Inc.

DATE October 1973

PROJECT NO.: FL-09-0007

KEYWORDS:

1. Advertising and Promotion
2. Bus, rapid transit
3. Financing Mass Transportation
4. Planning

This report was prepared for the East Central Florida Regional Planning Council on behalf of the Orange-Seminole-Osceola Transportation Authority. Its purpose is to provide an improved public transportation system that will attract riders who presently use automobiles but can be better served by mass transit. Recommendations are presented regarding service, facilities and promotional activities, all of which could be implemented by gradually recasting the present system.

Congestion relief is discussed in relation to corridor and intersection improvements. Service improvements are recommended via the modification and extension of service, the development of a new system of suburban express service, service to the outlying communities with heavy concentrations of elderly and service emphasizing the needs of the tourists. The financial implications of this improvement program (1973-1977) are delineated and the vehicle and facilities requirements are put forth. Possible sources of local funding are also discussed.

In terms of marketing and promotion aspects of the project, various techniques may be directed toward the individual rider to gain patronage of the public transportation system. One of these is the use of advertisements which stress the financial burdens of using the automobile for work trips. The text graphically displays some of the promotional techniques.

It is projected that through this detailed five-stage plan for improvement, a 40% increase in service may be realized and the expectation is that the number of rides provided each year can be expanded by 1,300,000.

The "Orange-Seminole-Osceola Transportation Authority Policy Statements" and the "Results of On-Board Survey" make up the appendices. Other materials include a map of existing routes, schedule hours of operation, five year estimates and Graphic Depiction of Expansion and Extension of Base Service.

NTIS ORDER NO.: PB 228 331/AS

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\$6.25

TITLE: HILLSBOROUGH COUNTY MASS TRANSIT TECHNICAL STUDY

AUTHOR: De Leuw, Cather Associates
(For Tampa Bay Regional Planning Council)

DATE: April 1974

PROJECT NO.: FL-09-0009

KEYWORDS:

1. Planning
 2. Bus
-

Hillsborough County, Florida, is the home of approximately 500,000 people, more than half of whom reside within the City of Tampa -- which geographically comprises only 8% of the total county area. While local public transportation has been provided within the Tampa city limits since the mid-1880's, the remaining 92% of the county area has always lacked adequate mass transit facilities.

The primary objectives of this study were to examine in detail the existing transit system, to determine the distribution of potential transit demand beyond the Tampa city limits, and to make recommendations for implementation over the next five years which would include the modification and expansion of existing services and the provision of new service.

The work plan was arranged in three major phases. The first phase was devoted to the collection and preparation of data. This included the design and execution of four surveys to determine the existing and potential need for mass transit service. An inventory and inspection of existing transit facilities were also conducted.

The second phase involved the detailed analysis of the collected data. Costs of each possible improvement were analyzed and an assessment of risks was made. Analysis was conducted of the sensitivity of cost and ridership estimates to variations inherent in the base data, as well as to possible changes caused by political, labor and financial factors.

The final phase was the development of a detailed five-year improvement program including an identification of priorities for the implementation of all physical, service and management improvements.

Tables, maps and figures are numerous. Appendices include fleet inventory and inspection results and the home interview and pilot interview questionnaires.

TITLE: FOUNDATIONS FOR MASS TRANSIT PROGRAM DEVELOPMENT IN THE
TAMPA BAY REGION Management Report

AUTHOR: The Research Group, Inc. and Tampa Bay Regional Planning Council,
in support of the Tampa Bay Area Rapid Transit Authority

DATE December 1973

PROJECT NO. FL-09-0010

KEYWORDS:

1. Planning
 2. Financing Mass Transportation
 3. Management, planning and analysis
 4. Government, intergovernmental relations
-

This report is part of a work effort being performed for the "Coordinated Support Services" program of the Tampa Bay Regional Planning Council (TBRPC) to the Tampa Bay Area Rapid Transit Authority (TBART) of Florida.

The report reviews recent efforts of the TBRPC to establish the Authority. Chapter I, entitled "Organizing for Transit Development," covers those steps taken by the Planning Council and TBART to establish the Authority and reviews issues related to securing the required local commitments to undertake a transit development planning project.

Chapter II describes the nature and source of existing State and Federal grant programs to financially support planning and preliminary engineering efforts of the Authority, and alternative sources of long-term local financial resources necessary to support system construction, operation and maintenance.

The "TBART Pre-Referendum Intergovernmental Relations Program," as the subject of Chapter III, addresses itself to the procedural requirements necessary in the planning process to secure approval of the adopted TBART system concept by units of local government, the State of Florida, and UMTA.

Chapter IV, "TBART Organizational Needs" reviews the organizational structure and staffing pattern of transit agencies similar to TBART in legal and transit development status, recommends an organizational framework and accompanying pre-referendum staffing pattern and estimates financial resources required to support the Authority in the pre-referendum period.

Chapter V deals with issues confronting the Authority as it moves from system design efforts to construction and operation of a proposed transit system.

TITLE: DES MOINES AREA TRANSIT STUDY

AUTHOR: Alan M. Voorhees & Associates, Inc. and
City of Des Moines Plan and Zoning Commission

DATE July 1973

PROJECT NO.: IA-09-0003

KEYWORDS:

1. Planning, tools
 2. Bus, rapid transit
 3. Financing Mass Transportation, sources
-

Increasing car ownership, improved highway systems and the dispersal of population and employment to the suburbs have been major factors causing the steady decline in transit ridership in Des Moines as well as other cities since the early 1950's. The Central Iowa Regional Planning Commission (CIRPC) retained Alan M. Voorhees and Associates to analyze transit service and needs in the Des Moines, Iowa, urban area. The study was designed to provide practical immediate action and short-range improvement programs and to provide guidelines for long-range transit planning.

The present status of public transportation in the study area is examined. Land use and population data were developed for the 12 super-districts under consideration. Descriptions, summaries and analyses of data collection are presented and transit characteristics and patterns discerned. The goals and objectives for transit are put forth. Continuance of present operations without assistance, a municipal operation, a metropolitan transit authority, or the payment of direct subsidy to the private owner are considered as alternatives. Recommendations are posited and financial needs determined.

Tables, charts and maps are numerous. The appendices include samples of the surveys conducted and maps of major traffic generators.

TITLE: SUBURBAN FACTBOOK 1973

AUTHOR: Northeastern Illinois Planning Commission

DATE: April 1973

PROJECT NO.: IL-09-0026

KEYWORDS:

1. Planning, tools
 2. Surveys
 3. Quantitative Analysis
-

This report is designed to be a useful tool for decision making in both management and planning. It is a comprehensive source of both census and non-census data currently available for northeastern Illinois.

The tables are organized into three sections. The first is devoted to counties and townships. Data for municipalities and unincorporated places are included in the second section. The last section contains data on school districts and park districts.

There are also three appendices which contain valuable background information. Appendix I contains extensive notes and definitions important to the correct interpretation and use of each of the tables. Appendix II contains a list of the sources for each of the tables, and Appendix III contains a description of other data services available from the Northeastern Illinois Planning Commission.

Various maps are also included to illustrate the particular areas mentioned.

TITLE: A PROPOSED PUBLIC TRANSPORTATION SYSTEM FOR THE PORTLAND-VANCOUVER METROPOLITAN AREA

AUTHOR: Columbia Region Association of Governments

DATE August 1973

PROJECT NO.: IT-09-0008

KEYWORDS:

1. Bus, intercity
 2. Bus, rapid transit
 3. Bus, stations and shelters
 4. Guideways
 5. Bus, priorities
 6. Bus, shuttle
-

This summary report was prepared to inform citizens of the aspects of the proposed public transportation system, the result of a two-year study which analyzed alternative concepts of providing public transportation service throughout the Portland-Vancouver metropolitan area.

It was concluded that the community should greatly expand its public transportation service through the development of a bus rapid transit system utilizing exclusive transit lanes, roadways, and park-and-ride stations. It was also decided that all facilities should be designed to allow for future conversion to an automatically operated transit system on fixed guideways with off-line stations when it becomes technologically feasible.

Specific features include: 160 miles of express routes with 22 miles of exclusive transit roadways and 15 miles of reserved bus lanes; 75 express bus stations and stops with total parking for 15,000 automobiles; conversion of certain streets in downtown Portland to exclusive transit malls with wide sidewalks and pleasing architectural treatment; 1,000 advanced concept, air-conditioned buses by 1990; a major downtown transfer station which would be part of a multimode transportation terminal; exclusive transit roadways which could later be converted to automatically controlled fixed guideway systems; and frequent shuttle service in the downtown area.

The report summarizes alternative concepts, planning assumptions, the plan description, ridership estimates, financial results of the operation, a financial and tax source analysis, the regional transit agency, and the implementation plan from 1975 through 1990.

A large transit map of the area is also included.

TITLE: HOME INTERVIEW UPDATE AND SELECTED OPINION POLL

AUTHOR: Tri-State Regional Planning Commission
(Felix Chu, Obinani)

DATE June 1974

PROJECT NO. IT-09-0014

KEYWORDS:

1. Trip Generation
2. Surveys
3. Quantitative Analysis
4. Qualitative Analysis
5. Socio-Economic Analyses

During 1963-64, the Tri-State Regional Planning Commission conducted a survey of households in a 1% random sample of occupied housing units and other special dwelling places in the New York metropolitan region to determine travel habits. Data obtained from the survey have subsequently been used to develop travel forecasts and plans for highways and transit.

The 1972-73 home interview update survey conducted in Brooklyn was undertaken primarily to test the cost and reliability of updating key data items in the 1963-4 estimates.

Three methods of data collection, all based on at least one face-to-face contact between an interviewer and a respondent member of a household, were used in the update survey.

A qualitative measure of the overall stability of trip generation rates between 1963 and 1972 was provided using simple cross-classification analysis. Total person or household trips were cross-classified by the number of automobiles available (owned) by the household, structure size, and household size. In general the relationships between the independent and dependent trip generation variables were invariant over the two time periods.

Chapters include an introduction, summary of findings, estimates from 1972 sample and data collection methods, trip generation rates, analysis of walk trips, analysis of travel behavior and the use of Downtown Brooklyn, and the relative effectiveness of data collection methods. Twenty-five tables and illustrations of sample clusters and an image rating of Downtown Brooklyn are presented.

TITLE: NORWALK BUS TRANSPORTATION STUDY

AUTHOR: Tri-State Regional Planning Commission and
Norwalk Community Development Action Plan (CDAP)

DATE January 1973

PROJECT NO.: IT-09-0014

KEYWORDS:

1. Bus
 2. Planning
-

This report seeks to review the existing bus system of Norwalk, Connecticut and how it evolved, and then to offer a series of four alternative courses of action that will provide adequate levels of transit service to Norwalk citizens.

Structured so that they can be phased in sequence, these alternatives can be presented separately in such a way that combinations of features can be made to form new alternatives which may be more responsive to local inputs.

The four alternatives proposed are: (1) Preserve existing bus service; (2) Traditional transit improvements; (3) Norwalk local system (This would eliminate intercity service by local bus transit to enable concentration of resources in Norwalk and in other neighboring cities with local bus systems. The intercity traveler would use the railroad or anticipate new service by an intercity bus carrier); (4) New concept approach for comprehensive transit improvement (Two types of service would be structured to complement one another; the bus subsystem is point-to-point; major traffic generators would be connected along a corridor. The taxi element of the system is configured to feed the basic spine bus route. Taxi mode would furnish continuous point-to-point service for trips originating and terminating in neighborhoods beyond the scope of the spine bus route.)

Chapters discuss the five-year transit development program, existing transit system route description and operations analysis, transit potential, administrative, institutional and fiscal characteristics of existing bus system, local automobile use characteristics, bus passenger survey, recommendations and findings to improve the system, and implementation.

Appendices and illustrations are included.

TITLE: BICENTENNIAL TRANSPORTATION STUDY FOR THE NATIONAL CAPITAL AREA

AUTHOR: Metropolitan Washington Council of Governments
and Wilbur Smith and Associates

DATE: December 1973

PROJECT NO.: IT-09-0020

KEYWORDS:

1. Bus
2. Center City
3. Information Aids
4. Parking, park & ride
5. Private Transportation, automobile

This report examines the impact of the Bicentennial Celebration on the transportation facilities available to Washington, D.C., visitors. The study projects the number of out-of-town visitors to be expected, based upon existing tourist levels and announced plans for commemorative events and exhibits. It has also estimated the demand for transit and other forms of transportation by visitors in 1976 and has recommended the type and amount of transit and other transportation improvements which should be developed to meet that demand.

The results of this Bicentennial study indicate that many special transit and other transportation features must be designed, planned, funded and inaugurated prior to the opening of the celebration year in order that a full visitor transportation system will be completely and smoothly operating by 1976. Every effort must be continued to complete the proposed Bicentennial Metro network of 18 miles and 24 stations. This will provide mass transit facilities to visitors particularly between important attractions in the downtown area.

Based upon a comprehensive review of past visitor projections and current information, it has been estimated that approximately 35 million people will come to Washington during the 200th anniversary year. Some 25 million will be visitors, including some 6 million residents within the greater Washington metropolitan area. The majority of visitors, approximately 70%, will arrive by automobile.

The Mall, stretching from the Lincoln Memorial to the Capitol, will be the anticipated center of visitor activity. Since tourists will be spending a major portion of their time in this limited area, transportation to and from the Mall will be a major priority for Bicentennial planners.

The recommendations of this study are directed toward the following major problems: parking for automobiles of visitors attending exhibits and ceremonies in the downtown Washington Mall area; transportation of visitors between their automobiles and the Mall area; transportation of visitors within the Mall area; and, providing information to visitors on the availability and costs of that transportation.

Appendices include a summary of planned Bicentennial Activities, major expositions, study results and a bibliography.

TITLE: CITIZEN SAFETY AND BUS TRANSIT

AUTHOR: Metropolitan Washington Council of Governments

DATE: June 1974

PROJECT NO.: IT-09-0020

KEYWORDS:

1. Safety
 2. Crime and Crime Prevention
 3. Bus
-

This report investigates all of the major factors which affect the relationships between bus transit, crime and the citizen in the Washington, D.C. area. These factors include: (1) actual reported on-bus incidents; (2) reported incidents that occur at local bus stop intersections and bus stop approaches; (3) incidents observed by bus riders; and (4) attitudes of bus riders and non-riders about bus related personal safety.

The report documents the current methods of transit crime reporting and identifies obstacles to the provision of thorough accounting and reporting transit crimes. Major related issues such as passenger victimization, public perception of transit crime levels vs. actual reported incidence levels, and prerequisites to maintaining the public confidence are discussed in conjunction with recommendations for agencies involved.

Conclusions include the following: a systematized method of determining the nature and extent of personally threatening incidents associated with bus riding does not currently exist in the metropolitan Washington area; driver reported bus related incidents which might threaten personal security are at a low level; based on a sample jurisdiction, incidents which might threaten personal security at bus stop intersections are at a low level; there appears to be a low priority of concern among bus riders and non-bus riders about bus related personal safety; and personal safety is a concern of both riders and non-riders but may not be a significant inhibition to public bus riding in the metropolitan Washington area.

Tables, displays and figures are included. Among the appendices is the sample questionnaire. A bibliography is furnished.

TITLE: A TRANSIT DEVELOPMENT PROGRAM FOR HUNTINGTON, LONG ISLAND
Final Report

AUTHOR: Alan M. Voorhees and Associates, Inc.
(Prepared for the Town of Huntington, New York)

DATE June 1974

PROJECT NO.: IT-09-0023

KEYWORDS: 1. Planning
2. Rail, commuter
3. Private Transportation, taxicabs
4. Bus

This report documents work performed and the conclusions reached in the Huntington (New York) Mass Transportation Study.

Two broad objectives were established at the onset of the study: (1) to identify problems associated with transit services and local access elements of commuter railroad service in the Town, so as to identify alternative opportunities for service improvement; and, (2) to develop policy and program directions that would help the town better cope with near total reliance on the automobile.

In the first of three phases of the study, existing transit services, population, employment, and economic data were collected. Approximately 20 interviews with representatives of potential transit user groups were conducted. Three surveys related to existing and potential transit use were also conducted. In the second phase, existing services were analyzed, needs for additional transit services defined, alternative improvements identified and preliminarily screened, and findings presented. In the final phase, alternative transit improvements were analyzed in detail, and a Transit Development Program developed.

The program includes four categories of service: (1) fixed route service; (2) commuter service; (3) specialized service; and, (4) a cooperative taxi program for special user groups.

Appendices contain the transit rider, commuter access and potential needs surveys, potential user interviews and preliminary program proposal.

TITLE: SHORT RANGE TRANSIT PLAN: TOPEKA, KANSAS

AUTHOR: Johnson, Brickell, and Mulcahy

DATE August 1972

PROJECT NO. KS-09-0001

KEYWORDS:

1. Public Ownership
2. Financing Mass Transportation, sources
3. Bus, rapid transit

This report discusses the problems of the Topeka Transportation Company, a privately-owned organization. Although there is a great need for public transit service in Topeka, the Company is failing due to the combination of aging buses, rising costs, and declining patronage and, due to existing revenue/cost standards, the Company cannot afford to provide service and equipment improvements.

The report analyzes the most recent three year-nine month period to indicate transit losses in the Topeka Metropolitan Area (an average loss of almost \$2,950 per month). During the most recent nine months, the Company has been forced to use funds earmarked for capital improvements in order to subsidize operations and, as a result, they have been unable to improve on service or equipment and have received no earnings from investments.

A solution is proposed which would shift the ownership from private to public and thereby enable the Topeka Transportation Company to obtain Federal grants to purchase new equipment. There are also recommendations for fare structure, operating authority, and transit management. The proposed program is designed to shift the emphasis away from a failing private operation to a public service more responsive to the community's needs. Under the program, the financial question of whether each item will pay its own way will be subordinated to the potential public benefits flowing from the change. This is an important shift in emphasis which must be accomplished completely before any other improvements can be made.

The report includes a background, an existing transit profile, a study of transit potentials, and a report on acquisitions including operating authority and cost. There are also numerous tables and figures.

TITLE: PADUCAH TRANSIT STUDY

AUTHOR: Schimpeler • Corradino Associates
for City of Paducah, Ky.

DATE February 1974

PROJECT NO.: KY-09-0003

KEYWORDS:

1. Small Cities
 2. Planning
 3. Bus
-

Transit patronage in the Paducah, Kentucky metropolitan area, as in many other areas of the country, has declined until it is no longer profitable for a private firm to operate the public transit system. This situation, along with the concomitant increased dependency upon the automobile, has caused severe transit problems in Paducah.

This report is developed to improve transit service in order to alleviate, to the greatest extent possible, traffic problems which now exist and to improve the mobility of those people particularly dependent upon public transportation.

The basic purpose of this study is to define short-range transit needs in the Paducah metropolitan area and to make recommendations for improvements. The analysis and findings of this report will provide a method for accelerated progress in providing needed mass transportation facilities.

Chapters discuss community involvement, transit objectives, evaluation of pre-existing conditions, data collection, transit ridership survey results, the short-range improvement program, implementation and continuing transit planning.

Appendices include the transit attitude questionnaire, projected operating statements, by alternate, Kentucky House Bill No. 414 and the legal opinion on establishment of transit authority.

Tables, figures and maps complement the text.

TITLE: LOUISVILLE METROPOLITAN TRANSIT IMPROVEMENT PROGRAM

AUTHOR: Schimpeler • Corradino Associates
(Prepared for Kentuckiana Regional Planning and Development Agency)

DATE November 1973

PROJECT NO.: KY-09-0004

KEYWORDS: 1. Planning
2. Bus

Louisville is Kentucky's largest city and the 40th largest in the United States. Located on the Ohio River, its population was 361,472 in 1970. The study area for the Louisville Metropolitan Transit Improvement Program constitutes the original SMSA boundaries - Jefferson County, Kentucky, and Clark and Floyd Counties, Indiana. This area also includes 26 incorporated communities. The study has been performed under the direction of the Kentuckiana Regional Planning and Development Agency, a regional planning organization which encompasses the newly constituted SMSA along with four other rural Kentucky counties.

The purpose of this report is to provide a short-range (five-year) transit improvement program. This program is designed to offer the Louisville community a specific course of implementation and several alternate funding sources whereby transit can be shaped to accommodate the community's needs.

This report has included an on-board origin-destination survey, public hearings, goals-based alternative systems analyses, and financial/legislative research to define practical avenues to implement the recommended plan.

Chapters address the background of the area, community involvements, transit goals and objectives, adequacy of service, valuation of physical assets, characteristics of transit users, alternate ownership/management framework, alternate transit systems, program for implementation, and continuing transit planning and improvement program.

Figures and tables are numerous.

TITLE: FIVE-YEAR TRANSIT DEVELOPMENT PROGRAM FOR NORTHERN KENTUCKY
Final Report

AUTHOR: Alan M. Voorhees and Associates, Inc.
(Prepared for Transit Authority of Northern Kentucky)

DATE: June 1974) PROJECT NO. KY-09-0005

KEYWORDS:

1. Bus
 2. Planning
 3. Public Ownership
-

After a lengthy history of declining ridership, the Cincinnati, Newport and Covington Transportation Company (the Green Line) gave notice that transit service in Northern Kentucky would be permanently withdrawn on November 4, 1972. In an attempt to reduce costs prior to that date, the modern buses of the Green Line fleet were sold, service underwent considerable reduction, fares were increased and the garage facility in Newport was sold.

In anticipation of the Green Line closure, The Transit Authority of Northern Kentucky (TANK) was created to assume responsibility for providing publicly owned mass transit in the area, subject to voter approval.

This study presents an updated five-year transit development program specifically for TANK. The impact that loss of transit service would have on Northern Kentucky is also evaluated.

Among the TANK service improvements were that: all Green Line routes would continue to be operated by TANK, many with more frequent service; service to Cincinnati CBD would be improved by a downtown shuttle bus; and demand-actuated routing (dial-a-bus) would provide better service levels in several areas. Furthermore, a two-zone fare system would be instituted and reduced fares would be available for school children and senior citizens. All intra-systems transfers would be free. Program costs are discussed.

Figures and tables complement the text. Appendices are "Bus Stop Shelter Location" and "1971 Valuation of Cincinnati, Newport and Covington Transportation Company (The Green Line)."

TITLE: PARK-AND-RIDE/PARK-AND-PADDLE FEASIBILITY STUDY

AUTHOR: Urban Transportation and Planning Associates, Inc.

DATE June 1973

PROJECT NO. LA-09-0003

KEYWORDS:

1. Bus, busway
2. Kiss-and-Ride
3. Ferries
4. Parking, park-and-ride

The central business district (CBD) of New Orleans is separated from the city's major residential areas by the Mississippi River. The major conduit into the city is the Greater New Orleans Bridge which is supplemented by ferry service. The purpose of this study was to develop and evaluate proposals to alleviate rush-hour traffic congestion on the bridge.

On-the-spot surveys of auto, bus and ferry commuters were conducted in order to determine: (1) how many commuters there are; (2) of these, how many were commuting to work; (3) what part of the city they were going to; and (4) why they were using that mode of transportation. A detailed analysis was made of such factors as: the pattern of trip distribution; average daily parking fees; the merits and drawbacks of such alternatives as monorails, people movers and over-the-water-craft; and availability and cost of suitable park-and-ride lot sites. The most formidable problem encountered during these studies was that of choosing a park-and-ride lot site. Site investigations were limited to publicly-owned land or vacant private parcels that could be purchased or leased for parking facility development.

Alternatives for the corridor transportation system were ranked according to degree of goal achievement. Cost-effective analysis for each alternative was made and the resulting choice of the park-and-ride plan was justified. Changes necessary for the implementation of park-and-ride as well as capital estimates are detailed. Supplemental recommendations are made. These include the eventual implementation of a park-and paddle system for ferry riders.

Maps, charts, a bibliography, and appendices including reproductions of the commuter questionnaires are included in the report.

TITLE: SOUTH SHORE RAIL RAPID TRANSIT EXTENSION
Preliminary Impact Study

AUTHOR: Metropolitan Area Planning Council
Prepared for Massachusetts Bay Transportation Authority

DATE: October 1973 PROJECT NO. MA-09-0010

KEYWORDS:

1. Rail, commuter
 2. Suburbs
 3. Surveys
 4. Land Use
 5. Rail, stations & terminals
-

The first phase of the Massachusetts Bay Transportation Authority's (MBTA) South Shore Rapid Transit Extension, which opened in Quincy, Massachusetts in 1971, was the Authority's first high speed rail rapid transit link between Boston and the suburban communities on the South Shore. Realizing the effects of this project on transportation and regional growth, the MBTA contracted with the Metropolitan Area Planning Council (MAPC) to study the impacts related to the transit extension.

The major goal of this report, then, is to increase the understanding of impacts of this transit extension with the view toward the planning of future transit extensions.

The major data source for the study was a ridership survey. The survey questionnaire was developed to determine a variety of ridership characteristics and transit extension impacts; i.e., time of use, mode of transportation, previous mode of travel, origin, destination, reasons for use, propensity to transfer, time saved or lost, and a variety of socio-economic characteristics. A sample questionnaire is included in this report.

Chapters include the methodology, historical review, planning considerations, engineering design aspects, ridership characteristics, impacts on traffic volume and patterns, economic impacts, and land use impacts.

It is concluded that future development within the defined impact zone will be related to transit stations, in that, the adjoining areas of the three stations under consideration have developed or will develop a roughly concentric land use pattern consisting of business and commercial uses closest to the station, followed by medium to high density multi-family development, and finally low density residential neighborhoods.

A bibliography is furnished.

TITLE: MINNEAPOLIS PEOPLE MOVER
Summary Report

AUTHOR: Bechtel, Inc.

DATE: April 1973

PROJECT NO.: MN-09-0005

KEYWORDS:

1. People Movers
 2. Financing Mass Transportation
 3. Guideways
 4. Quantitative Analysis
-

This report is a brief summary of the statistical data and findings which are covered in detail in the MINNEAPOLIS PEOPLE MOVER STUDY: Final Report (PB 222-619). The purpose of the study is to assess the feasibility of a people mover system for implementation in downtown Minneapolis by 1976. Incorporated in the study are the development and assessment of a conceptual design, and the preparation of preliminary performance specifications.

Specifically, this report covers the following general categories: need, desired characteristics, conceptual system, costs and financing, impact, and implementation.

There are numerous photographs included as well as a selected bibliography.

TITLE: MINNEAPOLIS PEOPLE MOVER STUDY
Final Report

AUTHOR: Bechtel, Inc.

DATE April 1973

PROJECT NO.. MN-09-0005

KEYWORDS:

1. People Movers
 2. Center City
 3. Benefit-Cost Analysis
 4. Routes and Routing
-

This study presents an assessment of the feasibility of constructing and operating a people mover system in downtown Minneapolis by 1976 and presents a conceptual plan for such a system. There is a corresponding Summary Report (PB 222-563/AS) which summarizes the data contained in the Final Report.

Of primary consideration in this study is the economic and design feasibility of a people mover system. The second objective is to develop design guidelines and performance specifications. The economic and environmental impacts are also assessed, as well as benefit cost analysis. The overall general aim of the study is to identify how a people mover system can realize the potential of downtown Minneapolis by solving its transportation problems.

Particular people mover systems covered in the study involve moving people either below ground, at street level, or at some elevation above the streets. Mechanical systems considered include the full range of people-transporting devices from moving sidewalks through individualized personal transit vehicles to intermediate transit or activity center vehicles. Considerations on the routing studies include tying together the fringe parking areas, cultural and housing facilities, and the downtown core. Future extensions to newly developing patronage generators are considered, as well as existing and proposed transportation facilities and structures.

Various sources of financing and revenue are also discussed in the report as well as legal considerations.

Included in the appendices are charts which describe downtown accident statistics, population characteristics, simulations, specifications and patronage calculations, and a bibliography.

TITLE: A PUBLIC TRANSPORTATION SYSTEM FOR JACKSON, MISSISSIPPI

AUTHOR: Barton-Aschman Associates, Inc.

DATE August 1973

PROJECT NO.: MS-09-0004

KEYWORDS:

1. Public Ownership
2. Ridership, attraction
3. Bus, intracity
4. Financing Mass Transportation, sources
5. Surveys

The purposes of this study are to analyze the transit system operations in Jackson, Mississippi and to develop an improvement program for immediate implementation, designed to cover public transportation requirements over the next five years. Specific recommendations for improvements to the system, the service, and the equipment are made as well as for options concerning the management/ownership aspects of the transit system, since the system has been losing money under private ownership.

When the scope of the study was originally designed, the Jackson Transit System was successful and the ridership was quite high. However, after transit operations ceased for two months during a transit strike, ridership dropped twenty percent, and the original scope of the study was altered.

Specific considerations concern route network revisions, the establishment of a transit center, an effective marketing program, the expansion of the transit system into two outlying areas, various types of ownership, and costs of capital improvements.

There is also a section on long-range transit planning considerations in which the future role of transit is studied with subsequent long-range planning strategies and service possibilities.

Appendices include survey forms, a summary of their results, and a section which describes the process of demand forecasting.

TITLE: A TRANSIT IMPROVEMENT PLAN FOR THE CITY OF MERIDIAN, MISSISSIPPI

AUTHOR: W.C. Gilman & Co.

DATE: June 1974

PROJECT NO.: MS-09-0005

KEYWORDS:

1. Small Cities
 2. Planning
 3. Bus
 4. Advertising and Promotion
-

The area encompassed by this technical study is the City of Meridian, Mississippi and its immediate environs. Based on the 1970 census, the city population was 45,000 with an additional 22,000 residing in Lauderdale County.

The purposes of this study were twofold: (1) to evaluate the transit operation, make recommendations for service improvements, and identify financial needs (both operating and capital) in the short-term future; and, (2) to examine alternative transit ownership and management options available to the City.

The first phase of the study was designed to evaluate the transit requirements for the next five-year period and develop appropriate service improvements. The thrust of this phase was to analyze the operation of the Meridian City Lines (MCL), including financial status, maintenance facilities, equipment requirements, and bus routes and schedules. The end product was information designed to permit elected city officials to reach a decision on the types of improvements which are necessary to maintain and improve the transit system.

The second phase of the study was directed to the future ownership and operation of MCL. While it had been recognized that transit should become a publicly-operated service, there are several alternative structures for public management. These alternatives relate to such aspects of transit as amount and form of public assistance, cost savings due to public ownership and provision of service.

The four main segments of the report deal with the aspects of existing transit operations such as fares, public attitudes, the immediate action program, and public involvement and program development, including, in the discussion about implementation of recommendations, the marketing program.

Tables and figures complement the text.

TITLE: A TRANSIT DEVELOPMENT PROGRAM FOR MANCHESTER

Alan M. Voorhees & Associates, Inc.

AUTHOR: (prepared for Southern New Hampshire Planning Commission)

DATE: April 1973

PROJECT NO.: NH-09-0001

KEYWORDS:

1. Planning
 2. Small Cities
-

The primary objective of this study is to develop, for the Manchester, New Hampshire, urban area, a five-year transit development program which meets the public transportation needs, especially those of the transit-dependent persons, and which is consistent with the goals and values of the residents in the area.

A summary of the current status of public transportation and an analysis of Manchester Transit's regular service on a route-by-route basis are presented. Preliminary data acquisition included an on-board passenger survey, community interviews and an appraisal of the transit system. A statement of goals and objectives for public transportation are stated and the potential impacts of the termination of public transportation service in Manchester are discussed. There is an investigation of the alternative forms of transit system ownership and management which are available to Manchester and a summary of pertinent state legislation. The range of public transportation alternatives is analyzed. Included among these are regular route service, school bus, and special transportation service alternatives. Examination of an alternative city-wide demand-responsive system is included in one of the appendices.

In the discussion of the recommended transit development program, details include a description of routes and services, program capital requirements, program implementation schedule, five-year cost-revenue forecasts, program marketing plan, program maintenance plan and the program monitoring plan.

Tables, figures and maps are numerous. Appendices also include on-board passenger survey, methodology, Manchester population and income distributions, and forecasted operating statistics.

TITLE: PLANNING MODE SELECTION AND ECONOMIC FEASIBILITY REPORT -
CHARLOTTE-HENRIETTA TRANSIT CORRIDOR. Volume I: Planning
and Preliminary Mode Selection

AUTHOR: Corddry Carpenter Dietz and Zack for
Rochester-Genesee Regional Transportation Authority

DATE: February 1974

PROJECT NO.: NY-09-0006

KEYWORDS:

1. Planning
2. Rail, systems planning & design
3. Bus, rapid transit
4. Bus, busway

The purpose of this report is to provide the necessary documentation by which an evaluation may be made of the economic and technical feasibility of the proposed Charlotte-Henrietta Rapid Transit System in Rochester, New York.

The Charlotte-Henrietta Corridor is unique in that the proposed right-of-way is predominantly along existing railroad lines, thus minimizing the problems of land acquisition, relocation of residences and businesses, and interference with existing transportation systems during construction or after implementation. The rapid transit system is also being designed to permit continuance of existing freight service during nighttime operations without interference to passenger operations.

Presented in this report are an analysis of present conditions, the determination of future transit requirements, and an initial analysis of alternative transportation systems. The background and need for a public transportation system, the definition of the corridor and the data that were used to select alternative transportation systems for more detailed economic evaluation and final mode selection are also discussed.

The requirements for rapid transit in the corridor are based on population projections, employment projections, existing land use, proposed land use plan, patronage projections and resultant service characteristics. The three alternative rapid transit modes which best satisfy all of the criteria established for Rochester were the grade separated conventional rail, light rail and busway system.

Appendices include the historical development of a balanced transportation system, participating organizations, description of existing railroad lines, models and projections, initial transit system design and a theoretical concept for obtaining qualitative measures of mode effectiveness.

Figures, tables, maps and photographs are numerous.

TITLE: PLANNING MODE SELECTION AND ECONOMIC FEASIBILITY REPORT
CHARLOTTE-HENRIETTA TRANSIT CORRIDOR
Volume II: Appendices

AUTHOR: Corddry Carpenter Dietz and Zack for
Rochester-Genesee Regional Transportation Authority

DATE: November 1974

PROJECT NO.: NY-09-0006

KEYWORDS:

1. Planning
 2. Rail, systems planning & design
 3. Bus, busway
-

This report contains the appendices to "Planning Mode Selection and Economic Feasibility Report - Charlotte-Henrietta Transit Corridor - Volume I - Planning and Preliminary Mode Selection" (PB 232-347/AS).

The purpose of the Volume I report was to provide the necessary documentation by which an evaluation may be made of the economic and technical feasibility of the proposed Charlotte-Henrietta Rapid Transit System in Rochester, New York. The Charlotte-Henrietta Corridor is unique in that the proposed right-of-way is predominantly along existing railroad lines, thus minimizing the problems of land acquisition, relocation of businesses and residences, and the interference with existing transportation systems during construction or after implementation. The rapid transit system is also being designed to permit the continuance of existing freight service during nighttime operations without interference to passenger operations.

Appendix A of this report is entitled "Light Rail Alternatives". Discussion centers upon grade crossing in the vicinity of terminals, extension of service to Kodak Park, the Lake Ontario Extension and a summary of light rail alternatives.

Busway alternatives is the topic under consideration in Appendix B. Bus capacity, the ability of transit buses to leave exclusive busway, express bus service, grade crossing in the vicinity of terminals, Lake Ontario extension, bus life analysis, intercorridor mode compatibility and a summary of busway alternatives are presented in this section.

Appendix C includes specific work items recommended for preliminary engineering and design. Plan and profile drawings compose Appendix D.

TITLE: ROCHESTER TRANSIT IMPROVEMENT STUDY - Final Report

AUTHOR: Coverdale & Colpitts, Inc. for
Rochester-Genesee Regional Transportation Authority

DATE: January 1973

PROJECT NO.: NY-09-0006

KEYWORDS:

1. Bus, intracity
 2. Routes and Routing
 3. Management, planning and analysis
-

This short-term transit improvement study of the Rochester Transit System in New York is directed toward the following objectives:

- To make transit operations more efficient by recommending better routes, schedules, methods of operations, and fare schedules.
- To determine the financial feasibility of extending service to areas not presently served.
- To aid bus operations by detecting deficiencies in the street system.
- To identify and justify capital facilities needs.
- To develop an operations plan which would coordinate bus service with transit improvements recommended in other studies covering express bus service and a downtown bus terminal.

The report is divided into sections including: an introduction, a history and description of the regional transit system, a study approach, routes and schedules, improvements, organizational matters, capital requirements, and a summary of recommendations.

Appendices are included in a separate volume (PB 226-039/AS).

TITLE: ROCHESTER TRANSIT IMPROVEMENT STUDY

Appendices

AUTHOR: Coverdale & Colpitts, Inc.
for the Rochester-Genesee Regional Transportation Authority

DATE January 3, 1973

PROJECT NO.: NY-09-0006

KEYWORDS:

1. Surveys
 2. Bus, intracity
 3. Computer Applications
 4. Codes & Coding
-

This report contains the appendices to the final report of the Rochester Transit Improvement Study (PB 225-690), which examines the current transit operations in Rochester, New York and makes recommendations for improvement.

Included in the appendices are:

- a bus user survey and its expansion and processing methodology;
- a summary of transit users' characteristics;
- an explanation of the coding procedure;
- the coding manual of the on-board bus survey;
- network coding assumptions;
- route changes coded into short-term improvement networks;
- a 1971 improved system patronage forecast;
- a comparison of the 1970 on-board transit survey results of a computer simulation; and,
- comments by respondents.

TITLE: SYRACUSE TRANSIT IMPROVEMENT STUDY

AUTHOR: Wilbur Smith & Associates (for Central New York
Regional Transportation Authority)

DATE: January 1973

PROJECT NO.: NY-09-0011

KEYWORDS:

1. Surveys
 2. Management, planning and analysis
 3. Bus, intracity
 4. Suburbs, business districts
 5. Ridership, profiles
-

This report presents investigations, data, and findings concerned with transit deficiencies in Syracuse, New York, as well as public attitudes toward transit, and solutions structured as a five-year development program. Principal recommendations of the study include a new routing pattern, adjusted schedules, a new fare structure, purchase of various new equipment, construction of several new structures, and the establishment of a comprehensive transit information program.

The introduction to the report includes a justification of the study, and an outline of purpose and basic problems to be considered. Existing public transportation service is then analyzed. The results of various surveys are presented and characterized according to ridership, traffic patterns, reasons for travel, opinions of riders and non-riders, and related topics. The next section considers planning characteristics and projections of population, land use, and travel. The organization and management of CNY Centro, formerly the Syracuse Transit Corporation, is then discussed and specific recommendations are made including route changes, schedule changes, equipment needs, improved farebox collection, shelters, a five-year plan and a long term transit improvement plan.

The final two sections consider the various aspects of contract and special bus service, operating forecasts and capital costs.

The appendix includes background legislation, a labor agreement, passenger tariffs, and an action plan. There are many illustrations and tabulations to support the methodology and findings of the study.

TITLE: CENTRAL OHIO TRANSIT AUTHORITY TRANSIT DEVELOPMENT PROGRAM

AUTHOR: Mid-Ohio Regional Planning Commission for the
Central Ohio Transit Authority

DATE February 1973

PROJECT NO.: OH-09-0011

KEYWORDS:

1. Bus, rapid transit
 2. Bus, intercity
 3. Government, intergovernmental relations
 4. Financing Mass Transportation
 5. Planning
-

The purpose of this study is to select the best set of options available to the Central Ohio Transit Authority (COTA) in its effort to improve, acquire, and expand the present transit system in the Central Ohio area. The decisions outlined in this volume represent COTA's best judgement, based on a careful study of the information available, designed to be flexible enough to accomodate improvement as experience and the continued gathering of information indicate. Various governments, city and county, and civic organizations worked closely with COTA to acquire the information presented in this study.

The report begins with a background of the history, problems and community benefits of the transit system. Policy guidelines and statements are discussed as are planned improvements for the five-year period from 1973-1978. A financial plan is presented including a revenue/cost analysis of existing routes, a revenue/cost analysis of new bus service, other expenditure items, and a capital improvement program.

The section under implementation includes management, fare reform, a bus replacement program, and a marketing program.

Various charts and tables, a map which details the five year program, and a bibliography are also included.

TITLE: AN INNOVATIVE MARKETING PROGRAM FOR COTA

AUTHOR: W.C. Gilman & Co., for The Central Ohio Transit Authority

DATE: October 1972

PROJECT NO.: OH-09-0011

KEYWORDS:

1. Market Research
 2. Surveys
 3. Information Aids
 4. Advertising & Promotion
-

This report concerns a marketing program, part of which was developed especially for the Central Ohio Transit Authority (COTA). The program covers specific implementation details during a period of one year. The basic purpose of the study is to develop a comprehensive marketing program, suitable for immediate implementation, aimed at increasing the use of transit. Transit marketing is stressed as a program composed of marketing functions; marketing research; design of vehicles, stops, shelters, and information aids; public relations; sales promotion; customer relations; market development; and advertising. Importance is also placed on the concept that good marketing in the transit industry is in integrating all the parts of the operation in order to meet the goal of high quality public service.

Basic research was conducted in order to determine the attitudes, characteristics and desires of both users and non-users. Two surveys, one conducted by telephone and one on board the buses, were designed and conducted. Procedures are listed in the appendix.

Interviews were held with leading merchants, the Chamber of Commerce, officials of the Columbus Transit Company (CTC) responsible for advertising and promotion, and representatives of Columbus area media. Data obtained were analyzed in terms of market group interest and need.

The report is divided into three parts: Part I outlines the basic philosophy of the report and the goals of transit marketing; Part II presents the recommended marketing plan; and Part III deals with the implementation of this plan.

TITLE: TRANSIT SYSTEM ORGANIZATION AND MANAGEMENT STUDY

AUTHOR: W.C. Gilman & Co., for the Central Ohio Transit Authority

DATE: December 1972

PROJECT NO.: OH-09-0011

KEYWORDS:

1. Management, planning and analysis
 2. Management, operations and techniques
 3. Public Ownership
-

A major concern of the Central Ohio Transit Authority (COTA) is how to manage the transit system for Columbus and Franklin County once public ownership occurs. The four principal problems which express this concern are: 1) the form of management that should be established, 2) the question of who should be the managers, 3) the most appropriate form of organization, and 4) the question of how management should relate to the COTA Board.

This report attempts to solve these problems as well as to provide COTA with recommendations for an action program. The report begins with a general discussion of the management alternatives COTA should consider, then presents a brief review and evaluation of the Columbus Transit Company(CTC) management group, and finally recommends short-term and long-term management and organization proposals.

Conclusions are based on: personal interviews with each member of the COTA Acquisition (management) Task Force; interviews with transit officials in Dayton, Toledo, Cleveland and Erie; several meetings with members of the Task Force; thorough study of the Transit Authority law, COTA's rules and regulations, COTA's goals, objectives and policies; and, considerable review of the CTC organization and management group.

TITLE: PRELIMINARY DESIGN OF MAINTENANCE AND REPAIR FACILITIES

AUTHOR: Tri County Metropolitan Transportation District, Portland and
URS/Madigan-Praeger, Inc.

DATE: January 1973

PROJECT NO.: OR-09-0004

KEYWORDS:

1. Maintenance, facilities
 2. Maintenance, equipment
 3. Construction, costs
-

This study outlines a proposed program which would convert the present maintenance and repair facilities of the Tri County Metropolitan District in Oregon into a completely modern transportation facility, providing the best conditions for maintenance and operations, while making maximum use of existing sites.

The study scope includes: a review of the existing operations, environment and future needs and goals; investigation and analysis of the actual condition of the existing facility and its adaptability to present day standards; preparation and submission of preliminary design schemes to the Tri-Met review committee and to pertinent agencies; preparation of a staged construction plan consistent with Tri-Met's operations and fiscal goals; preparation of cost estimates for construction and engineering; and preparation of a final report including material necessary for a capital grant application.

Structurally, the buildings were found to be in fair condition but substantial deficiencies were found in lighting, ventilation and general liveability. It was found that there was much wasted space, awkward space arrangements and poor circulation of people, all of which contributed to employee inefficiency.

In order to improve the existing situation, requirements would include additional exit doors and fire safe corridors, partitions moved, new floors, lighting and room finishes, and improved toilet areas. These improvements would equal or exceed the cost of new construction.

Architectural drawings are included.

TITLE: WILLIAMSPORT AREA TRANSIT STUDY
Transit Development Program

AUTHOR: Edwards and L. Kelcey, Inc. for
Pennsylvania Department of Transportation, City of
Williamsport and Lycoming County

DATE: April 1974

PROJECT NO. PA-09-0015

KEYWORDS:

1. Planning
 2. Bus
 3. Public Ownership
 4. Management, planning and analysis
-

On August 7, 1969, the City of Williamsport, Pennsylvania purchased, with the aid of a Federal grant, the Williamsport City Bus Lines. This action preserved transit service in the area since the private operator had been suffering financial losses that precluded continuation of operation. Yet, despite progressive actions, performance of the bus operations has declined.

Ridership which initially increased, resumed the decline which characterized the failure of the private operation and, overall, revenue passengers have declined.

This situation has raised questions regarding the proper approach which the city should take regarding transit operations. Questions have been raised as to whether existing service should be increased or decreased, fares raised or lowered, routes changed, apportionment of operating losses to service municipalities be re-evaluated, and whether the ever increasing deficit can be decreased. In addition, the issue of the most suitable form of public ownership has been raised by the problems which have developed in attempts to secure regional support for city operation.

This study was undertaken to answer the above questions and to develop a short-range transit development program covering the five-year period of 1973-77. Long-range implications of present trends are also discussed.

Recommended routes and schedules are presented. Continuation of the single-zone fare system with a small increase in rates is suggested. In terms of transit management, a commitment by each of the communities is called for. An extensive promotion and advertising program is suggested. The formation of a City-County Transit Authority or a County Transportation Department is proposed as the first step in carrying out the transit development program.

Appendices include transit analysis zones and tables of total person trips and transit trips.

TITLE: READING-BERKS TRANSIT STUDY, READING, PENNSYLVANIA

AUTHOR: Wilbur Smith & Associates

DATE: September 1973

PROJECT NO.: PA-09-0017

KEYWORDS:

1. Management, planning & analysis
2. Bus, rapid transit
3. Planning, tools
4. Surveys

The objective of this report was to develop recommendations for a five-year transit improvement program designed to address the transit problems of declining patronage, financial losses, and inadequate service in Reading and Berks County, Pennsylvania.

Reading Bus Company has been operating with emergency subsidies under the Pennsylvania Urban Mass Transportation Act. The Commonwealth of Pennsylvania, County of Berks and City of Reading are contributing funds to Reading Bus Company to insure continued operation at present service levels.

A detailed evaluation of existing transit service deficiencies included the findings that transit service coverage is not provided adequately in much of the area, only 51.1% of the area residents are provided some type of service, transit fares have increased from 18¢ to 35¢ in the ten-year period of 1962-1972, and financial reports of the Reading Bus Company indicate a substantial net loss for the year 1972, with no brighter hopes for the future.

Local public attitudes toward transit were surveyed. While area residents were generally satisfied with transit coverage, driver attitude, travel time and routings and connections, there were areas of dissatisfaction with various operating characteristics. Transit improvement is supported by the public.

Included in the report is the recommended transit development plan. Topics considered are a recommended management plan, transportation authority formation, feasible extent of transit services, system alternatives, recommended service levels, fare level tests, detailed passenger projection, transit-oriented street improvements, equipment and facilities, rider amenities and field supervisory and safety improvements.

Text material is supported by maps, tables, survey data, graphs and figures. Appendix "A" is "Definitions of Forms of Urban Public Transportation - U.S. Department of Transportation," Appendix "B" is "Inventory and Appraisal Tables" of the Reading Bus Company, Inc., and Appendix "C" is "Application to the Commonwealth of Pennsylvania Department of Transportation for a Purchase of Service Grant by the County of Berks."

TITLE: CLOSING REPORT ON PUBLIC TRANSPORTATION

AUTHOR: Delaware Valley Regional Planning Commission (DVRPC)

DATE: October 1973

PROJECT NO.: PA-09-0025

KEYWORDS:

1. Management, planning and analysis
 2. Intercity Transportation
 3. Rail, commuter
 4. Bus, rapid transit
-

This report reviews thirty-three public transportation projects carried on by the Delaware Valley Regional Planning Commission in Pennsylvania. The emphasis of the report is on the planned development of an urbanized area with special reference to public transportation facilities and services. The various operating agencies in the area which have responsibility for short-range planning are the Southeastern Pennsylvania Transportation Authority (SEPTA), the Delaware River Port Authority (DRPA), the City of Philadelphia, the City of Trenton, and Mercer County Improvement Authority (MCIA).

Specific projects covered by the report include coordination of operations, technical communications, congestion and public parking in downtown areas, cost evaluations, ridership profiles, rapid transit extensions of bus and commuter rail, Bicentennial celebrations, methods of transit evaluation and planning, transit inventories, transit information systems, fares and transfers, employment data, geographic and land use data, citizen participation, and internal administration.

Each project is outlined briefly, with information on project title, the DVRPC project number to facilitate retrieval of the complete study from them, program purpose, summary, and contents.

TITLE: NATIONAL TRANSPORTATION NEEDS. 1970-1990, PUERTO RICO.

AUTHOR: Puerto Rico Planning Board

DATE: August 1971

PROJECT NO.: PR-09-0001

KEYWORDS:

1. Environment and Environmental Control
 2. Public Ownership
 3. Urban Development and Planning
 4. Management, planning and analysis
-

This report is a comprehensive study of transportation needs in Puerto Rico. The work represents an integrated product which was generated with the cooperation of various public agencies. Needs estimates were developed with standard forecasting techniques to assist in the evaluation of several alternative capital improvement programs.

These programs are discussed with reference to distribution of Federal funds, project priorities, allocations among project alternatives, and public ownership of transit systems. Implementation procedures, costs and funding and transportation planning and regulations are also discussed.

The report concludes that major construction programs should be initiated to improve air, land, and water transportation facilities and services. A major emphasis of regional programming should be given to mass transportation as an agent for controlling urban sprawl and environmental quality. An island-wide rapid transit system is recommended. The report contains complete statistical documentation.

TITLE: TRANSIT PROGRAM FOR HOUSTON
Volume I

AUTHOR: Alan M. Voorhees & Associates, Inc.

DATE: October 1973

PROJECT NO.: TX-09-0008

KEYWORDS:

1. Management, planning and analysis
 2. Bus, rapid transit
 3. Planning
 4. Guideways
-

The final report of the Houston Transit Action Program is divided into two volumes documenting work performed and conclusions reached.

The original goals of the Transit Action Program were: 1) a long-range program looking to the end of the century; 2) a Stage One rapid construction program for the 70's; and, 3) an immediate five-year bus improvement program. All three are a coordinated effort to provide the best possible transportation service for the people in the Houston area.

The report is divided into ten sections supplemented by technical memoranda and work sheets available from the City of Houston. Volume I contains the first six sections. Section I summarizes the total process and the resulting recommendations. Section II explains the organization of the work program, including the status of area planning and the citizen-community involvement work. Section III describes area development trends, community concerns and objectives, transit issues, and the evaluation factors selected to compare the alternatives. Section IV and V present the work conducted to analyze long-range transit alternatives, proceeding from the initial search for possibilities of small and large capital investments and different technologies, through the in-depth analysis of the transit customer market potential related to different types of transit services, to a final evaluation of the more practicable alternatives. Section VI contains a description of the long-range program including various types of guideways and an analysis of the benefits estimated to accrue from its development.

Volume II (PB-226-146) concentrates mainly on bus improvements.

TITLE: TRANSIT PROGRAM FOR HOUSTON
Volume II

AUTHOR: Alan M. Voorhees & Associates , Inc.

DATE: October 1973

PROJECT NO.: TX-09-0008

KEYWORDS:

1. Financing Mass Transportation, sources
 2. Management, planning and analysis
 3. Bus, rapid transit
 4. Planning
 5. Construction, costs
-

The final report of the Houston Transit Action Program is divided into two volumes documenting the work performed and the conclusions reached.

The original goals of the Transit Action Program were: 1) a long-range program looking to the end of the century, 2) a Stage One rapid construction program for the 70's, and 3) an immediate five-year bus improvement program. All three are a coordinated effort to provide the best possible transportation service for the people in the Houston area.

The report is divided into ten sections supplemented by technical memoranda and work sheets available from the City of Houston. Volume II contains Sections VII through X.

Section VII provides further details to assist in the development of Stage One of the program, with refined construction cost estimates, a tentative schedule of development, and revenue estimates. The emphasis in Sections VIII and IX is on short-range bus improvements. Section VIII provides a summary of existing conditions and an extensive documentation of alternative types of bus service and fares. Section IX is the recommended Five-Year program for bus service, including guides to the continuing work effort needed to update and refine the Five-Year program. Section X describes the conclusions on the basic implementation task for Houston as well as the national, state and local financial program for the first five years, and conclusions on financing and organizational requirements.

Volume I (PB-226-145) concentrates mainly on long-range transit programs and the basic organization of the program.

TITLE: TRANSIT FOR LUBBOCK'S FUTURE

AUTHOR: Simpson & Curtin

DATE: April 1972

PROJECT NO.: TX-09-0011

KEYWORDS:

1. Bus, intracity
 2. Public Ownership
 3. Bus, jitney
 4. Advertising & Promotion
 5. Financing Mass Transportation, sources
-

This report presents an in-depth examination of the characteristics and adequacy of the existing transit service in Lubbock, Texas, its appraised value and financial performance, the characteristics of the transit riders, and community attitudes toward public transportation. A number of alternative plans regarding public participation in transit and possible revenue sources are explored. The role of public transportation relative to the cost of providing this service is discussed, along with the hardship to riders should this transit system cease operation.

A recommended transit plan is outlined in an eleven-point program based on the assumption of public acquisition. The sub-headings under the eleven-point program are Public Acquisition, Capital Improvements, Operating Deficits and Service Improvements.

In the event that the system does not become publicly owned, a twelfth point is presented which outlines a contingency plan in which it is suggested that privately-owned jitneys might satisfy citizen mobility needs.

There are descriptions and illustrations of various route alignments, a more detailed discussion of the capital improvement program, and an outline of the public information and service promotion programs which would include special fares for students, the elderly, and shoppers.

TITLE: WASATCH FRONT REGIONAL TRANSIT DEVELOPMENT PROGRAM

AUTHOR: Alan M. Voorhees & Associates, Inc.

DATE March 1973

PROJECT NO. UT-09-0003

KEYWORDS:

1. Bus, rapid transit
2. Management, planning and analysis
3. Planning

The purpose of this study is, first, to evaluate the present local service provided in parts of Box Elder, Weber, Davis, Salt Lake and Tooele Counties, Utah, by private bus companies and to determine the alternatives for improving service including the possible public acquisition of these private companies. Secondly, is the development of a short-range program for improving transit service in the study area and integration of the improved program with the operations of the Utah Transit Authority (UTA). In 1972 a patronage increase of nearly 10% over the previous year was experienced by UTA and it is intended that all transit service in the region be on a level at least equal with that provided by UTA.

The project is divided into four phases. Phase A, Valuation Studies, consists of all appraisals necessary to determine the fair market values of the physical assets and operating rights of some of the private companies. The Short-Range Transit Improvement Program, Phase B, includes all surveys, inventories and analyses leading to the development of an overall transit improvement program through 1980. Present transit service is analyzed in terms of such factors as route characteristics, fares, equipment, management, maintenance and facilities, patronage and user characteristics, trip purpose and travel patterns. Transit service alternatives are examined, recommendations are proposed, and implementation, organization and management are discussed.

Phase C, the Long-Range Transit Needs, includes a 1995 usage analysis, the determination if a separate right-of-way transit system is required in the future, and the specific types of rapid transit systems available. Supplemental transit studies for the University of Utah, Weber State College and Weber County Public Schools examine the transportation problems and make recommendations for solutions.

Illustrations are provided, along with tables of the data collected on each of the private bus companies. Appendix "A" contains the Operating Franchise of the Ogden Bus Lines, "B" is the 1972 On-Board Passenger Survey, "C" is the Bus-Mile Costs and Passenger Estimates and "D" is the Wasatch Front Regional Recommended Interrelationship.

TITLE: TRANSIT OWNERSHIP FOR THE CITY OF NORFOLK, VIRGINIA

AUTHOR: Ralph H. Burke Associates for the City of Norfolk

DATE: December 1972

PROJECT NO.: VA-09-0004

KEYWORDS:

1. Public Ownership
 2. Management, planning and analysis
 3. Small Cities
 4. Bus, rapid transit
 5. Financing Mass Transportation, sources
-

The purpose of this study is to determine the feasibility of the public acquisition of the transit property of the Virginia Transit Company (VTC) in Norfolk, and the development of a short-range transit development program for the area served by the VTC.

The 1967-1971 financial statements were analyzed and it was found that net income decreased substantially from 1967 to 1971. These losses were expected to increase, giving the VTC no choice but to discontinue its privately owned operation. It was recommended that the tangible property of the VTC, which was considered only adequate for a transit system serving the Norfolk area, be purchased at a price reasonably close to the appraised value. It was decided that a Regional Transportation District (RTD) should be formed to assume ownership. If this could not be accomplished, either as a multi-member RTD or as a City RTD, then it was suggested that ownership by the City of Norfolk should be effectuated. According to the authors, best suited to the current need would be an operation under a management contract with a professional management company.

A short-range transit program was prepared, designed to increase ridership. It was estimated that it would require from eight months to two years to construct a completely new transit facility and to purchase major quantities of new equipment. A detailed plan of action and a timetable for the public acquisition and improvement of the tangible property of the VTC are presented.

Other specific topics considered in this study include: description, condition and evaluation of tangible property; office, shop, and bus storage requirements; characteristics of present VTC staff; analysis of labor contract; transit ownership and operating options; estimated revenues, maintenance and operating expenses; and analysis of capital requirements and sources.

TITLE: A TRANSIT DEVELOPMENT PROGRAM FOR THE LYNCHBURG URBAN AREA

AUTHOR: Alan M. Voorhees & Associates, Inc.

DATE: February 1974

PROJECT NO.: VA-09-0006

KEYWORDS:

1. Management, operations and techniques
 2. Financing Mass Transportation
 3. Planning
-

This report summarizes the findings and recommendations of a planning study of the Lynchburg, Virginia, urban area.

Using data and information gathered throughout the study, the current status of transit service is described, trends over the past five years are provided and the financial prospects for the future operation of Lynchburg Transit Company are given. Through community interviews and other data, public transportation needs in the Lynchburg area are identified and transit goals and objectives are stated.

Transit ownership and management alternatives are described indicating the possible advantages and disadvantages of each alternative. In response to the specific transit objectives identified earlier, a set of service modifications is presented and discussed for incorporation into a Transit Development Program. Based on policy guidance by the City and the Technical Advisory Committee, a recommended Transit Development Program for Lynchburg is outlined. It includes routes and services, capital requirements, an implementation schedule, a five-year expense and revenue forecast, a program marketing plan, a program maintenance plan and the program monitoring plan.

TITLE: SEATTLE MODEL CITIES TRANSPORTATION STUDY

AUTHOR: Alan M. Voorhees & Associates

DATE: July 1973

PROJECT NO.: WA-09-0003

KEYWORDS: 1. Transportation Disadvantaged
2. Community Response
3. Bus, intracity
4. Social Benefits and Costs

The overall goal of this study is to investigate the transportation problems in Seattle, identify their magnitude, and propose solutions. The four principal objectives of the study are (1) to determine transportation needs and to assess transportation service problems of Model City residents, (2) to recommend solutions in sufficient detail and documentation to enable immediate implementation, (3) to recommend practical solutions which are capable of being part of existing public transportation facilities or which provide viable business opportunities, and (4) to coordinate the recommendations of the study with related area and sub-area land use and transportation plans, studies, and programs in order to improve the access of Model City residents to desired destinations and activities within and outside the area.

Coordination was maintained between the local public agencies through a Technical Advisory Committee and the Model City residents through a Community Involvement Program which is described fully in the report.

The authors make five lengthy and specific recommendations designed to achieve the maximum possible improvement in transportation in the study area, in the shortest possible time and at the greatest economy. The study area covers four square miles, and has a population of almost 40,000 people which has suffered severely under the Seattle area economic decline.

Recommendations are made on the basis of goals and objectives, alternatives and implementations and costs.

TITLE: BELLEVUE AREA MICRO-MODEL TRANSPORTATION ANALYSES

AUTHOR: Puget Sound Governmental Conference for City of Bellevue (Prepared by Redford Engineers, Inc. under contract to Daniel, Mann, Johnson & Mendenhall)

DATE: November 1972

PROJECT NO.: WA-09-0005

KEYWORDS: 1. Traffic Analysis 6. Land Use
2. Urban Development and Planning
3. Highway Planning
4. Trip Generation
5. Models & Modeling

The purpose of this report is to create a "micro-traffic assignment model" sensitive to the planning needs for all types of tripmaking for the Bellevue area. It was found that the accuracy of the predictions for free-way, expressway and major state highways were quite workable.

Since 1953, the study area, the City of Bellevue, has grown from 12,809 people to over 60,000, making it the fourth largest city in the State of Washington. There has also been, with the population expansion, a great territorial expansion with the construction of shopping centers outside the Central Business District. The need for a micro-traffic assignment model has been underscored by the necessity of planning transportation linkages between these shopping centers, the central business district, the industrial areas, and the residential areas.

In order to establish the model, tripmaking was related to land use categories, and a transportation analysis zonal structure sensitive to arterial planning within the Bellevue area was created and then calibrated by comparing volumes assigned by the computer to traffic movement patterns observed by traffic counts. A flow chart was then established to show the sequence of the predictive equations which were based on land use and then utilized to predict future trip-making on the calibrated street and highway network.

TITLE: EAU CLAIRE TRANSIT STUDY

AUTHOR: Dalton-Dalton-Little-Newport and ATE Management and Service Co.,
Inc.

DATE February 1973

PROJECT NO. WI-09-0009

KEYWORDS:

1. Financing Mass Transportation
 2. Bus, intracity
 3. Public Ownership
-

This report and a Technical Supplement represent a study sponsored by the City of Eau Claire, Wisconsin to determine the continued provision of urban transit service by the City, which has heavily subsidized the privately-owned city transit bus operation.

Specific conclusions of the report include the following:

(1) that service adjustments be based on passenger use; (2) that there be municipal ownership with management by a private firm; (3) that a city transit commission be gradually succeeded by an expanded city transit/parking commission; (4) the city transit commission would own only the transit vehicles and necessary supportive equipment such as bus washers and cleaner; (5) the City of Eau Claire would replace the existing bus fleet with nine new buses with the best comfort features available; and, (6) financing the operating deficit would be the responsibility of locally elected officials.

Chapter headings include: a description of Eau Claire, the city and the transit system; basic cost/revenue considerations; service revision and funding alternatives; ownership, management, organization; recommended transit programs; marketing transit; and a transit action plan.

A bibliography is included along with various illustrations, charts, exhibits and maps.

TITLE: EAU CLAIRE TRANSIT STUDY
Technical Supplement

AUTHOR: Dalton-Dalton-Little-Newport and
ATE Management and Service Co., Inc.

DATE: February 1973

PROJECT NO.: WI-09-0009

KEYWORDS:

1. Bus, intracity
 2. Surveys
 3. Financing Mass Transportation
 4. Routes and Routing
-

This technical supplement report, along with the final report, is part of a study to determine the continued provision of the privately owned city transit bus service by the City of Eau Claire, Wisconsin.

Included in this volume are: Recommended Bus Routes, an Appraisal of Eau Claire Transportation Company City Bus Fleet, and a 1972 Non-Rider Bus Survey.

The first part includes recommended route changes and a discussion of those changes by transit route fellows. The purpose of the route change proposal is to tailor the service to coincide with travel demand.

The second section seeks to determine the expected capital costs to the City of Eau Claire of assuming public operation of the city transit system presently operated by the Eau Claire Transportation Company. Specific questions addressed in this section are: 1) Is it advisable to purchase the vehicles presently operated? 2) What is the value of these vehicles? 3) Is it possible to purchase the facility presently used to service the bus fleet? and 4) What are the alternatives to the purchase of these facilities and their financial implications?

The third section, a 1972 non-rider survey, discusses areas such as schools, hospitals, senior citizen housing, shopping areas, employment areas and university areas. A sample survey questionnaire and resulting statistics are included.

TITLE: SAN JOSE - PALO ALTO BUS DEMONSTRATION PROJECT PLAN

AUTHOR: San Jose - Palo Alto Transit Authority

DATE: May 1972

PROJECT NO.: CA-06-0016

KEYWORDS:

1. Bus
 2. Community Response
-

In late 1970, a new concept of bus transit was developed to meet the transportation problems of San Jose and Palo Alto, California. A planning grant was received from UMTA to plan a new system in sufficient detail to permit a demonstration project. Emphasis was placed on customer-tailored transit service and on restructuring the underlying incentives that affect the use of public transit by individuals and its support by local institutions.

The demonstration project entailed a comprehensive redesign of bus services in both San Jose and Palo Alto. The innovations being demonstrated included every element of the transit systems---routing, management and promotional methods, means of financing, community involvement, and so forth. The service in the two cities was not interconnected at that time; the present Southern Pacific commuter rail and Greyhound Intercity service continued to serve the area between the two cities.

The proposed demonstration system was founded on a number of system elements or experimental variables. These were; CDAC routes, triangular financing, incentive program, bus preferential traffic system, fare collection system, marketing program, tailored service to special markets and information center. The most important innovation in the project was community involvement.

Among the appendices are the base system design, bus data and design, combined demand-actuated conventional service, triangular financing, bus preferential traffic system, the marketing program, evaluation plan and consumer clinics. Figures, tables, photographs and maps are included.

\$8.75

TITLE: DEMAND RESPONSIVE TRANSPORTATION SYSTEM FOR THE EAST/
NORTHEAST AND WATTS MODEL CITIES NEIGHBORHOODS.
Technical Report Number 1

AUTHOR: Wilbur Smith & Associates
(Prepared for the Los Angeles City Demonstration Agency)

DATE December 1973 PROJECT NO.: CA-06-0017

KEYWORDS:

1. Demand Responsive Systems
 2. Inner City
-

This report documents activities and operations of Demand-Responsive Transportation Projects in the East/Northeast and Greater Watts Model Cities Neighborhoods for the period May 1, 1973 to October 31, 1973.

This demonstration project was designed to demonstrate that a demand-responsive public transportation system utilizing subscription techniques could be a successful and important service in supplementing existing fixed-route bus operations. Such techniques, if successful in the study area, could be adopted on a city-wide scale.

The service priorities of the program were as follows: (1) persons requiring access to health and related facilities within the two Model Cities transportation project service areas; (2) elderly persons requiring transportation within the Model Cities service area; (3) persons without autos to shopping facilities; (4) youth to facilities and services available under the Model Cities programs; and (5) other priorities to be defined on the basis of experience during the project.

The contract for the project specified a one-year demonstration period in each Model City area. During this period, a fleet of 12-passenger, radio-dispatched vans provided low fare transportation (\$.15) for members of the respective communities. Operating data describing ridership, revenues resulting from system utilization, travel characteristics, the various types of pick-ups made and general performance of the system in terms of wait and travel times are included. Actual funds expended and estimated monthly operating costs are delineated. Productivity measures are examined. An evaluation and analysis of the Watts on-board survey is presented and major problems encountered are discussed. A brief evaluation of the service provided is made.

Technical Report Number 2 (PB 239-836) is also available.

TITLE: DEMAND RESPONSIVE TRANSPORTATION SYSTEM FOR THE EAST/NORTHEAST
WATTS MODEL CITIES NEIGHBORHOODS
Technical Report Number 2

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

DATE May 1974 PROJECT NO. CA-06-0017

KEYWORDS:

1. Demand Responsive Systems
2. Inner City

This report documents the activities and operations of the Demand-Responsive Transportation Projects in the East/Northeast and Greater Watts Model Neighborhoods for the period November 1, 1973 to January 31, 1974.

This demonstration project was designed to demonstrate that a demand-responsive public transportation system utilizing subscription techniques could be a successful and important service in supplementing existing fixed-route bus operations. Such techniques, if successful in the study area could be adopted on a city-wide scale.

The service priorities of the program were as follows: (1) persons requiring access to health and related facilities within the two Model Cities transportation project service areas; (2) elderly persons requiring transportation within the Model Cities service area; (3) persons without autos to shopping facilities; (4) youth to facilities and services available under the Model Cities programs; and (5) other priorities to be defined on the basis of experience during the project.

Operating data describing the ridership, revenues resulting from system utilization, travel characteristics, the various types of pick-ups made and general performance of the system in terms of wait and travel times are discussed. Actual funds expended as well as estimated monthly operating costs are presented. Productivity measures are examined. An evaluation and analysis of on-board surveys and an evaluation of each system in light of objectives and priorities as originally established are also included.

Technical Report Number 1 (PB 239-945) is also available.

TITLE: LONG BEACH TRANSIT MARKETING PROJECT
Evaluation Report

AUTHOR: Cunningham/Short/Berryman and Associates, Inc. and
VTN Consolidated, Inc.

DATE: January 1974

PROJECT NO.: CA-06-0018

KEYWORDS:

1. Market Research
2. Advertising and Promotion

In February 1972, the Long Beach (California) Public Transportation Company received from UMTA a demonstration grant to fund a program which, through innovative marketing, would attempt to focus on increased ridership among the traditional "non-transit user," specifically, those in moderate income categories and others not considered "transit captives."

The foremost goal of the Transit Marketing Project was to familiarize every Long Beach citizen with the advantages of bus travel and especially the services of the City-owned Long Beach Public Transportation Company.

To this end, community representatives were hired to deliver transit information hand-outs to homes in the selected market areas and to give presentations at service and luncheon clubs, as well as other places of public gathering. Augmenting the community outreach efforts were a newspaper-radio campaign and special on-board services such as free coffee, orange juice or newspapers, to enhance the general public image of the desirability of transit service. It was felt that these measures would do much to increase "middle class" acceptance of transit as a socially acceptable form of mobility, as well as increase awareness of the availability of public transportation among lower income persons.

Statistical analysis enabled the determination of changes in five basic variables: (1) ridership patterns; (2) attitude toward riding the bus; (3) trip frequency; (4) source of bus information; and (5) revenue data. Results of the evaluation are in tabular form.

The project background, evaluation and summary are presented. Conclusions and recommendations are put forth.

Appendices include the survey instrument, instructions to interviewers, departure time selection table, examples of newspaper advertisements and the Long Beach Bus Route Map.

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UP-TP
D.V.

TITLE: AUTOMATIC FARE COLLECTION
Supplementary Report

AUTHOR: Parsons Brinckerhoff-Tudor-Bechtel
(For Bay Area Rapid Transit District)

DATE: June 1973

PROJECT NO.: CA-06-0023

KEYWORDS:

1. Fares, collection
 2. BART
-

The original purpose of this demonstration project was to test and evaluate new technical concepts in the field of rapid transit, including a variety of advanced hardware, automatic train control and automatic fare collection. This report is supplemental to the original study (PB 189-148/AS) which was published in January 1970 and discussed the attributes of three separate automatic fare collection systems which were considered for implementation into the BART system. This particular report reviews the selected system, summarizing the final configuration of the equipment from a physical and operational viewpoint, and reflects the results of the original demonstration program. The analysis is divided into three main subgroups: equipment, human factors, and operations.

Basic equipment discussed included the automatic ticket vendor, the automatic additional fare machine, gate consoles (where tickets are collected allowing passengers access to trains), the money changing machine, and the agent's reader, which allows the agent to determine the validity of a passenger's ticket.

Human factors considered are ticket-coin usage, display awareness in which graphics and symbols are used in place of words whenever possible, barrier interaction, and baggage problems.

The operations aspect includes traffic patterns, duties of the agent, treasury operations, malfunction and vandalism, and maintenance.

TITLE: BART PROTOTYPE CAR DEVELOPMENT PROGRAM Volume I: Program Synopsis
Final Report

AUTHOR: Rohr Industries (for Bay Area Rapid Transit District)

DATE March 1973

PROJECT NO.: CA-06-0032

KEYWORDS:

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- | | |
|--------------------------------------|---------------------------|
| 1. Vehicle, design | 6. Management, operations |
| 2. Rail, systems planning and design | and techniques |
| 3. BART | |
| 4. Rail, commuter | |
| 5. Rail, rolling stock | |
-

This is Volume I of a two-volume report which traces the Bay Area Rapid Transit District Rapid Transit Vehicle Program through the planning phase, design phase, and the development and prototype test phase. The program was established to enhance the attractiveness of rail rapid transportation to the urban traveler by providing a comfortable, reliable and safe car which would incorporate the latest engineering concepts. The report provides design justifications, testing highlights, and reasons for modifications and changes resulting from the prototype test program.

Volume I, Program Synopsis, provides an overview of the complete program and is directed toward Federal, local government and rail transit management personnel. Specific topics covered are vehicle and subsystems design, manufacturing, qualification tests, combined prototype system test, verification tests, demonstration tests, and a summary. There are also numerous drawings and photographs.

Volume II, Program Details (PB 222-976), provides the detailed technical material for engineering personnel.

TITLE: BART PROTOTYPE CAR DEVELOPMENT PROGRAM Volume II: Program Details
Final Report

AUTHOR: Rohr Industries (for Bay Area Rapid Transit District)

DATE March 1973

PROJECT NO. CA-06-0032

KEYWORDS:

1. Vehicle, design
2. Rail, system planning and design
3. BART
4. Rail, commuter
5. Rail, rolling stock
6. Management, operations and techniques

This is Volume II of a two-volume report which traces the Bay Area Rapid Transit District Rapid Transit Vehicle Program through the planning phase, design phase, and the development and prototype test phase. The program was established to enhance the attractiveness of rail rapid transportation to the urban traveler by providing a comfortable, reliable and safe car which would incorporate the latest engineering concepts. The report provides design justifications, testing highlights, and reasons for modifications and changes resulting from the prototype test program.

This particular volume provides detailed technical material for engineering personnel. Specific topics include vehicle and subsystem design, design analysis, qualification tests, noise tests, combined prototype systems tests, verification tests, demonstration tests and a glossary of terms.

Volume I, Program Synopsis (PB 222-975), provides an overview of the complete program and is directed toward Federal, local government and rail transit management personnel.

TITLE: DIESEL EXHAUST EMISSION CONTROL PROGRAM
Final Report

AUTHOR: Atomics International (for Southern California Rapid
Transit District)

DATE: January 1974

PROJECT NO.: CA-06-0035

KEYWORDS:

1. Air Pollution
 2. Propulsion Systems, diesel
 3. Environment and Environmental Control
-

The purpose of this report was to demonstrate a prototype of the Atomics International (AI) diesel exhaust control system in a Southern California Rapid Transit District bus (a Flexible coach equipped with a Detroit Diesel 6V-71N engine). The program objectives were to meet the California 1975 heavy-duty vehicle standards and to establish the economics of the system.

The system design concept is based upon catalytic oxidation of nitric oxide of hydrocarbons, carbon monoxide, and of odorous oxygenated organic compounds. NO_x removal is based upon catalytic oxidation of nitric oxide to nitrogen dioxide and subsequent absorption of NO₂ in an alkaline molten carbonate salt scrubber.

Emission reduction objectives were attained except for reduction of NO_x. To meet California requirements of less than 5 gm/B-Hp-Hr of combined HC and NO_x, larger residence times are required. The resulting muffler size may not be compatible with bus installation constraints. Alternative technologies of NO_x control under development by diesel engine manufacturers may now prove to be more cost effective.

The advantages and disadvantages of the AI diesel exhaust emission control system (DEEC) in vehicle application are discussed. Recommendations are offered and conclusions reached.

Tables and figures are numerous. Appendices include the tabulation of laboratory test data, muffler performance test reports provided by the California Air Resources Board, Air Resources Laboratory, and a market analysis for the DEEC muffler.

TITLE: PARA-TRANSIT: A SUMMARY ASSESSMENT OF EXPERIENCE AND POTENTIAL

AUTHOR: The Urban Institute (Ronald F. Kirby)

DATE: June 1974

PROJECT NO.:

CA-06-0045

KEYWORDS:

- | | |
|-------------------------------------|---|
| 1. Private Transportation, carpools | 5. Demand Responsive Systems, dial-a-ride |
| 2. Bus, feeder | 6. Para-Transit |
| 3. Bus, jitney | |
| 4. Bus, minibus | |

Increasing concern over the congestion, pollution and fuel consumption accompanying the use of the private automobile in urban areas, together with greater emphasis on the needs of those without access to an automobile, has recently led to major efforts to upgrade the scheduled bus and rapid rail transit services in U.S. cities. Other forms of transportation which are available to the public and which use the street and highways of urban areas, referred to collectively as "para-transit", are now receiving consideration as transportation alternatives.

This study was designed to review the experience to date with para-transit services, to assess their potential for servicing urban transportation demand, and to design a research, development and demonstration (RD&D) program as needed to identify and demonstrate innovations in the provisions of para-transit services which would be beneficial to U.S. cities.

The para-transit services studied were grouped into three categories: a "hire and drive" category comprising daily car rentals and the various forms of short-term car rentals that have been proposed (including the Minicar and Public Automobile Systems); a "hail or phone" category made up of taxi, dial-a-ride, jitney, and related services; and, a "pre-arranged ride-sharing" category including the various forms of car pool, van pool, and subscription bus services.

The study identified four major applications of para-transit services which could contribute to the future improvement of urban transportation systems. These are applications for high density home-to-work travel, services for low density travel demand, feeder services and mobility within business and commercial districts.

Recommendations for action are put forth. References are furnished.

This report presents the executive summary and overview of the study, "Para-Transit: Neglected Options for Urban Mobility," (Order No. PB 234-320/AS).

TITLE: PARA-TRANSIT: NEGLECTED OPTIONS FOR URBAN MOBILITY

AUTHOR: The Urban Institute
(Ronald F. Kirby et al.)

DATE: June 1974

PROJECT NO.: CA-06-0045

KEYWORDS:

1. Private Transportation, carpools	5. Demand Responsive Systems, dial-a-ride
2. Bus, feeder	
3. Bus, jitney	6. Para-Transit
4. Bus, minibus	

Increasing concern over the congestion, pollution and fuel consumption accompanying the use of the private automobile in urban areas, together with greater emphasis on the needs of those without access to an automobile, has recently led to major efforts to upgrade the scheduled bus and rapid rail transit services in U.S. cities. Other forms of transportation which are available to the public and which use the street and highways of urban areas, referred to collectively as "para-transit", are now receiving consideration as transportation alternatives.

This study was designed to review the experience to date with para-transit services, to assess their potential for servicing urban transportation demand, and to design a research, development and demonstration (RD&D) program as needed to identify and demonstrate innovations in the provisions of para-transit services which would be beneficial to U.S. cities.

The para-transit services studied were grouped into three categories: a "hire and drive" category comprising daily car rentals and the various forms of short-term car rentals that have been proposed (including the Minicar and Public Automobile Systems); a "hail or phone" category made up of taxi, dial-a-ride, jitney, and related services; and, a "pre-arranged ride-sharing" category including the various forms of car pool, van pool, and subscription bus services.

The study identified four major applications of para-transit services which could contribute to the future improvement of urban transportation systems. These are applications for high density home-to-work travel, services for low density travel demand, feeder services and mobility within business and commercial districts.

Recommendations for action are put forth. References are furnished. Chapters include discussions of taxicab, dial-a-ride, and jitney service, daily and short-term rental cars, and subscription buses and car pools. A comparative study of para-transit modes, innovations in para-transit regulation and case studies are presented. A para-transit bibliography is included.

Summary of this report is "Para-Transit: A Summary Assessment of Experience and Potential," (Order No. PB 234-319/AS).

TITLE: REDUCING THE NEED FOR TRAVEL

AUTHOR: INTERPLAN Corporation
(Roman Krzyczkowski and Suzanne S. Henneman)

DATE: March 1974

PROJECT NO. CA-06-0045

KEYWORDS:

1. Travel Demand

The objectives of this report are: to identify the alternative ways of accomplishing the reduction of urban transportation needs, to assess the potential impact of each alternative and to recommend appropriate UMTA R&D program activity. In order to attain these objectives it is necessary to analyze the need for travel, evaluate the constraints impeding the implementation of travel alternatives, and ascertain the state-of-the-art, including estimates of the length of time to implementation.

This study looks at ways in which the demand for travel itself can be restructured, with the objectives of reducing total vehicle miles traveled and reducing peak-hour trips.

Given the above objectives, the scope of the study includes an assessment of ways to eliminate a trip, shorten a trip, and plan trips at non-peak hours. Within this scope the author sets forth the following three potential types of solutions: (1) provision of communications substitutes; (2) changes in the location and structure of cities; and (3) rescheduling of work hours. These solutions are basically concerned with rechanneling or accommodating existing travel demand. A fourth type of solution which can both directly and indirectly hasten the reduction of travel is reshaping the need to travel through increases in the cost of travel and re-education of the public.

The principal ways in which these types of solutions are expected to impact on study objectives are shown schematically. Substitution of goods movement is dealt with under communications substitutes.

The authors maintain that potential solutions need not be applied in isolation. There does not appear to be any single, fundamental solution, but rather a number of marginal steps, which when added together, may bring about the desired decrease in the need for travel. The potential solutions and their likely time frames are diagramed.

Appendices contain a tabulation of information on the state-of-the-art of candidate solutions, a bibliography of 136 sources and the names of individuals and firms contacted for opinions.

TITLE: DUAL MODE TRANSIT SYSTEM
Final Report

AUTHOR: Rohr Industries, Inc.

DATE: September 1974

PROJECT NO.: CA-06-0067

KEYWORDS:

1. Dual Mode Systems
-

This document contains the Rohr Industries, Inc. report for Phase I of the Dual Mode Transit System program. This program was originated by UMTA as a part of the continuing effort to improve the quality of urban transportation.

The Dual Mode concept seeks to combine the advantages of an efficient off-guideway collection distribution system, providing convenient access to an entire urban/suburban area, with an equally efficient on-guideway system, thereby providing rapid automated transportation throughout the service area. The system is to provide a combination of extensive scheduled service, convenient subscription service, and door-to-door demand service with minimum delays and transfers. The combination of rapid distribution and high speed line haul capability should, according to the authors, result in high system utilization and efficiency. The advanced design of the vehicle and other system components should result in exceptional ride quality, minimum noise and pollution, and the efficient utilization of power.

The objective of the program Phase I, Concept Definition and Preliminary Design, is to complete the design, through the top level assembly drawing level, of a system which has a capability of meeting the concept requirements. Contractors were requested to analyze system requirements, develop candidate concepts and perform trade-offs leading to logical selection of cost-effective system concepts. Rohr Industries, Inc., and its team of subcontractors were selected to conduct a Phase I study of a system utilizing high performance buses operating in manual and automatic controlled modes under automated systems management.

Chapters present the summary, scope, analysis of requirements, system description, design trade-off and analyses, operations analysis, system costs and planning studies. Figures and tables are numerous.

TITLE: DUAL MODE TRANSIT SYSTEM
Phase I - Final Report

AUTHOR: Transportation Technology, Inc.

DATE June 1974

PROJECT NO.: CO-06-0006

KEYWORDS: 1. Dual Mode Systems
2. Guideways

This report has been prepared by Transportation Technology, Inc. (TTI) as a result of work performed under contract to UMTA for the design phase of the three phase Dual Mode Transit System (DMTS) Development Program. This program is a part of an integrated UMTA RD&D program that applies new technology to existing means of mass transportation which are directed toward reducing traffic congestion and improving personal mobility within medium-to-large urban areas.

This report describes a system that TTI believes is optimal for the UMTA DMTS Program. The report describes the system, demonstrates the rationales for design and design decisions, and presents a summary of activities undertaken to develop the system. It documents the results of Phase I which combines a demand-activated, high-speed system using pallet transporters that move on a guideway with a feeder bus system that retains flexibility through the use of dial-a-ride.

The chapter on concept design and design rationale includes discussion of user scenarios, command, control and communication system, malfunction detection, on-guideway vehicle longitudinal and lateral control, vehicle, guideway, system capacity and future expansion, stations, maintenance, environmental impact, safety, reliability, maintainability, availability, and a cost parametric analysis summary.

Related documents are "Appendix A-E" (PB 239-892) which includes applicable documents, list of abbreviations, chassis structure calculations, determination of the ratio of buses to transporters required for DMTS, and bid specifications for Mercedes-Benz Diesel Bus Model 0309D. "Appendix F" (PB 239-893) contains the "Interaction of DMTS Demand and Service Levels" and Appendix G (PB 239-894) contains the "Passenger Management Strategy Study."

TITLE: DUAL MODE TRANSIT SYSTEM
Phase I Final Report
Appendix A-E
AUTHOR: Transportation Technology, Inc.

DATE June 1974

PROJECT NO.: CO-06-0006

KEYWORDS:

1. Dual Mode Systems
2. Guideways

This report has been prepared by Transportation Technology, Inc. (TTI) as a result of work performed under contract to UMTA for the design phase of the three phase Dual Mode Transit System (DMTS) Development Program. This program is a part of an integrated UMTA RD&D program that applies new technology to existing means of mass transportation which are directed toward reducing traffic congestion and improving personal mobility within medium-to-large urban areas.

This particular report contains Appendices A through E of the main report (PB 239-841).

Appendix A contains a list of the documents which are the principal references cited in the main report. Appendix B is a list of abbreviations used. Appendix C gives the chassis structure calculation and Appendix D discusses the determination of ratio of buses to transporters required for dual mode transit system. The bid specifications of the Mercedes-Benz Diesel Bus Model 0309D are put forth in Appendix E.

Other documents in this project are Appendix F (PB 239-893) which contains "The Interaction of DMTS Demand and Service Levels" and Appendix G (PB 239-894) which is the "Passenger Management Strategy Study."

DUAL MODE TRANSIT SYSTEM

TITLE: Phase I Final Report

Appendix F: "The Interaction of DMTS Demand and Service Levels"

AUTHOR: Transportation Technology, Inc. and
International Research and Technology Corporation
(Martin Stern and Thomas Jones)

DATE June 1974

PROJECT NO.: CO-06-0006

KEYWORDS:

1. Models and Modeling
2. Trip Generation
3. Modal Split
4. Dual-Mode Systems

This report has been prepared by Transportation Technology, Inc. (TTI) as a result of work performed under contract to UMTA for the design phase of the three phase Dual Mode Transit System (DMTS) Development Program. This program is a part of an integrated UMTA RD&D program that applies new technology to existing means of mass transportation which are directed toward reducing traffic congestion and improving personal mobility within medium-to-large urban areas.

The purpose of this study, prepared under subcontract to International Research and Technology Corporation, was to determine likely demand and operational strategies of the TTI DMTS when placed in a realistic urban environment. The Washington, D.C. and Houston metropolitan areas were chosen as suitable sites for implanting a configuration of DMTS.

A computerized model was built to simulate trip generation, trip distribution and modal split. Demand for DMTS was simulated by trip purpose and time of day. Likely service strategy options were identified for different times of day, various trip purposes and locations. An objective function was formulated for evaluating the system performance.

It was concluded that TTI DMTS is capable of generating ample demand and providing a wide array of service responses. Future applications of the model will be able to put these results on a more quantitative basis and provide information useful for design, layout, control and questions of fare policy and equity of benefits.

A glossary and references are included.

Related documents are: the main report, "Dual Mode Transit System Phase I Final Report" (PB 239-841); Appendices A-E (PB 239-892) which contains applicable documents, list of abbreviations, chassis structure calculations, determination of the ratio of buses to transporters required for DMTS, and bid specifications for Mercedes-Benz Diesel Bus Model 0309D; and Appendix G (PB 239-894) which is the "Passenger Management Strategy Study."

TITLE: DUAL MODE TRANSIT SYSTEM
Phase I Final Report
Appendix G: "Passenger Management Strategy Study"

AUTHOR: Transportation Technology, Inc. and
System Development Corporation
(L. Farr, R. Lamoureux, Paul Rosenthal)

DATE: June 1974 PROJECT NO.: CO-06-0006

KEYWORDS: 1. Models and Modeling
2. Trip Generation
3. Modal Split
4. Dual-Mode Systems

This report has been prepared by Transportation Technology, Inc. (TTI) as a result of work performed under contract to UMTA for the design phase of the three phase Dual Mode Transit System (DMTS) Development Program. This program is a part of an integrated UMTA RD&D program that applies new technology to existing means of mass transportation which are directed toward reducing traffic congestion and improving personal mobility within medium-to-large urban areas.

This appendix, prepared under subcontract to the System Development Corporation in Santa Monica, California, views the DMTS based on the passenger interfaces of: demand generation, trip origination, fare collection, transfer operations and trip termination. Various passenger interface strategies are evaluated and procedures for off-guideway operations are recommended to maximize passenger service and satisfaction. Functional requirements for fare cards, trip tickets, service request equipment, fare collecting equipment, destination selection equipment and passenger information equipment are presented that can be met using existing technologies.

Related documents are the main report (PB 239-841); Appendix A-E (PB 239-892) which contains applicable documents, a list of abbreviations, chassis structure calculations, determination of the ratio of buses to transporters required for DMTS and bid specifications for Mercedes-Benz Diesel Bus Model 0309D. Appendix F (PB 239-893) contains "The Interaction of DMTS Demand and Service Levels."

TITLE: THE VALLEY TRANSIT DISTRICT DEMONSTRATION PROJECT
Interim Summary Report

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

DATE: July 1973 PROJECT NO.: CT-06-0003

KEYWORDS: 1. Small Cities 6. Fares, collection
2. Bus
3. Bus, shuttle
4. Demand Responsive Systems
5. Transportation Disadvantaged

The Valley Transit Demonstration Project represents a comprehensive and far reaching effort to develop new flexible forms of integrated transit operations to serve the transportation needs of many small to medium-sized communities. This interim report summarizes the significant results and accomplishments of this innovative bus transportation system which has been in public operation for approximately 6 months in the Southern part of Connecticut.

The three year program began July 1971 and is currently beginning its third year. The program was subdivided into two phases. The first phase (eighteen months in duration) was devoted to the design and development of the equipment and operations. The second phase, presently in progress for the remainder of the program, is concerned with testing and demonstrating the system in public operation.

The operations at the present time involve the use of six medium-sized buses which are owned and operated by the Valley Transit District (VTD) of Derby, Connecticut. Three types of transit services are provided to the residents of the area: door-to-door, rent-a-bus and shuttle service.

Major accomplishments of the project to date include: ridership response has been overwhelming with the VTD now taking action to more than double the size of their fleet; a new concept in fare collection based on the use of credit cards has been developed by RRC International, Inc. and is now operating as part of the system; and vehicle modifications conceived by RRC have been demonstrated in actual transit operations to be highly acceptable and effective means of solving bus entry/exit problems encountered by elderly/handicapped passengers. The new fare collection allows the passenger to use special identification cards instead of cash. The passenger inserts a credit card when getting on and off the vehicle and is billed monthly for the rides, just as the telephone and electric companies charge for their services.

TITLE: AERODYNAMIC AND THERMODYNAMIC VALIDATION TESTS IN THE
BERKELEY HILLS TUNNEL Volume 1. Final Report

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

DATE: June 1973

PROJECT NO.: DC-06-0010

KEYWORDS:

1. Computer Applications
 2. Tunnels and Tunneling
 3. Aerodynamics
 4. Thermodynamics
 5. BART
-

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

This particular report, in two volumes, describes a series of field tests conducted on the Bay Area Rapid Transit system in California to validate the analytical tools developed pursuant to the original initiation of the project. The report also presents direct comparisons of experiment and theory, demonstrating the applicability of the analytical tools to full scale rapid transit systems.

Volume I discusses near field aerodynamics, far field aerodynamics, thermodynamics, pressure transients, fan tests and references.

Volume II (PB 226-897/AS) contains detailed pressure requirements.

TITLE: AERODYNAMIC AND THERMODYNAMIC VALIDATION TESTS IN
THE BERKELEY HILLS TUNNEL Volume II. Final Report
AUTHOR: Transit Development Corporation, Inc.

DATE: June 1973 PROJECT NO.: DC-06-0010

KEYWORDS:

1. Tunnels and Tunneling
 2. BART
 3. Aerodynamics
 4. Thermodynamics
 5. Computer Applications
-

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

This particular report, in two volumes, describes the validation of the Subway Environment Simulation (SES) computer program. The validation was done by field test in the Berkeley Hills Tunnel of BART.

Volume II contains the detailed pressure measurement made inside the tunnel, on six-car trains and at the tunnel portal. Pressure measurements show entry and exit transients and pressure fluctuation inside the tunnel caused by both train and emergency fan operations.

Volume I (PB 226-898/AS) discusses near field aerodynamics, far field aerodynamics, thermodynamics, pressure transients, fan tests and references.

TITLE: AERODYNAMIC NEAR FIELD OF A SUBWAY TRAIN IN SMOOTH AND
ROUGH TUNNELS

AUTHOR: Transit Development Corporation, Inc. and California Institute
of Technology (Gordon L. Harris)

DATE: January 1973

PROJECT NO.: DC-06-0010

KEYWORDS:

1. Models and Modeling
 2. Environment and Environmental Control
 3. Underground Structures
 4. Tunnels and Tunneling
-

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

In this report, a theoretical model for the near field aerodynamics of a subway train in smooth and ribbed tunnels has been developed. The theoretical results have been compared with experimental data measured in a number of different facilities over a wide range of experimental conditions.

General discussion is followed by a chapter on frictionless annulus flow. Total drag, effects of annulus friction and annulus friction factors are examined. A chart of the comparison between theory and experiment is presented. Another chapter presents the solution for large X/λ , solution for small X/λ , effective blockage ratio and annulus tunnel wall drag.

Two figures are included along with many formulas. References are furnished.

TITLE: EXPERIMENTAL AERODYNAMIC CHARACTERISTICS OF VEHICLES IN CONFINED SPACES

AUTHOR: California Institute of Technology/Graduate Aeronautical Laboratories and Transit Development Corporation, Inc.

DATE December 1972

PROJECT NO..

DC-06-0010

KEYWORDS:

1. Aerodynamics
 2. Rail, systems planning and design
 3. Tunnels and Tunneling
 4. Drag
-

This report was prepared under the Transit Development Corporation, Inc., (TDC) project entitled, "Ventilation and Environmental Control in Subway Rapid Transit Systems," and is one of the many reports leading to the final product---a "Subway Environmental Design Handbook." Described are the results of the experimental effort pertaining to the aerodynamics of vehicles traveling in tubes conducted in the Vehicles In Confined Spaces (VICS) 70 foot and 120 foot high small-scale test facilities at the Jet Propulsion Laboratory. The theoretical counterpart of this report is "Theoretical Aerodynamic Characteristics of Vehicles in Confined Spaces" (PB 231-385).

Experimental investigations on the aerodynamic characteristics of vehicles traveling in tunnels have been carried out in the VICS facilities. The purpose of these investigations was to develop sufficient understanding of the scaling considerations of subway train system aerodynamics to make, with the use of the theoretical models, adequate predictions for full-scale systems. A considerable amount of high quality data has been obtained during the two years of testing.

A simplified theoretical model for a vehicle traveling through an unvented tube under equilibrium incompressible conditions was used to aid the test program, reduce the data, and determine the self-consistency of the results. These results were then used to establish values for the arbitrary coefficients in the theoretical model. According to the authors, progress has been made in understanding the aerodynamic characteristics of vehicles traveling in tubes. This is exemplified by the good agreement of the theoretical model predictions with the experimental data throughout the entire Reynolds number range ($10^4 < R_d < 10^6$) and geometric variables tested.

Operational aspects discussed are calibrations, flow velocity measurement, testing medium and compressibility. Among data presented are drag coefficient, tube flow velocity ratio, cross plots and pressure signatures. The data analysis includes tube entrance and exit losses, pressure versus velocity inferred aero-drag coefficient, sensitivity of predicted vehicle drag coefficient to variations in constants, test section wall friction factor, model and tube-wall annular friction factors, momentum coefficients and component parts of vehicle aerodynamic drag.

References and a bibliography are included and the appendices are "Data Reduction" and "Simplified Theoretical Model for Tube Vehicle Aerodynamics (Incompressible, Steady-State, Single Vehicle, Unvented Tube)."

NTIS ORDER NO.: PB 231-386

TITLE: SUMMARY OF PHASE II ACTIVITIES, Ventilation and Environmental Control in Subway Rapid Transit Systems

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

DATE January 1973

PROJECT NO.: DC-06-0010

KEYWORDS:

1. Rail, systems planning and design
 2. Environment and Environmental Control
 3. Aerodynamics
-

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

This particular report describes the various task assignments undertaken by all participating contractors during the second year of the project. Highlights of these activities are included and major accomplishments are identified.

Specific accomplishments cited in the report include: 1) the environmental criteria work is complete and the report has been drafted for inclusion in the final document, 2) the accumulation of test data on the VICS 120 at the California Institute of Technology is complete, including the development of scaling laws and aerodynamic theory, 3) the various vent shaft configurations were tested to provide fundamental information for incorporation in the mathematical models relating to real world configurations, and results of these tests were transmitted to the Washington Metropolitan Area Transit Authority and the Chicago Transit Authority, 4) the analytical work was completed for the single track case, 5) the Port of New York Authority funded a single-track computer model to analyze 77 possible alternate ventilation design schemes, and 6) a serendipitous improvement in the ventilation and air conditioning system design of the Washington Metro based on the work in this project dealing with heat gain analysis, an unplanned benefit which, according to WMATA, has saved them 2 million dollars in construction costs.

Particular matters considered in the report include vent shaft inlet configurations, number of vent shafts required, factors affecting train power requirements, station air conditioning, and additional uses of test facilities.

A list of the technical reports prepared during the Phase II project is also included.

TITLE: THEORETICAL AERODYNAMIC CHARACTERISTICS OF VEHICLES IN CONFINED SPACES
AUTHOR: California Institute of Technology/ Graduate Aeronautical Laboratories, and Transit Development Corporation, Inc.

DATE March 1974 PROJECT NO.: DC-06-0010

KEYWORDS:

1. Aerodynamics
 2. Rail, systems planning and design
 3. Tunnels and Tunneling
 4. Drag
-

This report was prepared under the Transit Development Corporation (TDC) project entitled, "Ventilation and Environmental Control in Subway Rapid Transit Systems," and is one of many reports leading to the final product---a "Subway Environmental Design Handbook."

Trains moving in tubes experience drag forces which may be orders of magnitude higher than when in free air. A knowledge of such forces and their dependent parameters is essential in determining the tube optimal ventilation design as well as the moving and braking powers.

The piston action of the train causes the air in the tube to move with a velocity which is dependent on the train speed and blockage ratio. When in steady state, tube and train friction forces are the only cause of the drag. When in unsteady motion (acceleration), fluid particles are accelerated, causing additional pressure drag on the train. A train accelerating from rest in a tube causes compression and expansion waves to propagate from its front and rear ends respectively. This results in pressure increase and decrease at the respective ends. If a vent exists in the tunnel, drag forces are reduced; however, as the vehicle passes the vent, there is a sudden increase in drag due to the difference in flow velocities ahead of and behind the vent. The problem of a vehicle entering a tunnel with finite speed is also of interest. In this case a sharp increase in drag is initially experienced. Sudden acceleration of tunnel air at the entrance results in propagation of a shock wave down the tunnel which reflects from the tube end as an expansion fan which interacts with the vehicle.

Experimental and theoretical work on the subject of tube vehicle aerodynamics exists, mainly concerned with studying the problem of a vehicle accelerating from rest in an unvented tube. This report concentrates on the entry problem and the problem of the vented tube. It is the theoretical portion of the total effort. The experimental part was developed at the Jet Propulsion Laboratory, utilizing the VICS-70 and VICS-120 (Vehicles In Confined Spaces) facilities. That report is "Experimental Aerodynamic Characteristics of Vehicles in Confined Spaces." (PB 231-386)

Problem formulation, method of solution and examples and discussion are presented. References are furnished and numerous figures and statistical data support the text.

TITLE: THERMAL BEHAVIOR OF TRANSIT VEHICLE RESISTOR GRIDS

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

DATE: January 1973

PROJECT NO.: DC-06-0010

KEYWORDS:

1. Thermodynamics
 2. Rail, systems planning and design
 3. Environment and Environmental Control
 4. Computer Applications
-

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

It describes a mathematical model and a corresponding computer subroutine which characterize the thermal behavior of transit vehicle acceleration and deceleration resistor grids. This subroutine is part of the Subway Environment Simulation (SES) computer program. The mathematics involved comprise a "lumped thermal model" which characterizes a resistor grid and a numerical integration technique designed to solve the governing differential equation. Field test data were used to calibrate and validate the thermal model.

There is also an application and discussion of the results along with the author's conclusions and a list of references.

TITLE: VENT AND STATION TEST (YST) FACILITY SINGLE AND DOUBLE TRACK
STATION TESTING

AUTHOR: Transit Development Corporation

DATE: September 1972

PROJECT NO.: DC-06-0010

KEYWORDS:

1. Rail, stations and terminals
 2. Quantitative Analysis
 3. Aerodynamics
-

This is one of many reports leading to the final product, a "Subway Environmental Design Handbook". This particular report studies the airflow generated by a single train in a single track tunnel entering or leaving a station. The case of opposing trains entering or leaving the station from both ends of the station simultaneously is also studied experimentally.

Quantitative knowledge of aerodynamic behavior of the subway station under train piston action is necessary in order to implement analytical methods to simulate the airflow and heat distribution in subway systems. Because of the great complexity of the problem, quantitative analytical or semi-analytical methods need to be developed in order to predict the airflow and pressure distributions so that analytical subway environmental simulation models may be designed.

The report resulted in the development of a simplified theoretical model characterizing the station flow distribution and would require the use of the empirical normalized pressure signature of the station. The theory was applied to many different stations and was found to have greater accuracy in longer stations with higher impedance and in shorter stations with lower impedance, agreement was within twenty percent.

There are many charts and drawings which illustrate the findings of the report.

TITLE: VANDALISM AND PASSENGER SECURITY: A Study of Crime and Vandalism
in Urban Mass Transit Systems in the United States and Canada

AUTHOR: American Transit Association (John B. Schnell, et al.)

DATE September 1973

PROJECT NO.: DC-06-0017

KEYWORDS:

1. Crime and Crime Prevention
2. Social Benefits and Costs

This study analyzes the extent and seriousness of crime and vandalism on urban mass transit systems and examines approaches for dealing with the problem.

On the basis of data obtained from thirty-seven U.S. transit systems, the range of the total number of criminal incidents on all U.S. transit systems in 1971 is estimated at approximately 33,000 to 39,000. The range of total national transit vandalism costs is from \$7.7 million to nearly \$10 million. The main components of vandalism costs are window breaking, damage to seats, damage to stationary facilities, and graffiti.

Chapter IV of the study describes glazing, seating, and panelling materials that resist damage. Chapter V discusses devices and procedures for protecting passengers and employees; and deterring criminals and vandals, keeping them under surveillance, and helping apprehend them after crimes are committed. Chapter VI describes programs and liaison efforts directed at maintaining good relations with community and educational circles and involving them in the anti-vandalism effort. Chapter VII looks at relations between transit systems and institutions such as the police, the judiciary, educational authorities, and the mass media as factors in discouraging crime. The final Chapter presents six case studies of passenger attitudes in an attempt to assess the influence that fear of transit crime and vandalism exerts on passenger decisions concerning use of urban mass transit facilities.

TITLE:

MARKETING TECHNIQUES AND THE MASS TRANSIT SYSTEM

AUTHOR:

National Urban League, Inc. and Mark Battle Associates, Inc.

DATE:

June 1973

PROJECT NO.:

DC-06-0020

KEYWORDS:

1. Market Research
2. Communications
3. Information Aids
4. Management, planning and analysis

This transit information and marketing study was performed with two objectives in mind: (1) to identify marketing and information techniques being used successfully by mass transit systems to increase patronage and make their systems more accessible to the public, and (2) to develop a model for evaluating transit information and marketing systems and to develop methods to increase the effectiveness of these systems.

Three methods were used to gather the information in this report: a literature search, a written questionnaire to transit systems, and visits to five cities for personal interviews with transit system officials. The study describes a number of efforts being made in various places to overcome the problems confronting transit systems. The main problems are found to be competition with other transportation modes (especially automobiles), increasing costs, and communications barriers between transit systems and the public.

The authors provide a series of recommendations designed to solve these problems as well as suggesting areas in which further work and research may be useful. There are ten chapters arranged in three main sections: Marketing Concepts, Marketing in Five Selected Transit Systems, and a Systematic Marketing Evaluation Model.

A companion to this report, MARKETING TECHNIQUES AND THE MASS TRANSIT SYSTEM, A HANDBOOK (PB 223-736), includes specific examples of all the types of mass transit promotional advertisements and promotional pamphlets for use by all media.

TITLE: MARKETING TECHNIQUES AND THE MASS TRANSIT SYSTEM: A HANDBOOK

AUTHOR: National Urban League, Inc. and Mark Battle Associates, Inc.

DATE: July 1973

PROJECT NO.: DC-06-0020

KEYWORDS:

1. Market Research
 2. Information Aids
 3. Communications
-

This handbook contains a selection of materials that have been used by transit systems to promote their services or to provide the public with information about using their services. The samples here represent what the authors consider to be some of the more creative pieces that were provided by the fifty-eight transit systems covered in the research on the main report, MARKETING TECHNIQUES AND MASS TRANSIT SYSTEMS (PB 223-735).

The main report, a transit information and marketing study, was performed with two objectives in mind: (1) to identify marketing and information techniques being used successfully by mass transit systems to increase patronage and make their systems more accessible to the public, and (2) to develop a model for evaluating transit information and marketing systems and to develop methods to increase the effectiveness of these systems.

This volume is designed to support the purposes of the main report and to aid other transit systems in their selection of materials for their own marketing campaigns. Partial contents include: pamphlets and newspaper advertisements on rider reinforcement, newspaper advertisements on encouraging modal switch and notices of systems changes, schedules, special information tools, maps, news releases, radio spot advertising, multi-lingual announcements and announcements of special public relations activities. The format is largely graphic with very little commentary.

TITLE: TRANSPORTATION FOR THE ELDERLY AND HANDICAPPED

AUTHOR: National Urban League, Inc. and Mark Battle Associates, Inc.

DATE: July 1973

PROJECT NO.: DC-06-0020

KEYWORDS:

1. Elderly
2. Handicapped
3. Transportation Disadvantaged

The purposes of this study are to explore the characteristics of transit usage by the elderly and handicapped and to identify the major constraints to their use of mass transit systems including physical and psychological limitations, transportation costs, travel needs, information needs, and other problems as ascertained by the elderly and handicapped themselves.

The two primary methods of research were a search of literature relating to the transportation needs and problems of the elderly and the handicapped and case studies of four cities in which their needs and problems were considered in detail. The four cities are Albany, Knoxville, Sacramento, and South Bend, which were chosen with regard to population, geography, socio-economic characteristics, mass transit use as compared to automobile use, type of mass transit in use, and percentage of elderly and handicapped. Each of the cities has a percentage of elderly residents higher than the national average, which is 10%, and all are served by a bus system.

Findings are summarized according to the following categories: transit usage by the elderly and handicapped, physical limitations and psychological constraints, transportation costs, responsiveness of the transit system to travel needs, preferred and most used information sources, and service and system improvements. It was also found that the handicapped spend more money on transit, encounter more difficulties using mass transit, and use mass transit less than the elderly.

The report concludes with lists of recommendations which would enable the transit system to remove barriers associated with physical, institutional, economic, information and service functions to better supply the needs of the elderly and handicapped.

TITLE: URBAN TRANSPORTATION: MINORITY MOBILITY IN THE 70's

AUTHOR: Howard University/School of Social Work

DATE: January 1972

PROJECT NO.: DC-06-0026

KEYWORDS:

1. Inner City
2. Transportation Disadvantaged
3. Community Response
4. Universities

This report represents a conference which took place at Howard University on January 17 and 18, 1972, concerning transit mobility for the urban minorities, especially the aged, the poor, the handicapped, the young, and other transit deprived. The purpose of the conference was to increase the participation of minorities, including citizens, businesses, and representative community groups, in transportation planning, thereby improving transit service in minority communities while assuring the participation of the communities themselves.

Recommendations resulting from the conference include: (1) that UMTA support development of legislation making minority representation on transit policy boards a prerequisite for Federal funds; ascertain whether minorities are being included in the hiring, planning and execution of Federally funded projects; and to support Title VI of the 1964 Civil Rights Act; (2) that private transportation systems and UMTA recognize the distinct and changing needs of riders in modernizing routes, insuring reasonable fares, accomodating the youth and aged, and providing grants and subsidies where necessary to maintain efficient service; (3) that public education programs and increased interaction between citizen consumers and those in power be encouraged to improve the exchange of valid information; (4) that assistance be demanded to provide the pressure and technical skills necessary to persuade unions to increase minority membership; (5) that neutral regional transportation planning organizations be advocated and than an informal minority transit board be created.

Speakers included representatives of minority organizations, transit corporations, the Department of Transportation, Congress, businesses, and Howard University professors.

TITLE: PHILADELPHIA CENTRAL BUSINESS DISTRICT PARKING RATE EXPERIMENT

AUTHOR: Delaware Valley Regional Planning Commission

DATE: September 1974

PROJECT NO.: DC-06-0062

KEYWORDS:

1. Parking, facilities
2. Parking, planning
3. Parking, capacity and demand
4. Center City

The Philadelphia Central Business District (CBD) Parking Rate Experiment is one of the elements of DOT's Urban Corridor Demonstration Program. The Program's purpose is to maximize the use of transportation related facilities with a relative minimum expenditure of capital.

This parking rate demonstration project was designed to investigate public response to an experimental rate structure of an off-street parking facility. This would provide the short-term (non-commuter) parker with a marked rate advantage, so as to stimulate transient-type activity at the expense of the all-day (commuter) parker. Additionally, this project demonstrated the capability of the proposed rate structure to act as a mechanism for increasing the turnover rate (utilization) and revenue of such a facility.

The parking data collected for the period January 1970 to October 1973 was evaluated in order to determine how natural rate changes affected the general parking behavior. Two garages were chosen for this analysis on the basis of their different locations within the Philadelphia CBD, one serving an area of mostly retail and commercial interests and the other in the midst of heavily concentrated office buildings.

A sensitivity analysis concluded that rate changes have an affect on parkers, their related revenues and turnover rates.

According to the authors, changes made in the rate structures showed that the objectives of this experiment were accomplished. The rates have favored the short-term parker while long-termers have shown decreased usage over most periods. The turnover rates have increased thereby requiring potentially less new parking space construction. The economic viability of both facilities was maintained. Both garages showed growth in gross revenue.

Tables complement the text.

TITLE: DOWNTOWNER BUS SERVICE
Final Report

AUTHOR: District of Columbia Department of Highways and Traffic
(A.L. Neumann and Staff of Office of Planning and Programming)

DATE: November 1974

PROJECT NO.: DC-06-0069

KEYWORDS:

1. Bus, intracity
2. Bus, minibus
3. Center City

The Washington, D.C. Downtowner "Midibus" Demonstration Program has for its goals: (1) reduction of downtown congestion; (2) reduction in the size of transit coaches in the city core area; (3) reduced air pollution; (4) assistance and support of downtown revitalization efforts; (5) a revenue-cost ratio of 0.5; and (6) optimum routing of downtown circulation vehicles. The medium-sized bus, 25 feet long and 8 feet wide, has peripheral seating for 25 and a standing capacity of 15.

Detours created by the construction of the Washington Metropolitan area rapid rail transit system (METRO) hampered complete realization of project objectives. The Daytime Connector Route proved, however, to be optimum by all performance measures as indicated. By completion of the program on June 30, 1974, more than 1,200,000 passengers had been carried on the routes, nearly all on the Connector Route.

In July, 1974, the service was taken over by the Washington Metropolitan Area Transit Authority in consonance with an agreement with the District Government to continue the service if the demonstration proved to be utilitarian and well patronized.

A modified-zone fare structure proved acceptable and the service-cost ratio of 0.5 was exceeded by a wide margin - the figure approached 0.75 near the completion of the program. Both low fare and convenience of movement within the CBD encouraged public use of mass transit to circulate around the CBD for shopping and other errands. The net result was a reduction of downtown traffic with consequent lowered air pollution and progress in efforts to revitalize the downtown area.

Chapters address project structure in terms of financing, management and publicity, the description and reliability and maintenance of project vehicles, liquified natural gas fuel system, and ridership. Conclusions are presented.

TITLE: CONFERENCE ON TRANSPORTATION AND HUMAN NEEDS IN THE 70's
Second Phase

AUTHOR: The American University

DATE: July 19-21, 1972

PROJECT NO.: DC-06-0070

KEYWORDS:

- | | |
|-----------------|--|
| 1. Elderly | 5. Government, intergovernmental relations |
| 2. Handicapped | 6. Transportation Disadvantaged |
| 3. Youth | |
| 4. Universities | |
-

This report covers a conference which was held in July, 1972, at The American University on "Transportation and Human Needs in the 70's." The purpose of the conference was to explore the methods that are or could be employed by public transit bodies to meet the special needs of transit dependent groups in the United States. These groups include the elderly, handicapped, youth, the urban poor, the rural poor, and other people who are deprived of the regular use of the automobile in order to reach their jobs.

Attendees included representatives of groups and organizations familiar with the needs of transit-dependent people. Specific areas represented were the Department of Transportation, the transit industry, knowledgeable experts from Federal, state and local governments, industry, labor, universities and other interested groups.

The report contains four background papers which were prepared for the participants, various papers which were given at the conference, reports on the various workshops which were held, recommendations and actions resulting from the conference, participants' views and opinions, a forecast of the future of mass transit for the disadvantaged and the disabled, and a list of the participants.

Altogether there were twenty-one workshops, at least seven addresses by transit leaders and, on the third day of the conference, an open retrospective discussion which is transcribed in the report.

TITLE: BILINGUAL TRANSIT MARKETING DEMONSTRATION
Volume I: Description of Project and Evaluation of Data
AUTHOR: J. A. Reyes Associates, Inc.

DATE September 1973 PROJECT NO.: DC-06-0073

KEYWORDS:

1. Market Research	5. Advertising and Promotion
2. Bus, intracity	
3. Transportation Disadvantaged	
4. Community Response	

This report describes the design, demonstration and evaluation of four different experiments in mass transit advertising among Mexican Americans. The objective of this project was to explore the possibility of improving bus ridership through bilingual advertising and promotional techniques. The cities selected for the demonstration were: Albuquerque, New Mexico; Corpus Christi, Texas; San Antonio, Texas; and San Diego, California.

The promotional program was geared toward mid-day ridership when bus capacity is somewhat under-utilized. The Mexican American housewife was the principal focus of the study.

Distinctly different promotional demonstrations were conducted in each of the cities, yet each of the demonstrations sought to involve the population. Demonstration techniques included: bilingual hostesses; advertising in newspapers and on radio; a four color transit map; a Spanish language brochure which listed routes to principal places of business, shopping and community services; a shopping bag advertising the system; and, coupons for free rides.

Volume II of this report (PB 227-271) contains the results of the pre-demonstration and the post-demonstration surveys. The order number for the set of two reports is PB 227-269-SET (\$11.00).

TITLE: BILINGUAL TRANSIT MARKETING DEMONSTRATION
Volume II: Appendices

AUTHOR: J.A. Reyes Associates, Inc.

DATE: September 1973

PROJECT NO.: DC-06-0073

KEYWORDS.

1. Transportation Disadvantaged
2. Community Response
3. Market Research
4. Bus, intracity
5. Advertising and Promotion

This study describes the design, demonstration, and evaluation of four different experiments in mass transit advertising among Mexican Americans of the Southwest. The objective of the project was to explore the possibility of improving the bus ridership of this group through bilingual advertising and promotional techniques. The cities selected for demonstration were: Albuquerque, New Mexico; Corpus Christi, Texas; San Antonio, Texas; and, San Deigo, California; selected because they represented diversity of geography, culture, administration, and urbanization, while reflecting adequate homogeneity in Mexican American concentration. The promotional programs centered on mid-day ridership, when bus capacity is under-utilized. Pre-and post-demonstration surveys were conducted both on the buses and within a 1/4 mile radius of the routes.

This report summarizes the survey results by means of 264 different tables divided into eleven categories: (1) pre-demonstration survey, all sites, frequency counts; (2) pre-demonstration survey, all sites, cross tabulations; (3) pre-demonstration survey, Albuquerque, cross tabulations; (4) pre-demonstration survey, Corpus Christi, cross tabulations; (5) pre-demonstration survey, San Antonio, cross tabulations; (6) pre-demonstration survey, San Diego, cross tabulations; (the next five all concern post-demonstration surveys) (7) all sites, frequency counts; (8) Albuquerque, tabulations; (9) Corpus Christi, cross tabulations; (10) San Antonio, cross tabulations; and, (11) San Deigo, cross tabulations. The pre-demonstration survey explored personal characteristics, ridership habits, and transit attitudes. The post-demonstration survey explored similar questions about personal characteristics as well as the exposure and effect of the promotional demonstrations.

TITLE: SAFETY PRIORITIES IN RAIL RAPID TRANSIT
Volume 1: Report

AUTHOR: Transit Development Corporation
(W.M. Connell)

DATE: March 1975

PROJECT NO.: DC-06-0091

KEYWORDS: 1. Safety
2. Rail

Rail rapid transit presently produces the lowest number of fatalities of any of the major passenger transportation modes. This report develops a program to identify what should be done to aid in assuring that rail rapid transit safety continues.

All aspects of rail rapid transit safety are reviewed, hazards identified, priorities established, and remedial actions recommended.

Recommendations involve: (1) an evaluation program for materials which utilizes new methods of computing and assessing risk in the areas of flammability, smoke and toxicity; (2) compilation and dissemination of procedures, techniques and equipment used in the safe evacuation of rail rapid transit patrons; (3) an improvement study of fixed stairs in rail rapid transit facilities to determine whether significant reduction can be achieved in the number of patron falls; (4) a safety education plan to produce films for public education and use in primary schools; (5) work efforts in the development of fire detection and transit vehicle fire extinguishing equipment; (6) establishment of criteria for transparencies used for transit vehicles; (7) determination of hazards of power regeneration and energy storage on rail rapid transit systems and evolution of procedures to eliminate them; and (8) continuation and support of the Safety Advisory Board techniques for analyzing and assessing safety of rail rapid transit to help assure coordinated technical information input to transit safety development.

Chapters address the project plan and its execution, the Safety Advisory Board, identified priorities, fire safety, patron safety, operating safety, and data summary and cost estimates. Recommendations are presented and a bibliography is furnished. Exhibits are contained in "Safety Priorities in Rail Rapid Transit - Volume 2 - Exhibits" (PB 242-954).

TITLE: SAFETY PRIORITIES IN RAIL RAPID TRANSIT
Volume 2: Exhibits

AUTHOR: Transit Development Corporation (TDC)
(W.M. Connell)

DATE: March 1975

PROJECT NO.: DC-06-0091

KEYWORDS:

1. Safety
2. Rail

This report contains the exhibits of "Safety Priorities in Rail Rapid Transit - Volume 1 - Report" (PB 242-953). Rail rapid transit presently produces the lowest number of fatalities of any of the major passenger transportation modes. This report develops a program to identify what should be done to aid in assuring that rail rapid transit safety continues. The Volume 1 report reviews all aspects of rail rapid transit safety, identifies hazards, establishes priorities, and recommends remedial actions.

Exhibits are as follows: (1) Work Statement; (2) Project Implementation Plan; (3) Safety Advisory Board; (4) & (5) Safety Advisory Board Meeting Agendas and Minutes; (6) Safety Advisory Board Committee Meeting Minutes; (7) Montreal Fire Report; (8) Compilation of Safety Related Items; (9) Accident Source Items Final Listing; (10) TDC Monograph Series 500 "Transit Flammability Requirements" 500-3; (11) UITP - Combustibility of Material Used in the Construction of Modern Rolling Stock; (12) Work Statement on Non-metallic Materials; (13) Consultants Report on Fire Safety of Materials; (14) Engineering for Fire Safety of Rail Rapid Mass Transit Systems - SRI; (15) TDC Monograph Series 500 "Smokeless Cable" 500-2; (16) NASA Problem Statement No. 72-04-025 Smokeless Non-Toxic Cable; (17) Fire Extinguishing System - 8-74; (18) Work Statement - The Development of a Method and Equipment for Early Detection of Fire, etc.; (19) A proposed Study of Accidents on Fixed Stairs in Rapid Transit Stations - E. Novell; (20) Proposed Work Statement "Design, Test and Acceptance Criteria for Transparencies"; (21) Work Statement for the Production and Distribution of a Safety Film on Mass Transit; (22) Train Screen - A Concept and a Cost Saving; (23) Passenger Train Screens - TTC 7-74; (24) Proposed Statement of Work for the Compilation of Methods and Equipment for the Evacuation of Passengers; (25) Proposed Study of Regeneration Safety; (26) a. Prototype Sled Arrestor, b. Transit Vehicle Detection System, PP74-107 (title page only); and (27) TDC Memo - 12-19-74 Visit to San Francisco Muni.

TITLE: GUIDELINES ON THE OPERATION OF SUBSCRIPTION BUS SERVICES

AUTHOR: The Urban Institute (Ronald F. Kirby and Kiran U. Bhatt)

DATE: August 1974

PROJECT NO.: DC-06-0093

KEYWORDS:

1. Bus, commuter
2. Bus, express
3. Demand responsive systems
4. Fare, passes
5. Bus, priorities

The purpose of this report is to provide guidelines on the planning, organization, and operation of subscription bus services. The report deals with identifying potential riders; obtaining vehicles and drivers; meeting regulatory requirements; setting routes, schedules, and fares; revising routes and schedules as demand changes; and obtaining such special privileges as the use of express lanes, priority movement at intersections, and close-in parking.

The term "subscription" has been applied recently to a variety of specialized bus services tailored to serve urban travelers who patronize them on a regular basis, usually for their daily trips to and from work. While subscription services can be provided by taxicabs, vans, or small buses, as well as by larger 40 or 50 passenger buses, this report concentrates only with services provided by large buses.

Guidelines suggest that the following characteristics are among those critical to the successful operation of subscription bus services: a relatively large concentration of at least 50 fairly long trips with proximate origins or destinations and common, regular schedules; a dedicated organizational body to formulate the service and manage it on a continuing basis; a convenient source of buses and drivers (such as a transit authority or charter bus operator); and provision of personalized service features, such as guaranteed seating, door-to-door service and express ride.

The guidelines are based on detailed case studies of subscription services in Wentzville, Missouri; Fredericksburg, Virginia; Huntington Beach, California; Reston, Virginia; the San Francisco Mid-Peninsula; Gaithersburg, Maryland; Los Angeles, California; Golden Gate Bridge, Highway and Transportation District "Commuter Clubs"; Flint, Michigan; and Peoria, Illinois.

The report concludes with a discussion of the potential impacts of these services on the congestion, pollution and fuel consumption associated with urban travel.

A glossary and bibliography are furnished.

TITLE: PLAN TO IMPROVE TRANSPORTATION FOR THE ELDERLY

AUTHOR: East Central Florida Regional Planning Council

DATE June 1973

PROJECT NO.:

FL-06-0005

KEYWORDS:

1. Planning, tools
 2. Elderly
 3. Financing Mass Transportation
 4. Transportation Disadvantaged
-

Recognizing the need for improved transportation services for the elderly living within Orange, Seminole, and Osceola Counties, Florida, a planning study was undertaken to more specifically identify their needs and develop recommendations to respond to these needs. The planning phase was jointly funded by UMTA, the Florida Department of Transportation and the Orange-Seminole-Osceola Transportation Authority as part of a Service Development Program. Upon completion of the planning phase, a second grant application was prepared and submitted to carry out a 24 month demonstration program within the three county region.

The purpose of this demonstration project was to increase mobility of the elderly citizens living within the study area and in doing so increase their opportunity to participate more fully in obtaining and using the services and facilities available within the community.

The planning phase analyzed the transportation needs of the elderly, evaluated several alternative approaches to meeting these needs, and developed a recommended plan of operations to be tested during the demonstration phase. Throughout the planning phase, community participation was maintained through the Senior Citizen Transportation Advisory Commissions within each of the three counties. The recommended plan reflects the outcome of frequent discussions with the 3 advisory commissions and the County Commissioner representative on the transportation authority.

The following are objectives to be met by the transportation systems; it must be known and understood by the user, convenient to use, comfortable, designed to interconnect elderly residential locations with destinations to which they desire access; and it must be "cost-effective."

To meet the mobility needs of the elderly, it is further recommended that eight twenty-five to thirty passenger vehicles be purchased. Within the central Orange County area the service will be on a door-to-door basis to serve those who cannot use regularly scheduled transit.

Tables include population characteristics and county service costs. Among the figures is a distribution of elderly by census tract map. Appendix "A" contains the development of unit costs and "B" names the advisory commissions on senior citizen transportation.

TITLE: TRANSPORTATION OF THE ELDERLY (TOTE): A Pilot Project to Develop
Mobility for the Elderly and the Handicapped

AUTHOR: City of St. Petersburg
Florida Department of Transportation

DATE: April 1974

PROJECT NO.: FL-06-0007

KEYWORDS:

1. Elderly
2. Handicapped
3. Transportation Disadvantaged
4. Demand Responsive Systems

The Transportation of the Elderly (TOTE) Demonstration Project in St. Petersburg, Florida, was initiated for the purpose of improving and increasing the mobility of the elderly and handicapped. This demonstration is being conducted in a ten square-mile area which houses a target group of 30,000 persons.

Reservation, Subscription, Demand Response and Rent-a-Bus are the four door-to-door services being utilized to provide the elderly (60 and over) and the handicapped (no age limitation) with increased mobility. Thirteen customized maxi-vans provide service Monday through Friday from 7:30 A.M. until 7:00 P.M. and on Sunday from 9:00 A.M. until 2:00 P.M. At the conclusion of the demonstration it is anticipated that TOTE will be integrated with the Municipal Transit System to complement the more than 30 fixed routes presently in operation within the demonstration area.

Public acceptance and utilization of door-to-door transportation was slower than anticipated. However, once individuals utilized the service, they usually became steady riders. In fact, travel frequency tended to increase as a rider realized just what opportunities were available.

As a means of control and a method of identifying the riders, a registration program was initiated four months before service started. Approximately 7,000 persons had registered prior to the first passenger pick-up. This figure had increased to 12,626 as of March 31, 1974. It is expected that close to 20,000 persons will be registered by the end of the demonstration project.

Among the findings are: the two major outgoing trip purposes for the first six months of operation have been medical/dental (27.9%) and personal business (25.9%); peak hours have been between 10 A.M. and noon; and, reservation and subscription services have been used by approximately 85% of the riders during each month of operation.

Appendices include a map of the area, registration posters and photographs.

TITLE: ATLANTA MODEL CITIES SHUTTLE BUS

AUTHOR: Metropolitan Atlanta Rapid Transit Authority

DATE: May 1972

PROJECT NO.: GA-06-0001

KEYWORDS:

1. Bus, shuttle
 2. Inner City
 3. Surveys
-

In June 1969, a shuttle bus transit system demonstration project was initiated in the Atlanta Model Cities area, created under the 1964 Demonstrations Cities Act to eliminate the concentration of social, economic and physical problems besetting many urban areas. The Model Cities Agency was responsible for all phases of operation until August 1971 at which time the Metropolitan Atlanta Rapid Transit Authority (MARTA) assumed a number of administrative functions including promotion and evaluation of the system.

This report was prepared as part of MARTA's evaluation of the system to give a complete history of the shuttle service, detail the financial aspects of the system, determine the characteristics of the passengers, and to evaluate the entire system's performance and promotion program which was developed under MARTA's supervision.

A home survey of riders and non-riders was conducted, covering trip making characteristics of passengers, reason for use and non-use of the shuttle system, and to evaluate the results of the promotional program. Survey results and questionnaires are included in the appendices.

TITLE: NORTHWEST PASSAGE DEMONSTRATION PROJECT

AUTHOR: Chicago Transit Authority
Chicago and North Western Railroad

DATE May 1973

PROJECT NO.

IL-06-0009

KEYWORDS:

1. Rail, commuter
 2. Ridership, attraction
 3. Rail, stations and terminals
 4. Pedestrians
-

"Northwest Passage" was designed to provide a convenient pedestrian interchange between a commuter railroad and a rapid transit line in the Chicago area. It was the first transit project in the nation combining both capital grant and demonstration grant programs of UMTA into a single coordinated project involving two transportation agencies---Chicago Transit Authority (CTA) and Chicago and North Western Railroad (C&NW)--- and the City of Chicago, Department of Public Works.

A modern, weather-protected connecting passageway between C&NW's suburban concourse in the main passenger terminal and the mezzanine level of the Clinton-Lake station on CTA's Lake-Dan Ryan rapid transit route was constructed. The Clinton-Lake rapid transit station was rehabilitated.

Objectives of the study were to: (1) determine the effect of rider use of the Passage on the Chicago and North Western Railroad, the Chicago Transit Authority's rapid transit line, and other transportation modes; (2) ascertain the characteristics of riders gained or lost and the reasons for use of each particular mode; (3) determine the desirability of additional coordination between services in other instances; (4) test whether the connection will provide linkage between job opportunities and residence areas of potential employees; and, (5) develop guidelines useful in preparing a comprehensive metropolitan transportation plan and, most specifically in Chicago, for application to the Central Area Transit Study.

A discussion of the analysis of passenger surveys includes market analysis methodology, A.C. Nielsen Survey results and CTA passenger surveys. Project development is delineated. The marketing program is focused upon with graphic displays of the promotion of Northwest Passage.

The appendices contain CTA and CNW service information, photographs, and promotional materials including radio scripts and brochures.

TITLE: MONITOR-CTA
Final Report

AUTHOR: Chicago Transit Authority (Martin Lukes, Raymond Shea)

DATE May 1973

PROJECT NO.: IL-06-0010

KEYWORDS:

1. Vehicle, monitoring
 2. Bus
 3. Communications
 4. Computer Applications
 5. Safety
-

This report discusses a monitoring system which was implemented to test the practicability of centralized automatic schedule adherence checking, the effectiveness of a clandestine alarm aboard a transit vehicle and the possibility that such an automated system would allow significant improvement in radio channel utilization.

The evaluation was performed by collecting data pertinent to the system's performance (i.e., accuracy and reliability) in specifically designed experiments. The optional aspect was evaluated by collecting data before and after implementation.

The results of the evaluation indicate an excellent potential for increased management information. Although the system performance was adversely affected by poor reliability of the initial equipment aboard the buses, it was shown that this system can maintain schedule adherence at least as well as the present methods, accurately locate a vehicle in an emergency, and provide the information capacity of twice as many conventional voice radio channels.

From these results it is concluded that this system is a good investment. Acceptable reliability in future equipment should be facilitated through the technological developments that have taken place since the project was undertaken. Simultaneous modifications in software based on experience with this pilot installation may promote expanded usefulness of the system.

TITLE: DEVELOPMENT OF EXPERIMENTAL DESIGN METHODOLOGY FOR EVALUATING
MASS TRANSIT DEMONSTRATIONS: AN APPLICATION TO THE SEATTLE
BUS SERVICE DEMONSTRATION PROJECT Volume I: Executive Summary
and Main Report

AUTHOR: Northwestern University/The Transportation Center

DATE: September 1973

PROJECT NO.:

IL-06-0021

KEYWORDS:

1. Research Operations
 2. Bus, express
-

The Urban Mass Transportation Administration, through its RD & D Program, has been actively involved in the process of funding full-scale transit demonstration projects in select metropolitan areas throughout the country. These demonstrations are carried out for the purpose of research, testing and evaluation of transit concepts with potential nationwide implications.

One major objective to be accomplished as an integral part of the demonstration program is the development of a systematic and effective means of evaluation which will enable UMTA to determine not only the effectiveness of the specific projects, but also the extent of application to other areas of the country.

The Transportation Center of Northwestern University sought to accomplish this objective by means of this study. This summary report was aimed at accomplishing three primary objectives: (1) determining the feasibility of using experimental design methodology to evaluate transit demonstration projects; (2) utilizing the methodology in assessing the impact of transit innovations; and (3) determining the implications and applications of the demonstration findings in other locales, as well as appropriateness of the evaluation methods used.

The basic steps of the approach were developing an experimental design, testing the design methodology and evaluating the results. The demonstration setting was established in Seattle, Washington where an express bus service demonstration project was initiated in 1970 supported by UMTA R&D funds.

It was concluded, among other things, that the utilization of an experimental design methodology is a most efficient and economical means of evaluating demonstration projects on a micro-level, where differences in effectiveness and estimates of performance potential can be measured.

Tables complement the text. Appendices are contained in Volume II of the report, "Development of Experimental Design Methodology for Evaluating Transit Demonstrations: An Application to the Seattle Bus Service Demonstration Project - Volume II - Appendices" (Order No. PB 235-510).

TITLE: DEVELOPMENT OF EXPERIMENTAL DESIGN METHODOLOGY FOR EVALUATING
MASS TRANSIT DEMONSTRATIONS: AN APPLICATION TO THE SEATTLE
BUS SERVICE DEMONSTRATION PROJECT Volume II: Appendices

AUTHOR: Northwestern University/The Transportation Center

DATE September 1973 PROJECT NO.: IL-06-0021

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This report contains the appendices of the Volume I (PB 235-509) report. Appendices are: Magnitude of Ridership on Blue Streak Routes, Data from the Origin and Destination Surveys, Magnitude of Vehicles Using Expressway Facilities, An Evaluation of Methods for Counting Bus Passengers, and Issues Arising in the Conduct of the Study.

TITLE: MASS TRANSIT MANAGEMENT: A HANDBOOK FOR SMALL CITIES

AUTHOR: Indiana University/Graduate School of Business/ Institute for
Urban Transportation

DATE February 1971

PROJECT NO. IN-06-0002

KEYWORDS:

1. Market Research
2. Small Cities
3. Advertising and Promotion
4. Financing Mass Transportation
5. Management, operations and techniques

This purpose of the study is to provide information for the management of the mass transit industry particularly for smaller cities in the United States, which are defined for the purposes of this report as cities with a population of 150,000 or less. The cities in question are in rather isolated areas and therefore cut off from experienced transit management people in and around large metropolitan areas.

The two major constraints discussed are the amount of money which is available and the degree of specialization possible with the limited manpower of a small enterprise. Practices of smaller transit systems in the United States were investigated in order to determine some of the methods and problems of such properties. The best methods utilized by these undertakings have been included. The report also discusses ways in which it might be possible to improve on existing management and conventional practices of the transit industry.

A consumer-oriented approach is strongly emphasized because the author is of the opinion that today's transit industry is primarily operations-oriented in a relatively unsystematic fashion to a degree unusual for American enterprise today. Public and private ownership is discussed especially in relation to service quality. Much attention is also paid to the gaining of public support in financing mass transit in small cities. The report is directed not only toward transit managers but toward public officials and private citizens who wish to inaugurate or improve transit service through public action.

The report is divided into four sections, each of which is designed to be complete in and of itself. They are: Organization and Finance, Management and Control, Operations, and Marketing. There is a bibliography, sample questionnaires, maintenance forms, and a complete index.

TITLE: EVALUATION OF URBAN TRANSIT BUS MODIFICATION KITS TO REDUCE
ENGINE SMOKE, ODOR, NOXIOUS EMISSIONS AND NOISE
Final Report

AUTHOR: MITRE Corporation (G.F. Swetnam and F.L. Willingham)

DATE May 1973

PROJECT NO.

IT-06-0022

KEYWORDS:

1. Air Pollution
2. Environment and Environmental Control
3. Noise and Noise Control
4. Bus, design

This report is a result of a 15 month field evaluation of an "Environmental Improvement Program Kit" which had been designed to reduce the noise, smoke, odor, and pollution created by buses.

The principal components of the EIP kit are: (a) fuel injectors revised for better control of the injection process; (b) an exhaust heat-activated catalytic reactor, incorporated into a new muffler design; (c) a vertical exhaust stack incorporating air aspiration, intended to disperse the exhaust better and to control odor; (d) an acoustically treated air induction system; and (e) new engine mounts designed to reduce sound transmission into the passenger compartment. In other words, this kit modifies the air induction, fuel injection, and exhaust systems of the engines as well as the engine's attachment to the coach chassis.

To test effectiveness, EIP kits were experimentally tested under actual urban service conditions in 1969 model buses in San Francisco and 1963 models in Washington, D.C. Measurements included exhaust emissions of carbon monoxide, hydrocarbons and oxides of nitrogen. Noise tests were also conducted and data compared. Reliable field tests for odor were not supported within the scope of the UMTA evaluation.

Among the findings was that, in general, the EIP kits significantly reduced smoke, odor and hydrocarbon emissions on the oldest GMC models but had less effect on the newer buses. There was less odor reduction and no improvement in smoke or hydrocarbon emission in the later models. This difference is attributed to the year of manufacture of the buses; not to the amount of mileage of the bus but to annual improvements that have been made during the 14 years that the current model has been in production. A detailed summary of kit benefits, tables of measurements and illustrations are included.

Costs, benefits and maintenance aspects of the EIP kit are outlined. Furthermore, alternatives are offered to the installation of the kit since the amount of labor involved in converting a bus may warrant selection only of the most effective and lowest cost components when retrofitting existing coaches.

The test project did tend to confirm the broad aspects of GMC's claims. Adequate data is presented to make clear distinctions as to the EIP kit's effectiveness on different bus models and the efficacy of the specific component parts.

References are furnished.

99

\$5.25

NTIS ORDER NO.: PB 228-470/AS

TITLE: MODE CHOICE AND THE SHIRLEY HIGHWAY EXPERIMENT

AUTHOR: DTM, Inc.
(J.M. McLynn and Keith M. Goodman)

DATE November 1973

PROJECT NO.: IT-06-0024

KEYWORDS:

1. Mode Choice
 2. Models and Modeling
 3. Bus, commuter
 4. Bus, priorities
-

The Shirley Highway Bus-on-Freeway Demonstration Project represents a major part of the UMTA and Federal Highway Administration effort to test different technologies and system configurations in order to better serve the nation's transportation needs. The Shirley Highway corridor, extending from suburban Northern Virginia to downtown Washington, D.C., is a 150 square-mile area containing about 550,000 people. This project was designed to provide corridor commuters with fast and reliable peak-period bus service to the three major employment areas of downtown Washington, D.C., the Pentagon and the Crystal City complex in the Northern Virginia suburbs. The elements of the project include: 1) the busway, including the exclusive lane on Shirley Highway and bus-priority lanes in Washington, D.C.; 2) a bus transit operation, involving new buses with special features operating on new routes with revised schedules; and 3) residential fringe parking facilities for bus riders, located in shopping centers and newly constructed park-and-ride lots.

The major objective of this study was to determine and isolate those factors which influence the switch from auto to bus ridership and to determine how those factors could be generalized to other areas in the country. The products of this effort include: a new modal choice or market share model which has significant behavioral advantages over its predecessors; an analysis of the data collected during the Shirley Highway Bus-on-Freeway Demonstration Project; calibrations of the N-Dimensional Logit Model and the Utile Model using the Shirley corridor data; a calibration of the new mode choice model; a comparison of the three calibrated models; and, a sensitivity analysis of the three models including a comparison of the three forecasts for a set of realistic transportation policy options.

Related reports include: "The Shirley Highway Express-Bus-on-Freeway Demonstration Project-Project Description" (PB 218-983), "Shirley Highway Express-Bus-on-Freeway Demonstration Project-First Year Results" (PB 214-335), "Shirley Highway Express-Bus-on-Freeway Demonstration Project-Second Year Results" (COM-74-10785), "Shirley Highway Express-Bus-on-Freeway Demonstration Project-User's Reactions to Innovative Bus Features" (COM-73-11453).

TITLE: THE SHIRLEY HIGHWAY EXPRESS-BUS-ON-FREEWAY DEMONSTRATION
PROJECT: SECOND YEAR RESULTS

AUTHOR: National Bureau of Standards
(James T. McQueen, Richard R. Yates and Gerald K. Miller)

DATE: November 1973

PROJECT NO.: IT-06-0024

KEYWORDS: 1. Bus, commuter
2. Lane, reserved
3. Bus, express
4. Parking, park-and-ride
5. Bus, priorities

The Shirley Highway Express-Bus-on-Freeway Demonstration Project entered its fourth year of service in July 1973. This report documents project achievements up to that date, with primary emphasis on activity between July 1972 and June 1973.

The Shirley Highway Corridor, extending from suburban Northern Virginia to downtown Washington, D.C., is a 150 square-mile area containing approximately 550,000 people. The project was designed to provide corridor commuters with fast and reliable peak-period service to the major employment centers of downtown Washington, D.C., the Pentagon, and the Crystal City Complex in Northern Virginia. Its purpose was to determine the effectiveness of different technologies and system configurations to ease urban traffic congestion and improve the urban environment.

Jointly sponsored by the Urban Mass Transportation Administration and the Federal Highway Administration of the U.S. Department of Transportation, this project includes three elements: 1) the busway, including the exclusive lane on Shirley Highway and the bus-priority lanes in Washington, D.C.; 2) a bus transit operation involving new buses with special features; and 3) residential fringe parking facilities for bus riders, located in shopping centers and newly constructed park-and-ride lots.

Results of the project, as reported in this document, include: 1) a shift of approximately 8300 auto commuters to the bus service; 2) an improvement in vehicle utilization which has reduced by 17 the number of buses required to maintain the March 1973 headways; 3) a diversion of approximately 5000 autos from daily peak-period corridor traffic and the removal of all buses from auto lanes on Shirley Highway; 4) a substantial improvement in people-moving efficiency; 5) a reduction in peak-period auto emissions and gasoline usage; 6) a reduction in travel time for motorists and bus riders; and, 7) an improvement in reliability of transit service.

Among related documents is "Shirley Highway Express-Bus-on-Freeway Demonstration Project---First Year Results" (PB 214-333).

TITLE: THE SHIRLEY HIGHWAY EXPRESS-BUS-ON-FREEWAY DEMONSTRATION
PROJECT: USERS' REACTIONS TO INNOVATIVE BUS FEATURES

AUTHOR: National Bureau of Standards
(Theodore H. Saks, Richard F. Yates, and Keith M. Goodman)

DATE: June 1973

PROJECT NO.: IT-06-0024

KEYWORDS: 1. Surveys
2. Bus, commuter
3. Lane, reserved
4. Bus, express
5. Parking, park-and-ride
6. Bus, Priorities

This report describes an on-board survey of commuters as part of the Shirley Highway Express-Bus-on-Freeway Demonstration Project. The purpose of the survey was to obtain users' attitudes concerning the special interior bus features as well as new transit service features.

The Shirley Highway Bus-on-Freeway Demonstration Project represents a major part of the UMTA and Federal Highway Administration effort to test different technologies and system configurations in order to better serve the Nation's transportation needs. The Shirley Highway Corridor, extending from suburban Northern Virginia to downtown Washington, D.C., is a 150 square-mile area containing about 550,000 people. This project was designed to provide corridor commuters with fast and reliable peak-period bus service to the major employment areas of downtown Washington, D.C., the Pentagon and the Crystal City Complex in the Northern Virginia suburbs.

Bus commuters' perceptions of the relative importance of various interior bus features (i.e., carpeting, special lighting, windows, etc.) and transit service features (i.e., reliable schedules, assurance of a seat, etc.) are analyzed in this report. The relative impact of various project marketing and promotional techniques is also presented.

Among the major findings of the study was that bus commuters were highly satisfied with the special interior features on the project buses but with the exception of air conditioning/heating, they did not consider these features particularly important. Service related features, however, were deemed important. Findings suggest that alterations in bus design which upgrade already adequate interior comfort and aesthetic features are less attractive to the commuter than service improvements. "Word of mouth" promotion was the most frequently identified means of informing commuters about the service.

Related documents include "Shirley Highway Express-Bus-on-Freeway Demonstration Project---Project Description" (PB 218-982); "Shirley Highway Express-Bus-on-Freeway Demonstration Project---First Year Results" (PB 214-333); "Shirley Highway Express-Bus-on-Freeway Demonstration---Second Year Results" (COM-74-10785); and "Mode Choice and the Shirley Highway Experiment" (PB 231-893).

TITLE: FORECAST OF URBAN 40-FOOT COACH DEMAND

AUTHOR: Booz-Allen Applied Research Inc. and Simpson & Curtin

DATE December 1972

PROJECT NO.

IT-06-0025

KEYWORDS:

1. Market Research
 2. Bus, cost
 3. Bus, intercity
 4. Bus, transbus
-

This study provides an estimate of the U.S. market demand for 40-foot transit coaches from 1972 through 1990. The study was conducted in support of the Transbus project, which concerns the development of a standard-design transit coach which will be produced during that time period.

The data base for the forecast is the 1972 National Bus Fleet Inventory, which includes approximately 95% of U.S. transit coaches in major urban areas. The calculation of the probable annual replacement rate was based on age distribution of the fleet, assumed service life, demographic factors and public policy. The annual replacement forecasts ranged from 3,400 units in the earlier forecast years to 4,800 by 1990.

Charts are included which project the cost of replacement and net additions for 40-foot coaches through 1990, factors which influence the 40-foot bus demand, and bus replacement according to the age of the bus.

Fleet characteristics are analyzed according to length, seating capacity and age. There are other charts which provide a statistical analysis of such factors as population, ridership, travel modes, and route mileage.

TITLE: TRANSIT BUS PROPULSION SYSTEMS STATE-OF-THE-ART

AUTHOR: Booz-Allen Applied Research Inc. and Development, Inc.

DATE: August 1972

PROJECT NO.: IT-06-0025

KEYWORDS:

1. Bus, Transbus
 2. Propulsion Systems, diesel
 3. Propulsion Systems, turbine
 4. Air Pollution
-

This report reviews the present state-of-the art of propulsion technology applicable to the 40-foot transit bus (Transbus). The best available components and technology are utilized to improve the performance, suitability and public acceptability of the motor coach for urban mass transportation.

Major coverage is given to diesel and gas turbine engines (Otto cycle and Brayton cycle). Closed-cycle (external combustion) engines such as Rankine and Stirling engines are also covered. Power, weight, cost, and environmental considerations, as well as transmission and power management are discussed, in reference to each type of propulsion system.

The report concludes with information on energy storage devices and energy transfer devices such as hydrokinetic transmissions, hydrostatic transmissions, or electric transmissions.

Appendices include propulsion system data and references.

This is the first of four reports submitted under Project 3 (Propulsion System Technology) of the Bus Technology Program, which was initiated in 1971 to develop a modern and efficient motor coach for use in urban mass transit systems. The purpose of Project 3 is to determine which propulsion systems are feasible for use in Transbus and to select systems suitable for alternative use during the 15-year life span of the model bus.

TITLE: APPLICATIONS OF BART PROGRAM EXPERIENCE TO THE UMTA URBAN RAPID RAIL VEHICLE AND SYSTEMS PROGRAM

AUTHOR: Boeing Vertol Company, Surface Transportation Systems Department

DATE: April 1973

PROJECT NO.: IT-06-0026

KEYWORDS:

1. BART
 2. Rail, systems planning and design
 3. Vehicle Design
 4. Rail, commuter
-

This report reviews one task element of the UMTA Urban Rapid Rail Vehicle and Systems Program. The program objective is to enhance the attractiveness of rail rapid transit to the urban traveler by providing existing and proposed transportation systems with service that is as comfortable, safe, reliable, and economical as possible.

As part of this program, UMTA sponsored the production and component testing of ten prototype rapid transit cars for the San Francisco Bay Area Rapid Transit District. The objective of the project was to accomplish the engineering, production, service test, retrofit and associated evaluation and modification of the ten cars, to form the basis for the subsequent production run for RART.

It was concluded that the BART car represents the integration of modern technology with systems and approaches in rail rapid transit vehicle design. It is the product of a soundly conceived program of subsystem evaluation and development and reflects the advanced type of specification under which it was produced. The procurement specification encouraged advancement because it replaced the traditional hardware orientation with performance requirements and objectives.

Operating experience with the BART car has revealed several improvements which are applicable to the State-of-the-Art car (SOAC) and Advanced Concept Train (ACT) projects and which appear worthy of consideration for transit car design generally. Among these are: crashworthy design, damage resistant glazing materials, separation of primary and secondary equipment functions, and special maintenance design.

It was recommended that the ten car prototype testing program be considered for all future transit car procurements because it provides for the resolution of many problems prior to large scale production.

TITLE: DETAIL SPECIFICATION FOR STATE-OF-THE-ART CAR
Revision A

AUTHOR: Boeing Vertol Company, Surface Transportation Systems Department

DATE October 1973

PROJECT NO.

IT-06-0026

KEYWORDS:

1. Rail, systems planning and design
 2. Rail, materials
 3. Vehicle, design
-

The State-of-the-Art Car (SOAC) was developed under UMTA's Urban Rapid Rail Vehicle and Systems program. The objective of this program is to enhance the attractiveness of rapid rail transportation for the urban traveler by providing transit vehicles which are as safe, reliable, economical and comfortable as possible.

The SOAC is one phase of this program and its particular specifications within the study include design and fabrication, design criteria, and performance requirements. Specific matters under study in this report include: car body, car body items, coupler and draft equipment, door operation, heating, cooling and ventilating systems, and various electrical and power systems including systems support, management systems and testing methods.

Revisions from the original report (May 1973) are generally in the fields of system requirements, noise and vibration control, strength requirements, performance requirements, electrical and lighting equipment, acceleration and deceleration, and the interpretations and definitions of general information.

A glossary of terms and abbreviations is included with a set of drawings.

TITLE: INVESTIGATION OF VOLTAGE TRANSIENTS AND SPIKES IN DIRECT CURRENT
RAPID TRANSIT SYSTEMS Final Report

AUTHOR: Boeing Vertol Company/Surface Transportation Systems Department

DATE: June 1973

PROJECT NO.

IT-06-0026

KEYWORDS:

1. Computer Applications
 2. Rail, systems planning and design
 3. Propulsion Systems, electric
-

This report is an investigation of voltage transients and spikes on five existing rail rapid transit systems (Philadelphia, New York City, Boston, Cleveland and Chicago). The purpose of the report is to define the power environment in which new rail transit cars might be expected to operate.

Third rail shoe transients and spike voltages are described, evaluated and measured during rush and non-rush hours. The resulting data is condensed into curves which may be used as the basis of a general performance specification. In addition, the underlying theory as well as special test equipment used during the Field Test Activity are described in detail, together with the special computer program required for test data evaluation. The results thus obtained, according to the authors, may be partially extended for future subway car speed control systems using static power conversion.

The authors present their conclusions and recommendations and there are extensive illustrations and tables.

TITLE: SOAC - STATE-OF-THE-ART CAR DEVELOPMENT PROGRAM
Volume I: Design, Fabrication and Test

AUTHOR: Boeing Vertol Company, Surface Transportation Systems Department

DATE: April 1974

PROJECT NO.: IT-06-0026

KEYWORDS:

1. Rail, systems planning and design
 2. Research Operations
-

As systems manager for the UMTA Urban Rapid Rail Vehicle and Systems Program, the Boeing Vertol Company is supervising the design, fabrication and test of two new State-of-the-Art Cars (SOAC). The objective of this program is to demonstrate the current state-of-the-art in rail rapid transit vehicle technology.

Passenger convenience and operating efficiency are primary goals for the cars. Built by the St. Louis Car Division of General Steel Industries, the SOAC features chopper control, separately excited DC traction motors, all-steel construction (with molded fiberglass ends), and vandal resistant and fire-retardant materials in the interior.

The two SOAC cars were designed, fabricated, functionally tested and delivered to the U.S. Department of Transportation's High Speed Ground Test Center in Pueblo, Colorado. During 1973, the vehicles underwent an extended period of engineering testing. Systems testing on UMTA's 9.1 mile Rail Transit Test Track was completed on April 10, 1974.

This volume covers the development program through engineering testing; including data on design and performance, propulsion and braking systems, subsystems, test program, engineering design changes and corrective actions, mockup, test and evaluation programs and economic analysis.

Illustrations and figures are numerous. References are furnished.

TITLE: URBAN RAPID RAIL VEHICLE AND SYSTEMS DESIGN

AUTHOR: Boeing Vertol Company/Surface Transportation Systems Department

DATE: July 1973

PROJECT NO.: IT-06-0026

KEYWORDS:

1. BART
 2. Rail, automatic control
 3. Rail, systems planning and design
 4. Rail, commuter
-

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

This second annual report specifically describes the work accomplished and summarizes pertinent technical and design data. The report format is organized according to the following program tasks: (1) Completion of the review of the BART prototype testing, (2) State-of-the-Art Car (SOAC) which was tested at the High Speed Ground Test Center in Pueblo, Colorado, (3) Completion of the design and development phase of the Advanced Concept Train (ACT-1) research and development, (4) Status on Advanced Concept Train Subsystems research and development (ACT-2), (5) Status on Advanced Concept Train operational demonstration planning (ACT-3), (6) Economic analysis, and (7) Human factors analysis.

The first annual report, dated July 1972, is available from the National Technical Information Service, Springfield, Virginia (PB 212-848).

TITLE: PROJECT FARE TASK I REPORT: URBAN MASS TRANSPORTATION INDUSTRY
INFORMATION REQUIREMENTS

AUTHOR: Arthur Andersen & Company

DATE: July 1972

PROJECT NO.

IT-06-0034

KEYWORDS:

1. Financing Mass Transportation
2. Information Aids
3. Qualitative Analysis
4. Management, operations and techniques

In the past, it has not been possible to get an accurate measure of the operating deficit of the transit industry or to obtain comparable measures of the levels of service being provided by the various transit systems. Therefore, Project FARE (Financial Accounting and Reporting Elements) was initiated to develop and test a candidate reporting system to accumulate transit industry financial and operating data and to categorize it uniformly. An improved information base such as this is a prerequisite to effective planning and administration of financial assistance programs for Federal, state and local government agencies. It will aid transit industry associations in monitoring performance. Individual transit systems will be able to compare their effectiveness with other systems portraying similar characteristics. Project FARE evolved as a joint effort by UMTA, the Institute for Rapid Transit and the American Transit Association.

This report, Task I, has as its objective the identification of the anticipated information requirements for the potential users of FARE. Delineated are the methods, design criteria, information requirements and plans for Task II. Appendices are the "Relationship of Production System to Resource and Consumption Markets" and "Transit System Capital Classifications."

Task II surveys the capability of selected transit systems to supply information that is required. Task III is to develop a candidate system of reporting elements for which implementation is currently feasible and Task IV is to test the implementation of the candidate system at selected transit operations.

PROJECT FARE TASK II REPORT, Urban Mass Transportation Industry Reporting Capability is composed of the following: "Part I: Survey Findings" (PB 213-474, \$5.75) and "Part II: Sample Questionnaire" (PB 213-475, \$4.75).

TITLE: PROJECT FARE TASK III REPORT, URBAN MASS TRANSPORTATION INDUSTRY
REPORTING SYSTEM DESIGN Part I: Task Summary

AUTHOR: Arthur Andersen & Co. (David Harvey, John Nagel and
William T. Van Lieshout)

DATE: June 1973 PROJECT NO.: IT-06-0034

KEYWORDS:

1. Financing Mass Transportation
2. Research Operations
3. Rail, commuter
4. Management

Project FARE (Financial and Accounting Reporting Elements) is composed of four Task projects designed to address the needs of individual transit systems to compare their performance with other similar transit systems, for transit industry associations to monitor industry performance, and for Federal, state and local agencies to aid in transit analysis and financial assistance program administration. The Task III study maintained close contact with all phases of the transit industry.

This particular volume is the first of a four volume study under Task III, which describes a uniform reporting system for the urban mass transit industry. It covers the needs and objectives of Task III, methodology, general design, conclusions, recommendations, and concludes with a description of the plans of Task IV.

Part II (PB 222-043) and Part III (PB 222-044) present a detailed documentation of the reporting requirements for transit systems other than commuter rail. Part IV (PB 222-045) covers the reporting requirements for commuter rail systems. The order number for set of Task III Reports is PB 222-041-SET and the price is \$20.00.

TITLE: PROJECT FARE TASK III REPORT, URBAN MASS TRANSPORTATION INDUSTRY
REPORTING SYSTEM DESIGN Part II: Reporting System Instructions

AUTHOR: Arthur Andersen & Co. (David Harvey, John Nagel and
William T. Van Lieshout)

DATE: June 1973

PROJECT NO.: IT-06-0034

KEYWORDS:

1. Financing Mass Transportation
2. Management
3. Research Operations

Project FARE (Financial and Accounting Reporting Elements) is composed of four Task projects designed to address the needs of the individual transit systems in order that they might be able to compare their performance with other similar transit systems, for transit industry associations to monitor industry performance, and for Federal, state and local agencies to aid in transit analysis and financial assistance program administration. The Task III study maintained close contact with all phases of the Transit Industry.

This particular volume is the second of a four volume study under Task III, which describes a uniform reporting system for the urban mass transit industry. Part II contains general system instructions, prescribed accounting standards to be employed for this reporting, and detailed definitions of all reporting categories in the system for transit operations other than commuter rail.

Part I, the Task Summary (PB 222-042), covers needs, objectives, methodology, general design, conclusions, recommendations, and a description of the plans of Task IV. Part III (PB 222-044) provides reporting system forms for the work contained in Part II with a cross reference to the appropriate section in Part II. Part IV (PB 222-045) covers reporting requirements relating to commuter rail services. The order number for the set of Task III Reports is PB 222-041-SET and the price is \$20.00.

NTIS ORDER NO.: PB 222-043

\$11.25

TITLE: PROJECT FARE TASK III REPORT, URBAN MASS TRANSPORTATION INDUSTRY REPORTING SYSTEM DESIGN, Part III: Reporting System Forms

AUTHOR: Arthur Andersen & Co. (David Harvey, John Nagel and William T. Van Lieshout)

DATE: June 1973

PROJECT NO.: IT-06-0034

KEYWORDS:

1. Financing Mass Transportation
 2. Management
 3. Research Operations
-

Project FARE (Financial and Accounting Reporting Element) is composed of four Task projects designed to address the needs of the individual transit systems in order that they might be able to compare their performance with other similar transit systems, for transit industry associations to monitor industry performance, and for Federal, state and local agencies to aid in transit analysis and financial assistance program administration. The Task III study maintained close contact with all phases of the transit industry.

This is the third in the Task III four volume study which describes a uniform reporting system for the transit industry. Part III provides the forms for the work done in Part II with appropriate cross references to Part II. This covers report forms for assets, liabilities, capital, expenses, and non-financial operating data.

Part I, the Task Summary (PB-222-042), covers needs, objectives, methodology, general design, conclusions, recommendations, and a description of the plans of Task IV. Part II (PB 222-043), in cooperation with Part III, provides detailed documentation of reporting requirements for transit systems other than commuter rail. Part IV (PB 222-045) covers the reporting requirements for commuter rail systems. The order number for the set of Task III Reports is PB 222-041-SET and the price is \$20.00.

NTIS ORDER NO.: PB 222-044

\$5.25

TITLE: PROJECT FARE TASK III REPORT, URBAN MASS TRANSPORTATION REPORTING
SYSTEM DESIGN Part IV: Commuter Rail Reporting

AUTHOR: Arthur Andersen & Co. (David Harvey, John Nagel and
William T. Van Lieshout)

DATE: June 1973

PROJECT NO.: IT-06-0034

KEYWORDS:

1. Financing Mass Transportation
 2. Management
 3. Research Operations
-

Project Fare (Financial and Accounting Reporting Elements) is composed of four Task projects designed to address the needs of the individual transit systems in order that they might be able to compare their performance with other similar transit systems, for transit industry associations to monitor industry performance, and for Federal, state and local agencies to aid them in transit analysis and financial assistance program administration. The Task III study maintained closed contact with all phases of the transit industry.

This is the last in a series of four reports which comprise Task III of Project FARE. It covers the reporting requirements for commuter rail systems. ICC Form A is included with modifications in order to obtain a complete report of revenues, expenses and nonfinancial operating data pertaining to commuter rail systems. The purpose of the separation of rail transit from other transit systems is derived from Chapter 3 of Part I, Task Summary, which explains why commuter rail systems are subject to a different reporting requirement than that of other transit systems.

Part I, the Task Summary (PB 222-042), covers needs, objectives, methodology, general design, conclusions, recommendations, and a description of the plans of Task IV. Part II (PB 222-043) and Part III (PB 222-044) provide detailed documentation of reporting requirements for transit systems other than commuter rail. The order number for the set of Task III Reports is PB 222-041-SET and the price is \$20.00.

PROJECT FARE TASK IV REPORT

TITLE: Volume I: Task and Project Summary

AUTHOR: Arthur Andersen & Company

DATE November 1973

PROJECT NO.: IT-06-0034

KEYWORDS:

1. Accounts and Accounting
 2. Financing Mass Transportation
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The primary objective of Project FARE (Financial Accounting and Reporting Elements) is to develop and test a candidate reporting system to accumulate transit industry financial and operating results by uniform categories. The objective of Task IV is to test the systems concepts included in the reporting framework developed in Task III. Test results validated previously developed systems concepts. Task IV is divided into five volumes.

Volume I, Task and Project Summary, summarizes the work performed in each of the four Tasks, concluding with a recommendation that the FARE system be implemented and that transit systems throughout the country be assisted in upgrading their internal information systems through a coordinated, nationwide program. The conduct of the entire project is summarized as well as Task IV methodology and results.

Volume II, Reporting System Instructions (PB 226-355/AS), contains general system instructions, prescribed accounting standards, and detailed definitions of all reporting categories.

Volume III, Reporting System Forms (PB 226-356/AS), contains examples of all the forms used in the system for transit operations other than commuter rail.

Volume IV, Commuter Rail Reporting System Instructions (PB 226-359/AS), contains system instructions, accounting standards and definitions of all reporting categories in the system for commuter rail operations.

Volume V, Commuter Rail Reporting System Forms (PB 226-358/AS), contains examples of all the forms used in the system for commuter rail operations.

The order number for all five volumes of Task IV is PB 226-353-SET and the price is \$27.00.

\$4.75

NTIS ORDER NO.: PB 226-354/AS

TITLE: PROJECT FARE TASK IV REPORT
Volume II: Reporting System Instructions

AUTHOR: Arthur Andersen & Company

DATE: November 1973

PROJECT NO.: IT-06-0034

KEYWORDS:

1. Accounts and Accounting
 2. Financing Mass Transportation
-

The primary objective of Project FARE (Financial Accounting and Reporting Elements) is to develop and test a candidate reporting system to accumulate transit industry financial and operating results by uniform categories. The objective of Task IV is to test the systems concepts included in the reporting framework developed in Task III. Test results validated previously developed systems concepts. Task IV is divided into five volumes.

Volume I, Task and Project Summary (PB 226-354/AS), summarizes the work performed in each of the four Tasks, the conduct of the entire project, its methodology, its results, and recommendations.

Volume II, Reporting System Instructions, contains general system instructions, prescribed accounting standards to be employed for this reporting and detailed definitions for all reporting categories in the system for transit operations other than commuter rail. Specific matters discussed include: accounting practice instructions, asset reporting, liability, capital, revenue, expense, nonfinancial operating data, and central processing of FARE reports.

Volume III, Reporting System Forms (PB 226-356/AS), contains examples of all the forms used in the system for transit operations other than commuter rail. Each form shows a cross reference to the applicable instructions in Volume II.

Volume IV, Commuter Rail Reporting System Instructions (PB 226-357/AS), contains system instructions, accounting standards and definitions of all reporting categories in the system for commuter rail instructions.

Volume V, Commuter Rail Reporting System Forms (PB 226-358/AS), contains examples of all the forms used in the system for commuter rail operations.

The order number for all five volumes of Task IV is PB 226-353-SET and the price is \$27.00.

\$11.50

NTIS ORDER NO.: PB 226-355/AS

TITLE: PROJECT FARE TASK IV REPORT
Volume III: Reporting System Forms

AUTHOR: Arthur Andersen & Company

DATE: November 1973 PROJECT NO.: IT-06-0034

KEYWORDS:

1. Accounts and Accounting
 2. Financing Mass Transportation
 3. Management, operations and techniques
-

The primary objective of Project FARE (Financial Accounting and Reporting Elements) is to develop and test a candidate reporting system to accumulate transit industry financial and operating results by uniform categories. The objective of Task IV is to test the systems concepts included in the reporting framework developed in Task III. Test results validated previously developed systems concepts. Task IV is divided into five volumes.

Volume I, Task and Project Summary (PB 226-354/AS), summarizes the work performed in each of the four Tasks, the conduct of the entire project, its methodology, its results, and recommendations.

Volume II, Reporting System Instructions (PB 226-355/AS), contains general system instructions, prescribed accounting standards to be employed for this reporting, and detailed definitions for all reporting categories in the system for transit operations other than commuter rail.

Volume III, Reporting System Forms, contains examples of all the forms used in the system for transit operations other than commuter rail. Each form shows a cross reference to the applicable instructions in Volume II. Reporting forms cover assets, liabilities, capital, revenue, expenses, and nonfinancial operating data.

Volume IV, Commuter Rail Reporting System Instructions (PB 226-357/AS), contains system instructions, accounting standards, and definitions of all reporting categories in the system for commuter rail instructions.

Volume V, Commuter Rail Reporting System Forms (PB 226-358/AS), contains examples of all the forms used in the system for commuter rail operations.

The order number for all five volumes of Task IV is PB 226-353-SET and the price is \$27.00.

\$5.75

NTIS ORDER NO.: PB 226-356/AS

TITLE: PROJECT FARE TASK IV REPORT
Volume IV: Commuter Rail Reporting System Instructions

AUTHOR: Arthur Andersen & Company

DATE: November 1973

PROJECT NO.: IT-06-0034

KEYWORDS:

1. Accounts and Accounting
 2. Financing Mass Transportation
 3. Management, operations and techniques
 4. Rail, commuter
-

The primary objective of Project FARE (Financial Accounting and Reporting Elements) is to develop and test a candidate reporting system to accumulate transit industry financial and operating results by uniform categories. The objective of Task IV is to test the systems concepts included in the reporting framework developed in Task III. Test results validated previously developed systems concepts. Task IV is divided into five volumes.

Volume I, Task and Project Summary (PB 226-354/AS), summarizes the work performed in each of the four Tasks, the conduct of the entire project, its methodology, its results, and recommendations.

Volume II, Reporting System Instructions (PB 226-355/AS), contains general system instructions, prescribed accounting standards to be employed for this reporting, and detailed definitions for all reporting categories in the system for transit operations other than commuter rail.

Volume III, Reporting System Forms (PB 226-356/AS), contains examples of all the forms used in the system for transit operations other than commuter rail, with a cross reference to the applicable instructions in Volume II.

Volume IV, Commuter Rail Reportings System Instructions, contains general system instructions, prescribed accounting standards to be employed for this reporting, and detailed definitions of all reporting categories in the system for commuter rail operations. Specific topics covered include general instructions, accounting practice instructions, commuter rail capital reporting, commuter rail revenue reporting, commuter rail expense reporting, commuter rail nonfinancial operating data reporting, and central processing of FARE commuter rail reports.

The order number for all five volumes of Task IV is PB 226-353-SET and the price is \$27.00.

\$5.75

NTIS ORDER NO.: PB 226-357/AS

TITLE: PROJECT FARE TASK IV REPORT.
Volume V: Commuter Rail Reporting System Forms

AUTHOR: Arthur Andersen & Company

DATE: November 1973

PROJECT NO.: IT-06-0034

KEYWORDS:

1. Accounts and Accounting
 2. Financing Mass Transportation
 3. Rail, commuter
-

The primary objective of Project FARE (Financial Accounting and Reporting Elements) is to develop and test a candidate reporting system to accumulate transit industry financial and operating results by uniform categories. The objective of Task IV is to test the systems concepts included in the reporting framework developed in Task III. Test results validated previously developed systems concepts. Task IV is divided into five volumes.

Volume I, Task and Project Summary (PB 226-354/AS), summarizes the work performed in each of the four Tasks, the conduct of the entire project, its methodology, its results, and recommendations.

Volume II, Reporting System Instructions (PB 226-355/AS), contains general system instructions, prescribed accounting standards to be employed for this reporting, and detailed definitions for all reporting categories in the system for transit operations other than commuter rail.

Volume III, Reporting System Forms (PB 226-356/AS), contains examples of all the forms used in the system for transit operations other than commuter rail, with cross references to the applicable instructions in Volume II.

Volume IV, Commuter Rail Reporting System Instructions (PB 226-357/AS), contains general system instructions, prescribed accounting standards to be employed for this reporting, and detailed definitions of all reporting categories in the system for commuter rail operations.

Volume V, Commuter Rail Reporting System Forms, contains examples of all the forms used in the system for commuter rail operations. Each form shows a cross reference to the applicable instructions in Volume IV. Specific topics covered in the reporting forms include capital, revenue, expense, and nonfinancial operating data.

The order number for all five volumes of Task IV is PB 226-353-SET and the price is \$27.00.

\$3.75

NTIS ORDER NO.: PB 226-358/AS

TITLE: AUTOMATIC VEHICLE MONITORING SYSTEM

AUTHOR: RCA Government Communications Systems/Communications Systems
Division/Government and Commercial Systems (A. Liguori, G.
Kaplan, and C. Haber)

DATE: March 1973

PROJECT NO.: IT-06-0048

KEYWORDS:

1. Vehicle, monitoring
 2. Computer, Applications
 3. Research Operations
-

The research in this report has been conducted in order to develop and test alternative real-time Automatic Vehicle Monitoring (AVM) systems. This report describes the technical performance characteristics and cost estimates for various components of an x-band signpost AVM designed by RCA Government Communications Systems.

In this system, short-range x-band transmitters are installed in signposts along bus routes which relay location information to properly equipped vehicles as they pass by. Checks on signal strength and parity are performed by the vehicle receiver unit to ensure that only reliable messages based on strong signals will be accepted for storage. A two-way radio is then employed by the operations control center to interrogate the vehicles and obtain location information. Elements of the proposed AVM system are described with reference to user requirements and applications (e.g., police emergency vehicles, buses, taxicabs, trucks and other dispatch services); baseline system configuration (including a summary of the x-band signpost location technique, communications systems and computer systems); variations from baseline requirements; and advanced design of signpost equipment. Attention is also given to cost estimates for various system components. Results of an operational urban environment experiment are presented in detail. Tests of location accuracy, interference and other system parameters are discussed.

The experiments were performed in a specially-instrumented section of downtown Philadelphia as well as special areas in proximity to airport radar transmitters, power generators, and tall buildings. High speed tests were also performed in open areas. The authors conclude the the x-band AVM performed satisfactorily, with acceptable average location errors.

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

AUTHOR: De Leuw, Cather & Company and The Urban Institute (D.B. Sanders,
T.A. Reynen and K. Bhatt)

DATE: May 1974

PROJECT NO.: IT-06-0049

KEYWORDS:

1. Planning, tools
 2. Rail
 3. Bus
 4. Private Transportation, automobile
 5. Modal Split
-

The objective of this document is to provide a single reference source which characterizes the most important (from the standpoint of evaluation) performance characteristics of three contemporary urban transportation systems; rail, bus, and highway (automobile and mixed mode), in as simple a format as possible for easy reference. It assesses only the supply or performance aspect of urban transportation dealing with passenger demand implicitly in that demand itself sometimes dictates certain supply characteristics (e.g., operating costs).

The seven supply parameters chosen and studied are: (1) speed - average, maximum; (2) capacity (service volume)-vehicle, person; (3) operating cost (vehicle); (4) energy consumption (vehicle or source); (5) pollutant emission (vehicle or source); (6) capital cost - land, construction, vehicle acquisition; and (7) accident frequency.

The material presented in this handbook is organized as a series of independent self-descriptive tables and figures dealing with the conventional transport modes of rapid rail and commuter rail transit, local bus and bus rapid transit, and automobile-highway system (automobiles and other vehicles). Each of these modes is organized in its own chapter according to the seven supply parameters. Furthermore, each parameter is constructed to present three levels of detail specifically designed to assist the urban planner in characterizing a particular transportation mode. These levels include default value, range of values, and theoretical value.

Source references and data qualifications are given for all tables and figures. Each of the sections dealing with conventional transport has its own appendix section where the more important site specific information is listed. In addition, two other appendix sections are included which show a list of references and a general bibliography. A list of key terms and their definitions precedes the formal report.

\$5.75

TITLE: SOFTWARE SYSTEMS DEVELOPMENT PROGRAM: INTRODUCTION TO URBAN TRAVEL DEMAND FORECASTING. Summary

AUTHOR: Cambridge Systematics, Inc. and Peat, Marwick, Mitchell & Co.

DATE: March 1974

PROJECT NO.:

IT-06-0050

KEYWORDS:

- | | |
|------------------------|--------------------------|
| 1. Travel Demand | 4. Planning, tools |
| 2. Trip Generation | 5. Computer Applications |
| 3. Models and Modeling | 6. Benefit-Cost Analysis |

In the modern process of urban transportation planning, travel forecasting methods are used to predict the amount and nature of travel which will occur in planned or proposed transportation systems. Such predictions are essential in order to identify the direct and indirect benefits and costs of transportation proposals. The UMTA Transportation Planning System (UTPS) provides a wide range of analytical and computerized tools for making travel forecasts for existing and proposed multimodal transportation systems.

This manual is designed as an integral part of UTPS. The object of the manual is to provide an introduction to travel forecasting to enable transportation planners and analysts to utilize UTPS effectively. This manual provides a comprehensive overview of the methodology of travel forecasting, the analytical tools available and their appropriateness for typical problems the transportation planner faces, input requirements, outputs needed for proper evaluation, and appropriate levels of effort for various stages of analysis.

This manual is divided into three parts. The first part, the summary, serves as a guide to the detailed material in Volume I "Demand Modeling" (PB 236-848), and Volume II, "Evaluation" (PB 236-849).

In this summary, an overview of UTPS is presented and the purposes of travel forecasting in terms of sketch planning and long-range and short-range planning are discussed. Within the scope of transportation planning, the range of options, impacts and principles are considered. Guidelines to the use of the manual are presented.

References are furnished.

The order number for the set of three reports is PB 236-846 (\$15.00).

\$3.75

NTIS ORDER NO.: PB 236-847/AS

TITLE: SOFTWARE SYSTEMS DEVELOPMENT PROGRAM: INTRODUCTION TO URBAN TRAVEL DEMAND FORECASTING. Volume I: Demand Modelling

AUTHOR: Cambridge Systematics, Inc. and Peat, Marwick, Mitchell & Co.

DATE March 1974

PROJECT NO.

IT-06-0050

KEYWORDS:

- | | |
|------------------------|---------------------------|
| 1. Travel Demand | 5. Computer, applications |
| 2. Travel Forecasting | 6. Benefit-Cost Analysis |
| 3. Models and Modeling | |
| 4. Planning, tools | |

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This manual is divided into three parts. A summary report (PB 236-847/AS) and a Volume II, "Evaluation" (PB 236-849/AS) are also available.

Among the topics discussed in this volume are the basic concepts of travel forecasting, alternative demand modelling choices, and choice of a travel forecasting strategy. An extended example of analysis strategies for travel demand forecasting is presented.

References are furnished.

\$9.25

NTIS ORDER NO.: PB 236-848/AS

TITLE: SOFTWARE SYSTEMS DEVELOPMENT PROGRAM: INTRODUCTION TO URBAN TRAVEL DEMAND FORECASTING. Volume II: Evaluation

AUTHOR: Cambridge Systematics, Inc. and Peat, Marwick, Mitchell & Co.

DATE: March 1974

PROJECT NO.:

IT-06-0050

KEYWORDS:

- | | |
|------------------------|--------------------------|
| 1. Travel Demand | 5. Computer Applications |
| 2. Travel Forecasting | 6. Benefit-Cost Analysis |
| 3. Models and Modeling | |
| 4. Planning, tools | |
-

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This manual is divided into three parts. The first part is the summary (PB 236-847/AS) and the second is Volume I "Demand Modelling" (PB 236-848/AS)

In this report, an evaluation of transportation alternatives is made and discussion centers around the evaluation problem, methods of community interaction, prediction of and incidents of impacts, evaluation methods, an extended evaluation method, and a summary.

References are furnished.

\$4.75

NTIS ORDER NO.: PB 236-849/AS

TITLE: SOFTWARE SYSTEMS DEVELOPMENT PROGRAM: Demand Model Selection Manual

AUTHOR: Cambridge Systematics, Inc. and Peat, Marwick, Mitchell & Co.

DATE: June 1974

PROJECT NO.: IT-06-0050

KEYWORDS:

1. Models and Modeling
 2. Travel Demand
 3. Travel Forecasting
-

This manual describes procedures for selection of demand models used in forecasting urban travel. It was prepared for UMTA under its Software Systems Development Program (SSDP) and is designed as an integral part of the UMTA Transportation Planning System (UTPS).

The purpose of the manual is to instruct the planner on how to develop criteria and formulate hypotheses to guide the selection and testing of demand models in the context of the overall travel forecasting process. The aim is to promote the most effective utilization of UTPS.

A discussion of criteria for model selection in terms of relevance, theory, testability, compatibility and feasibility is presented. Development of hypotheses is described in relation to analysis of market segments, selection of modelling variables and functional forms, and in terms of tests of hypotheses in face of data resource constraints.

The necessity of continued testing and refinement of selected models is emphasized. The manual concludes with a summarized methodology for developing an overall approach in the travel forecasting process.

References are furnished.

TITLE: SPRING CREEK DEMONSTRATION PROJECT: Urban Corridor Demonstration Program - Early Implementation Project

AUTHOR: City of Dallas and Dallas Transit System

DATE May 1973

PROJECT NO.: IT-06-0062

KEYWORDS:

1. Bus, commuter
 2. Ridership, attraction
 3. Center City
-

In August, 1971, the City of Dallas and the Dallas Transit System, under the Urban Corridor Demonstration Program, initiated a one-year early implementation project which was to lead to more than a doubling of transit service on DTS' longest route. The Spring Creek Line operates in the heavily-traveled, highly-congested North Central Expressway Corridor from the central business district (CBD) of Dallas northward for 14.8 miles. The goal of the project was to stimulate diversion of CBD-oriented work trips from private automobile to rapid bus transit.

The initial step taken toward this goal was a review of the existing Spring Creek route to determine whether routing changes would improve travel time or make service more accessible to a greater number of patrons. This was not found to be the case and the route was left unchanged.

The bus schedule was then revised in order to make bus service more attractive to those persons working in or near the CBD. This proved to be far more complicated than simply adding buses. It was necessary to ensure that added trips would coincide timewise with demands for CBD worktrips by North Dallas residents as well as to accomodate domestic workers who partonized the line outbound in the morning and inbound in the afternoon. This new schedule increased the number of daily trips from 17 to 44 and increased the bus requirements from 2 to 6 vehicles. As a result, morning inbound trips more than doubled and afternoon outbound trips more than tripled.

The Spring Creek experiment confirmed the belief that increased bus service in heavily-travelled urban corridors will result in a diversion from auto use in peak travel hours. An on-bus survey counted a total of 1,062 passengers on August 24, 1972 as compared with a total of 557 passengers on March 25, 1972, five months prior to project implementation.

The increased bus service also caused a significant number of new trips to be generated. During the project the proportion of passengers who used the bus from one to three days per week declined from 18 to 11 per cent. At the same time, however, the proportion of daily trips increased from 78 to 86 per cent. This indicated an increased usage by existing patrons as well as an actual gain in patronage. The total possible impact of this type of program was limited, however, because of the necessity of using the already congested surface streets and freeways. The success of the project, as the author sees it, proves that similar success could be achieved in other cities or even other areas of Dallas by intensifying bus service within highly-congested radial freeway corridors.

TITLE: URBAN CORRIDOR DEMONSTRATION PROGRAM EXCLUSIVE BUS LANE:
Interstate 495 - New Jersey Approach to Lincoln Tunnel

AUTHOR: Tri-State Regional Planning Commission (Leon Goodman)

DATE: July 1972

PROJECT NO..

IT-06-0062

KEYWORDS:

1. Bus, commuter
 2. Lane, reserved
-

December 18, 1970 marked the establishment of an exclusive bus lane for eastbound (city-bound) buses along a 2.5 mile stretch of Interstate 495 between the Lincoln Tunnel and the New Jersey Turnpike. This experiment was part of the United States Department of Transportation's Urban Corridor Demonstration Program. The project serves as an example of how a significant public transportation improvement can be established quickly and at a relatively low cost in an urban area where several planning and operating agencies exercise jurisdiction. The report reviews the plan for coordinating the inputs and activities of the Urban Mass Transportation Administration, the Federal Highway Administration, the Tri-State Regional Planning Commission, the N.J. Turnpike Authority, N.J. DOT and the Port Authority of New York and New Jersey. Also discussed are the bus eligibility criteria and traffic-control devices used as well as the public information campaign which was carried out.

Significant data on the project include the fact that the reverse-flow exclusive lane shuttled thousands of commuters daily at a time saving varying from 10 to 25 minutes. In 1971, more than 206,000 buses and 8.7 million riders used the lane. During the peak commuting period, from approximately 7:30 to 9:30 AM, an average of 809 buses carrying 34,000 passengers used the lane. Few delays were experienced; during 1971 there were only 25 stoppages for such diverse reasons as engine problems, flat tires and mechanical causes. The few delays that did occur lasted an average of just seven minutes. Only four accidents took place on the lane during its first year of operation.

The success of the project is established in the analysis of commuter response surveys, aerial photos and data collected during day-to-day operations of the lane. Results suggest that 2300 commuters have become bus riders since the lane's inception. Future plans for the first reverse-flow exclusive bus lane on a freeway in the United States are summarized.

TITLE: GUIDELINES TO REDUCE ENERGY CONSUMPTION THROUGH TRANSPORTATION ACTIONS

AUTHOR: Alan M. Voorhees and Associates, Inc.

DATE: May 1974

PROJECT NO.: IT-06-0092

KEYWORDS:

1. Environment and Environmental Control
2. Energy Conservation
3. Planning, tools
4. Planning

This document is intended to serve as an aid to local transportation planners, traffic engineers, and administrators in the incorporation of energy conservation considerations into the transportation planning process, especially in reference to short-range transportation planning.

Various types of low cost, short-term transportation actions are summarized and their potential for reducing energy consumption is estimated. Summary tables are presented which array the actions in terms of relevant institutional and legal considerations, and socio-economic and environmental effects.

Interrelationships between the energy consumption reduction potential of groups of actions are discussed, and a process for formulation of coherent packages of such actions is presented.

Guidelines are presented for evaluating and formulating these action packages for large (1,000,000 and over population), medium (250,000 to 1,000,000) and small (50,000 to 250,000) urban areas. The example criteria for evaluating the transportation actions for inclusion in an urban area package are: short lead time, minimal institutional obstacles to implementation, favorable public opinion and high energy reduction.

Using the example criteria and guidelines, three sample action packages were formulated for each urban size area and some general conclusions drawn.

Transportation actions may reduce energy consumption in one or more of the following ways: improving efficiency of vehicle operation, such as improving traffic flow on city streets; causing a shift of trips from one or two passenger automobiles to higher occupancy buses, vans, and car-pools; and reducing travel demand by, for example, instituting the four-day work week. Individual transportation actions to reduce energy consumption are categorized into ten major groups.

Appendices are "Actions to Reduce Energy Consumption," "How Transportation Actions Can Reduce Energy Consumption," and a bibliography.

TITLE: TRANSPORTATION POOLING

AUTHOR: Alan M. Voorhees and Associates, Inc.

DATE: January 1974

PROJECT NO.:

IT-06-0092

KEYWORDS:

- | | |
|-------------------------------------|---------------------------------|
| 1. Energy Conservation | 4. Para-Transit |
| 2. Private Transportation, carpools | 5. Transportation Disadvantaged |
| 3. Bus | |
-

With the advent of impending energy shortages in the winter of 1973-74, the U.S. Department of Transportation embarked on an accelerated program to promote increased use of high-occupancy vehicles -- transit and carpools. As part of this program a series of reports was prepared that summarized the major aspects of carpool programs designed to assist local areas in initiating successful pooling action programs. This report is a collection of the ten individual reports.

The goal of the Carpool/Buspool Program is to satisfy travel requirements more efficiently by increasing passenger occupancy in autos and buses, thereby reducing the number of vehicles using the streets and highways. Achievement of that goal calls for coordination among many institutions within a metropolitan region including public agencies and citizen and business groups. The information and techniques presented in this report should be considered as a guide to the development of a sound program in a metropolitan area.

The individual reports contained in this volume are: Review of Carpool Activities, Organization for Carpooling, Approaches to Matching, Legal and Institutional Issues, Incentives to Carpooling, Transit/Taxi Coordination, Vanpools, Buspools, Pooling for the Disadvantaged, and Carpool Backup Systems.

The review of past, present and potential use of carpooling, vanpooling and buspooling in the U.S. indicates that these special modes of travel promise to become vital and effective ways of coping with the national energy crisis and other transportation impacts on the public sector. It is hoped that the programs described in this review will encourage and inspire many others to participate in activity that promises to alleviate the immediate crisis situation which affects us all and learn how best to weave pooling more permanently into the national transportation fabric.

TITLE: BIBLIOGRAPHY ON GROUND CONTROL VEHICLE COMMUNICATIONS AND
CONTROL: A KWIC INDEX

AUTHOR: Transportation Systems Center (W.I. Thompson III)

DATE July 1971

PROJECT NO.: MA-06-0003

- KEYWORDS:
1. Bibliographies
 2. Computer Applications
 3. Vehicle, monitoring
 4. Communications
-

This bibliography covers the subject of communication and control of ground vehicles including land-mobile communication, computer aided traffic control, communication with high speed ground vehicles, and radio frequency noise. Emphasis is based on the 150,450 and 900 MHz frequency bands.

There are two indexes - a KWIC or key word in context index and an author index. There are 1100 citations in the bibliography.

TITLE: THE ADMINISTRATION OF TRANSPORTATION MODELING PROJECTS

AUTHOR: Harvard Graduate School of Business Administration (John W. Drake)

DATE: May 1972

PROJECT NO.: MA-06-0019

KEYWORDS:

1. Management, operations and techniques
 2. Social Benefits and Costs
 3. Qualitative Analysis
 4. Research Operations
 5. Models and Modeling
-

The objective of this report is to examine the transportation models which are considered useful by decision makers and to learn what factors correlate with these models by investigating the way in which the modeling projects are administered with specific concentration on interactions between decision makers and modelers.

This study examines the background of the problem, the seeming high percentage of unsatisfactory models, looks at the nature of the transportation analysis problem and outlines the structure of the modeling industry. Specific hypotheses are framed concerning the effects of factors such as client-modeler contact, communication, coordination, role recognition, and backgrounds. Other factors investigated include the decision maker's desire for success, the extent to which the problem is technical as opposed to more social, political or economic in content, the degree of bureaucracy in the decision maker's environment, the formality with which the project was planned and conducted, the extent to which the usefulness of the result was apparent early, and the relative usefulness of European as opposed to U.S. models.

Over fifty projects were examined, twenty-five in considerable detail, with fifteen in the final sample. All modes of transportation are included. Relationships were observed permitting positive recommendations to be made, in operational terms, for better project administration.

The author concludes that clients and modelers should know what they are asking each other, should search out qualified industry people on both sides, should probe beforehand each other's backgrounds, values, objectives, needs, goals, and punishment and reward systems, and should keep the model short, simple and specific.

TITLE: EVALUATION OF THE MONITOR - CTA AUTOMATIC VEHICLE MONITORING SYSTEM

AUTHOR: Transportation Systems Center (Harold G. Miller and William M. Basham)

DATE: March 1974

PROJECT NO.: MA-06-0024

KEYWORDS:

1. Vehicle, monitoring
 2. Headways
 3. Benefit-Cost Analysis
-

In June 1972, UMTA requested that the Transportation Systems Center (TSC) perform an evaluation of the Chicago Transit Authority's (CTA) Monitor-Automatic Vehicle Monitor (AMV) system. TSC conducted the overall evaluation, prepared the analytical data reduction, performed data evaluation and prepared the conclusions and recommendations.

The evaluation of the existing CTA-Monitor system was to: (1) determine the technical validity of the existing system; and (2) determine, based on (1) above, if the government would be justified expending capital grant funds for the completion of the Monitor-CTA system. The evaluation was conducted from July through mid-August of 1972.

To evaluate the existing system the following six tests and/or evaluations were conducted: management and operations evaluation; schedule and headway adherence test; system response rate evaluation; system reliability evaluation; system accuracy test; and cost benefit evaluation.

According to TSC, if the aim of the Monitor-CTA system is to maintain schedule adherence and headway at least as well as a non-monitor system, then from a financial point of view, the investment of government funds seems advisable. The cost benefit analysis has shown that mainly with the reduction of supervisors (point men and terminal telephone men), the proposed system will pay for itself in the sixth year whether the monitor system improves schedule and headway adherence or not.

However TSC feels that the long term goal of the Monitor-CTA system is not to remain as status quo but to show that this system can indeed improve schedule adherence and headway, in other words to become an operational command and control system. The system must be considered non-operational until the time that the present system's technical and operational deficiencies are corrected. Therefore, before further investing of government funds, 5 recommendations are outlined.

TITLE: ANALYSES OF RAIL VEHICLE DYNAMICS IN SUPPORT OF DEVELOPMENT
OF THE WHEEL RAIL DYNAMICS RESEARCH FACILITY

AUTHOR: Transportation Systems Center (Herbert Weinstock)

DATE: June 1973

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Rail, systems planning and design
 2. Computer, applications
 3. Rail, materials
 4. Tracks and Trackage
-

The purpose of this study is to gain insight into the dynamics of rail vehicles in order to guide the development of the wheel/rail simulators and to establish an analytic framework for the design and interpretation of tests to be conducted at the DOT High Speed Ground Test Center facilities. Continuation of these efforts is expected to result in a definition of the interrelationship between track construction and maintenance requirements and the vehicle design parameters required for meeting ride vibrations and noise transmission standards at minimum cost.

The mechanics of rail vehicle lateral guidance are reviewed on the basis of linearized models. Computer programs are developed for predicting stability and general lateral response characteristics. Included also are computer programs for predicting vertical and pitch vehicle response to track irregularities. Implications of non-linear effects are discussed.

The report describes the status of work currently in progress and subject to revision. Publication is intended primarily to stimulate the exchange of information on this subject.

TITLE: ASSESSMENT OF DESIGN TOOLS AND CRITERIA FOR URBAN RAIL TRACK STRUCTURES. Volume I: At-Grade Tie-Ballast Track

AUTHOR: Battelle-Columbus Laboratories for Transportation Systems Center (Robert H. Prause et al.)

DATE: April 1974

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Tracks and Trackage
 2. Research Operations
 3. Rail, materials
-

The development of techniques and criteria for track design is an important part of the Rail Supporting Technology Program that is being managed for the Urban Mass Transportation Administration by the Transportation Systems Center (TSC).

This report presents the results of a critical review of the technical factors which govern the design and performance of at-grade tie-ballast track for urban rail systems. The assessment of current design practice is based on a review of the literature and discussions with experienced track design personnel. The evaluation includes design loads and the criteria for selecting rail size, tie size and spacing, ballast depth, and subgrade parameters. The major track problems identified were rail joints, rail wear and noise on curves, rail fasteners, and rail corrugation. Detailed technical evaluations were made to determine those areas where the track design procedures are inadequate.

The report includes detailed information for the engineering design of track and recommendations for both short and long-range program plans for future research pertaining to the improvement of track performance.

References, as well as tables and illustrations, are presented. Appendices include rail production data and ballast pyramid model.

Volume II of this two volume report, entitled "Assessment of Design Tools and Criteria for Urban Rail Track Structures - At-Grade Slab Track", gives similar results for at-grade concrete slab track construction.

TITLE: ASSESSMENT OF DESIGN TOOLS AND CRITERIA FOR URBAN RAIL TRACK
STRUCTURES. Volume II: At-Grade Slab Track

AUTHOR: Battelle-Columbus Laboratories for Transportation Systems Center
(Howard C. Meacham et al.)

DATE April 1974

PROJECT NO. MA-06-0025

KEYWORDS:

1. Tracks and Trackage
 2. Research Operations
 3. Rail
-

The development of techniques and criteria for track design is an important part of the Rail Supporting Technology Program that is being managed for the Urban Mass Transportation Administration by the Transportation Systems Center (TSC).

This report presents the results of a critical review of the technical factors which govern the design and performance of at-grade slab track for urban rail systems. The assessment of current design practice is based on a review of the literature and discussions with experienced track design personnel. The evaluation includes descriptions of slab structures now in use in four countries, followed by review of design and analysis procedures used to characterize the subgrade and its support characteristics; the reinforced concrete slab itself, and the subgrade-support system.

With a few exceptions, most of the work reported in the literature is based on highway or runway applications, where the mechanism of load transfer into the slab is completely different than in a rail support slab. Further research on the mechanisms of load transfer from rail fasteners into a reinforced concrete slab is needed, and the newly developed finite element approach appears well-suited. Continued study of settlement and failure criteria is needed for soil and base materials subjected to cyclic loading. The relative merits of various types of reinforced concrete slabs, for example, pre-stress or post-stress considerations and joints are recommended for further study.

Reference and illustrations are furnished. Volume I of this report is entitled "Assessment of Design Tools & Criteria for Urban Rail Track Structures - At-Grade Tie-Ballast Track," (PB 233-016/AS).

TITLE: A BIBLIOGRAPHY ON THE DESIGN AND PERFORMANCE OF RAIL TRACK STRUCTURES

AUTHOR: Battelle-Columbus Laboratories for Transportation Systems Center
(Robert H. Prause, Helen C. Pestel and Ronald H. Melvin)

DATE: September 1974

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Bibliographies
 2. Rail
 3. Tracks and Trackage
-

This bibliography was prepared as part of the Rail Supporting Technology Program being sponsored by the Rail Programs Branch of the Urban Mass Transportation Administration. It is based on the reference material that was used to evaluate the technical factors which govern the design and performance of at-grade track structures for urban rail systems. While most of the reference material that has been included is directly related to track used for railroad, rail rapid transit and light rail transportation, there are some additional references on related topics such as rail vehicle dynamics, soil mechanics, stress analysis, etc. However, this bibliography does not include a comprehensive review of these related topics.

This survey includes much of the published literature on track design, track loading, ballast, wood and concrete cross ties, rail and rail fasteners. It also includes considerable material on track problems such as rail wear and corrugation, rail defects, rail joints and track degradation.

The formal literature search for this bibliography covered the time period from about 1963 to 1973. The principal sources were the National Technical Information Service (NTIS) file of government reports, Engineering Index, and the Applied Science and Technology Index. Earlier references were identified from the Railroad Research Information Service (RRIS) computerized data base and bibliographies prepared by the RRIS and the Association of American Railroads.

TITLE: NOISE ASSESSMENT AND ABATEMENT IN RAPID TRANSIT SYSTEMS

AUTHOR: Transportation Systems Center
(L.G. Kurzweil, R. Lotz, and E.G. Apgar)

DATE: September 1974

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Rail
2. Noise and Noise Control

As Systems Manager for the Urban Rail Supporting Technology Program sponsored by the Rail Programs Branch of the Urban Mass Transportation Administration, the Transportation Systems Center is conducting an effort in Urban Rail Noise Abatement.

A portion of this effort, described herein, is concerned with the assessment of noise and of the potential for noise abatement on existing U.S. transit properties. A methodology is described for assessing the noise climate and for selecting the combination of abatement techniques which reduces the existing noise to user specified levels for minimum cost. This methodology, developed in a pilot study of the Massachusetts Bay Transportation Authority (MBTA) rapid transit lines, takes into account the large number of interrelated acoustic and economic considerations present in rail transit systems. The various noise receivers include riders and operating personnel in cars and stations, and individuals in the wayside community. Noise sources include several types of wheel-rail noise, propulsion, power pick-up, auxiliary equipment and braking noise. Noise propagation paths include airborne and structureborne components establishing both direct and reverberant sound fields in tunnels, stations, transit cars, and communities. In the pilot application to the MBTA, minimum-cost noise control options were determined for noise level goals in the range 75 to 90 dBA.

Appendices contain MBTA noise data, algorithm for minimizing noise control costs, a glossary and references.

TITLE: PREDICTION AND CONTROL OF RAIL TRANSIT NOISE AND VIBRATION -
A STATE-OF-THE-ART ASSESSMENT

AUTHOR: Cambridge Collaborative, Inc. for Transportation Systems Center
(J.E. Manning, R.G. Cann, and J.J. Fredberg)

DATE April 1974

PROJECT NO. MA-06-0025

KEYWORDS:

1. Rail
 2. Noise and Noise Control
 3. Vibrations
 4. Rail, stations and terminals
-

As systems manager for the Urban Mass Transportation Administration's Rail Supporting Technology Program, the Transportation Systems Center has undertaken research in rail transit noise abatement. As part of this effort, this report contains the results of a critical review of current technology for the prediction and control of urban rail transit noise and vibration, with primary emphasis on the parameters affecting propagation paths.

Specifically included are tools for the prediction of wayside noise and vibration adjacent to both at-grade and elevated transit track, ground-borne noise propagation from subway tunnels, and noise in cars and in stations. In addition, several noise and vibration control techniques are evaluated including resilient rail fasteners, floating slabs, noise barriers, elevated structure enclosures, structural damping, and acoustical treatment of stations and tunnels.

Specific recommendations are made for areas requiring further research and development. Two of these areas, elevated structure noise and groundborne vibration from tunnels, have been selected for continued investigation under this contract (MA-06-0025).

Appendices include a model for predicting wayside noise, methods for prediction of noise from rails and ties, propagation of noise and vibration through soil, ground vibration levels due to surface operations and tunnel wall vibration data. References are provided.

TITLE: TRACK GEOMETRY DEVELOPMENT:
UMTA Urban Rail Supporting Technology Program

AUTHOR. Transportation Systems Center (F.J. Rutyna, ed.)

DATE April 1974

PROJECT NO. MA-06-0025

KEYWORDS:

1. Rail, systems planning and design
 2. Tracks and Trackage
 3. Qualitative Analysis
 4. Maintenance, facilities
-

The Department of Transportation's Transportation Systems Center (TSC) has been designated by UMTA as Systems Manager for its Urban Rail Supporting Technology Program. This program is an integrated, goal-oriented program of research, development, test and evaluation directed toward the systematic improvement and evolutionary development of urban rail technology. As part of this effort, TSC has been developing a track geometry system for use on rail transit properties to derive the benefits from comprehensive, orderly and complete track inspection data.

At present there are diagnostic or inspection cars in operation on main-line railroads, and to a limited extent, in urban transit systems. The principal vehicles in use in the U.S. and Canada which measure track geometry are: DOT/FRA "T-2"; Southern Railroad "R-1"; Canadian National "TR-Car"; Boston and Maine "Track Fax"; and NYCTA "X-116". The appendix details the principal features of these cars.

Measurement of transit system track geometry parameters, under normal operating conditions, is essential for planning and conducting an effective maintenance program. The pertinent parameters are profile, gage, alignment, and cross level.

Present methods of determining track conditions are, according to the authors, inefficient and highly subjective. To overcome these deficiencies, TSC has investigated and evaluated several track geometry measurement methods. These methods are all designed for use under revenue service conditions. The goal is to make available to the operating properties a system which is simple, reliable, mobile, inexpensive, and which yields a real-time output in a form directly useable for track diagnostics and maintenance planning.

The general results of the investigations and tests are presented here, together with a discussion of the system selected for prototype test and evaluation.

URBAN RAIL SUPPORTING TECHNOLOGY PROGRAM

TITLE: Fiscal Year 1973 Year End Summary

AUTHOR: Transportation Systems Center
(Ronald J. Madigan)

DATE: October 1974

PROJECT NO.: MA-06-0025

KEYWORDS: 1. Rail, rolling stock
2. Research Operations
3. Instrumentation
4. Rail, systems planning and design

In this report, the Urban Rail Supporting Technology Program, being conducted for UMTA, is described for the 1973 Fiscal Year period. The program is a goal-oriented activity of R&D and is directed toward the systematic improvement and evolutionary development of rail system technology. In concert with UMTA, and with the cooperation of the transit industry, primary system and technology objectives have been identified and priorities established; new and existing technology and methods are being critically evaluated; and applicable new technology will be recommended for proof-of-concept.

Management of these wide ranging but related activities is accomplished by organizing the program into five subprograms or tasks, described in this report. The tasks include program management, technical support and application engineering, facilities development, test and evaluation, and technology development.

Specific technical discussion covers track geometry measurement, UMTA facilities development at the High Speed Ground Test Center at Pueblo, Colorado, rail car test and evaluation (especially of the State-of-the-Art-Car (SOAC) and of Boston's MBTA Green Line), instrumentation for data acquisition and processing, noise abatement methodology, and tunneling and crashworthiness studies.

This Year End Summary presents FY 73 accomplishments and provides an outline of work to be undertaken in the future. Prior accomplishments are reported in the summary for Fiscal Year 1972 (PB 220-846).

Tables, statistics and photographs complement the text of the report.

TITLE: URBAN RAIL SUPPORTING TECHNOLOGY PROGRAM
Fiscal Year 1974 Year End Summary

AUTHOR: Transportation Systems Center
(Ronald J. Madigan)

DATE March 1975

PROJECT NO.: MA-06-0025

KEYWORDS: 1. Rail
2. Research Operations
3. Safety
4. Rail, systems planning and design
5. Tracks and Trackage
6. Noise and Noise Control
7. Tunnels and Tunneling

This report is the third in a series of fiscal year summaries of UMTA's Urban Rail Supporting Technology (URST) Program. The program for the 1974 fiscal year period is described, accomplishments presented, and an outline provided of work to be undertaken in the future.

URST Program activities are designed to meet goals and objectives in support of the advancement of urban rail technology. While the principal emphasis of the activities lies in the area of rail rapid transit, the long range applications will also benefit commuter rail and light rail systems as well.

Major areas described in the report include: program management; technical support and application engineering; facilities development; test and evaluation; and technology development.

Specific technical discussion includes: track measurement systems; UMTA facilities development at the Department of Transportation High Speed Ground Test Center, Pueblo, Colorado (in 1974 officially designated the Transportation Test Center); rail car test and evaluation; instrumentation for data acquisition and processing; noise abatement technology; tunneling; and car crashworthiness studies.

Appendices contain URST Program projects, contracts and grants, and document list.

Related documents are: "Urban Rail Supporting Technology Program, Fiscal Year 1972, Year End Summary" (PB 220-846) and "Urban Rail Supporting Technology Program, Fiscal Year 1973, Year End Summary" (PB 238-602).

TITLE: WHEEL/RAIL NOISE AND VIBRATION CONTROL

AUTHOR: Bolt Beranek and Newman, Inc. for Transportation Systems Center
(Paul J. Remington, et al.)

DATE: May 1974

PROJECT NO.: MA-06-0025

KEYWORDS:

1. Rail
 2. Noise and Noise Control
-

This report contains interim results of a program sponsored under the UMTA Urban Rail Supporting Technology Program to develop a basic understanding of urban transit wheel/rail noise generation for applications to the evaluation and improvement of wheel/rail noise control devices.

The report critically reviews existing analytical models and related experimental findings for the wheel/rail dynamic system and for the three categories of wheel/rail noise generation: squeal, impact, and roar. The limitations found result in recommendations for the remaining work required.

A compilation is presented of existing or promising wheel/rail noise control devices, their acoustic and non-acoustic effects. The relative severity of the three noise categories is compared by examining wayside noise data from numerous transit systems and railroads around the world, and by using a scale recommended here for rating urban transit wheel/rail noise, i.e., the peak A-weighted sound pressure level to which the receiver of interest is exposed. Squeal produces the most annoying noise followed closely by impact and roar.

Methodology is presented for assessing the non-acoustic performance of wheel/rail noise control devices.

The method is applied to an example in which it is assumed that resilient wheels are installed on all New York City Transit Authority cars.

A bibliography is furnished and tables and figures are presented. Appendices are "Determining Discount Rate for Investments in the Public Sector" and "Report of Inventions."

\$6.25

TITLE: NOISE AND VIBRATION OF A STEEL WHEEL/STEEL RAIL PERSONALIZED RAPID TRANSIT SYSTEM

AUTHOR: Pullman, Inc., Pullman Standard Division for Transportation Systems Center

DATE January 1974

PROJECT NO.: MA-06-0027

KEYWORDS:

1. Personal Rapid Transit
 2. Rail, systems planning and design
 3. Noise and Noise Control
 4. Vibrations
-

This report describes a test program which has been conducted to establish baseline noise levels and ride characteristics for a state-of-the-art steel wheel on steel rail personalized rapid transit vehicle. A full-scale test vehicle and an 840 foot track, including two 30 foot curves, have been built and used for 128 test runs under various conditions of operation. Permanent records have been made on magnetic tape and oscillograph paper for future analysis as needed. Testing conditions include speed, load, power and track, with instrumentation to provide recordings of the appropriate behavior measurements. This testing was supplemented by tests of non-operating situations and a dual-treaded vehicle.

According to the author the vehicle has been successfully demonstrated and has met speed and acceleration design goals. Noise levels of 82 to 85 dB (A) have substantially exceeded proposed criteria for both tangent track and curve track. The ride vibration has met current criteria on tangent track to the 30-mph test speed and to a 5-mph speed limit on the tight 30 foot curve track. There is some tendency to vehicle-hunting.

System description, test procedure and results and discussion are followed by conclusions and recommendations. Photographs, charts and figures are numerous. Appendices are entitled, "Vehicle Power and Propulsion," "Test Track," and "Instruments."

TITLE: AVAILABILITY ANALYSIS OF DUAL MODE SYSTEMS

AUTHOR: Transportation Systems Center (Charles R. Toye)

DATE: April 1974

PROJECT NO.: MA-06-0029

KEYWORDS:

1. Dual Mode Systems
-

This report discusses the availability procedures that were given to the contractors (Pohr Corporation, General Motors Corporation, and Transportation Technology, Incorporated) selected to participate in Phase I of the UMTA Dual Mode Program. The objective of this program is to combine the best automated transit technology, such as Personal Rapid Transit (PRT), with the best aspects of modern bus technology. The dual mode concept combines two methods of operation: a driver-operated mode on surface streets or highways and an automated mode on fixed guideways.

Phase I of the Dual Mode Transit System development program will cover concept and system design with special attention to improving the quality of transportation while minimizing initial capital investment, installation time and operating costs. This part of the program is expected to be completed within nine months. Phase II will consist of construction, operational testing, and evaluation of prototypes at DOT's High Speed Ground Test Center at Pueblo, Colorado. Phase III is expected to bring dual mode systems into revenue service by 1980.

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

The analytical procedures presented here define a method of evaluating the effects of a failure in a complex dual mode system based on a "worst" case steady state analysis. The computed result is an availability figure of merit and not an absolute prediction with associated confidence levels of system availability. The advantage of this procedure is that it avoids the use of a dynamic network traffic flow simulation which is both costly and time-consuming.

TITLE: COMMUNICATION SYSTEMS FOR DUAL MODE TRANSPORTATION

AUTHOR: Transportation Systems Center (R.E. Eaves and R.D. Kodis)

DATE February 1974

PROJECT NO.: MA-06-0029

KEYWORDS:

1. Communications
2. Dual Mode Systems

UMTA is presently engaged in a program to develop and demonstrate transportation systems based on vehicles which are capable of automatic operation on special guideways and manual operation on conventional roads. Adequate and reliable communications to and from vehicles is essential to dual mode's success. This report treats this important aspect of communications.

In the chapter on communications systems for dual mode transportation, the dual mode concept, on-guideway communications, off-guideway communications and FCC regulations are discussed. In terms of candidate communications systems, communication through electromagnetic fields and closed-circuit communication through mechanical contact are covered. Conclusions are presented.

References are furnished. The appendix is a chart of "Communications in Some Contemporary Ground Transportation Systems". It examines dual mode (Rohr, GM, TTI) Transpo PRT (Rohr Monocab, Ford, Bendix Dashaveyor, TTI) BART, Morgantown and AIRTRANS.

TITLE: ELECTROMAGNETIC ENVIRONMENT MEASUREMENTS OF PRT SYSTEMS AT
"TRANSPO 72". Volume I

AUTHOR: National Scientific Laboratories, Inc.
for Transportations Systems Center (Earl E. Jamison)

DATE: January 1974

PROJECT NO.: MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
 2. Safety
 3. People Movers
-

The work described in this report was performed as part of a test program conducted to evaluate the Safety and Performance characteristics of the four Personalized Rapid Transit Systems (PRT) on display at Transpo[®] 72. Sponsored by the U.S. Department of Transportation, Transpo[®] 72 was the first United States International Transportation Exposition and was intended to demonstrate to the general public new technologies in transportation.

The PRT demonstration program was the responsibility of the Urban Mass Transportation Administration (UMTA) and was conducted to provide detailed engineering test data in addition to providing mature candidates for an urban demonstration.

An X-Y plot is made of the ambient radiated electromagnetic signals and noise between 1KHz and 50KHz at Dulles International Airport for the purpose of assessing the local environment at each of the four Personalized Rapid Transit (PRT) sites prior to operation of each system. A Polaroid scope camera was used in conjunction with a spectrum analyzer to photograph signals between 50KHz and 50MHz.

The purpose of the measurements program was to establish some base line information on the electromagnetic signal characteristics in the Dulles area in the event there was an interaction between the PRT Command and Control Systems and the Federal Aviation Administration Air Traffic Control equipment.

The measurements obtained during this series of tests will be used for a comparison with data obtained under the same conditions, first with each system operating individually and then with all four systems operating simultaneously.

This is the first of a 12 volume set of reports, all of which are available through the National Technical Information Service.

TITLE: ELECTROMAGNETIC ENVIRONMENT MEASUREMENTS OF PRT SYSTEMS AT
"TRANSP0 72". Volume II: Dashaveyor System

AUTHOR: National Scientific Laboratories, Inc.
for Transportation Systems Center (Earl E. Jamison)

DATE January 1974

PROJECT NO. MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
 2. People Movers, Dashaveyor
 3. Safety
 4. Research Operations
-

The work described in this report was performed as part of a test program conducted to evaluate the Safety and Performance characteristics of the four Personalized Rapid Transit Systems (PRT) on display at Transpo[®]72. Sponsored by the U.S. Department of Transportation, Transpo[®] 72 was the first United States International Transportation Exposition and was intended to demonstrate to the general public new technologies in transportation.

The PRT demonstration program was the responsibility of the Urban Mass Transportation Administration (UMTA) and was conducted to provide detailed engineering test data in addition to providing mature candidates for an urban demonstration.

An X-Y plot is made of the radiated Electromagnetic signals and noise between 1KHz and 50KHz at each of the four Personalized Rapid Transit (PRT) sites at Dulles International Airport. The PRT systems were operated individually to establish the signal characteristics of each system. A spectrum analyzer was used to view the frequency spectrum broadband prior to recording and a Polaroid scope camera was used in conjunction with the spectrum analyzer to photograph signals between 50KHz and 50MHz. This frequency range was sufficiently broad to cover all command and control frequencies of the four PRT systems.

The purpose of the measurements program was to establish some base line information on the electromagnetic signal characteristics in the Dulles area in the event there was an interaction between the PRT Command and Control systems and the Federal Aviation Administration Air Traffic Control equipment.

The measurements obtained during this series of tests will be used for a comparison with data obtained with no PRT systems operating and later with all four systems operating simultaneously.

TITLE: ELECTROMAGNETIC ENVIRONMENT MEASUREMENTS OF PRT SYSTEMS AT
"TRANSPO 72". Volume III: Ford System

AUTHOR: National Scientific Laboratories Inc.,
for Transportation Systems Center (Earl E. Jamison)

DATE: January 1974

PROJECT NO.: MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
2. People Movers, Ford
3. Safety

The work described in this report was performed as part of a test program conducted to evaluate the Safety and Performance characteristics of the four Personalized Rapid Transit Systems (PRT) on display at Transpo (R) 72. Sponsored by the U.S. Department of Transportation, Transpo (R) 72 was the first United States International Transportation Exposition and was intended to demonstrate to the general public new technologies in transportation.

The PRT demonstration program was the responsibility of the Urban Mass Transportation Administration (UMTA) and was conducted to provide detailed engineering test data in addition to providing mature candidates for an urban demonstration.

An X-Y plot is made of the radiated Electromagnetic signals and noise between 1KHz and 50KHz at each of the four Personalized Rapid Transit (PRT) sites at Dulles International Airport. The PRT systems were operated individually to establish the signal characteristics of each system. A spectrum analyzer was used to view the frequency spectrum broadband prior to recording and a Polaroid scope camera was used in conjunction with the spectrum analyzer to photograph signals between 50KHz and 50MHz. This frequency range was sufficiently broad to cover all command and control frequencies of the four PRT systems.

The purpose of the measurements program was to establish some base line information on the electromagnetic signal characteristics in the Dulles area in the event there was an interaction between the PRT Command and Control systems and the Federal Aviation Administration Air Traffic Control equipment.

The measurements obtained during this series of tests will be used for a comparison with data obtained with no PRT systems operating and later with all four systems operating simultaneously.

TITLE: ELECTROMAGNETIC ENVIRONMENT MEASUREMENTS OF PRT SYSTEMS AT
"TRANSPO 72". Volume IV: Monocab System

AUTHOR: National Scientific Laboratories, Inc.
for Transportation Systems Center (Earl E. Jamison)

DATE: January 1974

PROJECT NO.: MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
2. People Movers, Rohr Monocab
3. Safety

The work described in this report was performed as part of a test program conducted to evaluate the Safety and Performance characteristics of the four Personalized Rapid Transit Systems (PRT) on display at Transpo (R) 72. Sponsored by the U.S. Department of Transportation, Transpo (R) 72 was the first United States International Transportation Exposition and was intended to demonstrate to the general public new technologies in transportation.

The PRT demonstration program was the responsibility of the Urban Mass Transportation Administration (UMTA) and was conducted to provide detailed engineering test data in addition to providing mature candidates for an urban demonstration.

An X-Y plot is made of the radiated Electromagnetic signals and noise between 1KHz and 50KHz at each of the four Personalized Rapid Transit (PRT) sites at Dulles International Airport. The PRT systems were operated individually to establish the signal characteristics of each system. A spectrum analyzer was used to view the frequency spectrum broadband prior to recording and a Polaroid scope camera was used in conjunction with the spectrum analyzer to photograph signals between 50KHz and 50MHz. This frequency range was sufficiently broad to cover all command and control frequencies of the four PRT systems.

The purpose of the measurements program was to establish some base line information on the electromagnetic signal characteristics in the Dulles area in the event there was an interaction between the PRT Command and Control systems and the Federal Aviation Administration Air Traffic Control equipment.

The measurements obtained during this series of tests will be used for a comparison with data obtained with no PRT systems operating and later with all four systems operating simultaneously.

TITLE: ELECTROMAGNETIC ENVIRONMENT MEASUREMENTS OF PRT SYSTEMS AT
"TRANSPO 72". Volume V: TTI System

AUTHOR: National Scientific Laboratories, Inc.
for Transportation Systems Center (Earl E. Jamison)

DATE: January 1974

PROJECT NO.: MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
2. People Movers, Transportation Technology, Inc.
3. Safety

The work described in this report was performed as part of a test program conducted to evaluate the Safety and Performance characteristics of the four Personalized Rapid Transit Systems (PRT) on display at Transpo[®] 72. Sponsored by the U.S. Department of Transportation, Transpo[®] 72 was the first United States International Transportation Exposition and was intended to demonstrate to the general public new technologies in transportation.

The PRT demonstration program was the responsibility of the Urban Mass Transportation Administration (UMTA) and was conducted to provide detailed engineering test data in addition to providing mature candidates for an urban demonstration.

An X-Y plot is made of the radiated Electromagnetic signals and noise between 1KHz and 50KHz at each of the four Personalized Rapid Transit (PRT) sites at Dulles International Airport. The PRT systems were operated individually to establish the signal characteristics of each system. A spectrum analyzer was used to view the frequency spectrum broadband prior to recording and a Polaroid scope camera was used in conjunction with the spectrum analyzer to photograph signals between 50KHz and 50MHz. This frequency range was sufficiently broad to cover all command and control frequencies of the four PRT systems.

The purpose of the measurements program was to establish some baseline information on the electromagnetic signal characteristics in the Dulles area in the event there was an interaction between the PRT Command and Control systems and the Federal Aviation Administration Air Traffic Control equipment.

The measurements obtained during this series of tests will be used for a comparison with data obtained with no PRT systems operating and later with all four systems operating simultaneously.

TITLE: ELECTROMAGNETIC ENVIRONMENT MEASUREMENTS OF PRT SYSTEMS AT "TRANSPO 72". Volume VI

AUTHOR: National Scientific Laboratories, Inc.
for Transportation Systems Center (Earl E. Jamison)

DATE January 1974 PROJECT NO. MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
 2. People Movers
 3. Safety
-

The work described in this report was performed as part of a test program conducted to evaluate the Safety and Performance characteristics of the four Personalized Rapid Transit Systems (PRT) on display at Transpo[®] 72. Sponsored by the U.S. Department of Transportation, Transpo[®] 72 was the first United States International Transportation Exposition and was intended to demonstrate to the general public new technologies in transportation.

The PRT demonstration program was the responsibility of the Urban Mass Transportation Administration (UMTA) and was conducted to provide detailed engineering test data in addition to providing mature candidates for an urban demonstration.

An X-Y plot is made of the radiated electromagnetic signals and noise between 1KHz and 50KHz at each of the four Personalized Rapid Transit (PRT) sites at Dulles International Airport. The PRT Systems were operated simultaneously in an effort to determine if any interaction existed between systems. A spectrum analyzer was used to view the frequency spectrum broadband prior to recording and a Polaroid scope camera was used in conjunction with the spectrum analyzer to photograph signals between 50KHz and 50MHz. This frequency range was sufficiently broad enough to cover all command and control frequencies of the four PRT systems.

The purpose of the measurements program was to establish some base line information on the electromagnetic signal characteristics in the Dulles area in the event there is an interaction between PRT Command and Control Systems and the Federal Aviation Administration Air Traffic Control equipment.

The measurements obtained during this test will be used to assess the signal interaction from adjacent systems by comparison with data obtained with no systems operating and with each system operating individually.

TITLE: ELECTROMAGNETIC ENVIRONMENT MEASUREMENTS OF PRT SYSTEMS AT "TRANSPO 72". Volume VII

AUTHOR: National Scientific Laboratories, Inc.
for Transportation Systems Center (Earl E. Jamison)

DATE: January 1974

PROJECT NO.: MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
2. People Movers
3. Safety

The work described in this report was performed as part of a test program conducted to evaluate the Safety and Performance characteristics of the four Personalized Rapid Transit Systems (PRT) on display at Transpo[®] 72. Sponsored by the U.S. Department of Transportation, Transpo[®] 72 was the first United States International Transportation Exposition and was intended to demonstrate to the general public new technologies in transportation.

The PRT demonstration program was the responsibility of the Urban Mass Transportation Administration (UMTA) and was conducted to provide detailed engineering test data in addition to providing mature candidates for an urban demonstration.

This report covers the measurements of the broadband conducted noise present on the A.C. power lines feeding the Personalized Rapid Transit (PRT) systems at Dulles Airport with all four systems off.

The purpose of the measurement effort was to evaluate the electrical environment existing on each of the PRT "hot" and neutral A.C. power lines prior to the installation and operation of any of the systems. These data will provide a baseline for use in establishing the relative increase in EMI levels associated with PRT system operation.

Data obtained under this effort will enable an evaluation of whether or not existing or potential EMI levels might affect the normal operation of the PRT systems. Such interference could conceivably contribute to breakdown, malfunctions, or safety problems associated with the automated equipment utilized by the PRT systems in performing normal functions.

TITLE: ELECTROMAGNETIC ENVIRONMENT MEASUREMENTS OF PRT SYSTEMS AT "TRANSPO 72". Volume VIII Dashaveyor System

AUTHOR: National Scientific Laboratories, Inc.
for Transportation Systems Center (Earl E. Jamison)

DATE: January 1974

PROJECT NO.: MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
2. People Movers, Dashaveyor
3. Safety

The work described in this report was performed as part of a test program conducted to evaluate the Safety and Performance characteristics of the four Personalized Rapid Transit Systems (PRT) on display at Transpo[®] 72. Sponsored by the U.S. Department of Transportation, Transpo[®] 72 was the first United States International Transportation Exposition and was intended to demonstrate to the general public new technologies in transportation.

The PRT demonstration program was the responsibility of the Urban Mass Transportation Administration (UMTA) and was conducted to provide detailed engineering test data in addition to providing mature candidates for an urban demonstration.

This report covers the measurements of the broadband conducted noise present on the A.C. power lines feeding the Personalized Rapid Transit (PRT) systems at Dulles Airport with each system operating individually.

The purpose of the measurement effort was to evaluate the electrical environment existing on each of the PRT "hot" and neutral A.C. power lines and to assess the effect of each system on the power line with all other PRT systems turned off.

The measurements obtained during this test will be used for a comparison with data obtained with no PRT systems operating and with all four PRT systems operating simultaneously.

TITLE: ELECTROMAGNETIC ENVIRONMENT MEASUREMENTS OF PRT SYSTEMS AT "TRANSPO 72". Volume IX: Ford System

AUTHOR: National Scientific Laboratories, Inc.
for Transportation Systems Center (Earl E. Jamison)

DATE January 1974

PROJECT NO..

MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
 2. People Movers, Ford
 3. Safety
 4. Research Operations
-

The work described in this report was performed as part of a test program conducted to evaluate the Safety and Performance characteristics of the four Personalized Rapid Transit Systems (PRT) on display at Transpo[®] 72. Sponsored by the U.S. Department of Transportation, Transpo[®] 72 was the first United States International Transportation Exposition and was intended to demonstrate to the general public new technologies in transportation.

The PRT demonstration program was the responsibility of the Urban Mass Transportation Administration (UMTA) and was conducted to provide detailed engineering test data in addition to providing mature candidates for an Urban demonstration.

This report covers the measurements of the broadband conducted noise present on the A.C. power lines feeding the Personalized Rapid Transit (PRT) systems at Dulles Airport with each system operating individually.

The purpose of the measurements effort was to evaluate the electrical environment existing on each of the PRT "hot" and neutral A.C. power lines and to assess the effect of each system on the power line with all other PRT systems turned off.

The measurements obtained during this test will be used for a comparison with data obtained with no PRT systems operating and with all four PRT systems operating simultaneously.

TITLE: ELECTROMAGNETIC ENVIRONMENT MEASUREMENTS OF PRT SYSTEMS AT "TRANSPO 72". Volume X: Monocab System

AUTHOR: National Scientific Laboratories, Inc.
for Transportation Systems Center (Earl E. Jamison)

DATE January 1974

PROJECT NO.: MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
 2. People Movers, Rohr Monocab
 3. Safety
 4. Research Operations
-

The work described in this report was performed as part of a test program conducted to evaluate the Safety and Performance characteristics of the four Personalized Rapid Transit Systems (PRT) on display at Transpo [®]72. Sponsored by the U.S. Department of Transportation, Transpo [®]72 was the first United States International Transportation Exposition and was intended to demonstrate to the general public new technologies in transportation.

The PRT demonstration program was the responsibility of the Urban Mass Transportation Administration (UMTA) and was conducted to provide detailed engineering test data in addition to providing mature candidates for an urban demonstration.

This report covers the measurements of the broadband conducted noise present on the A.C. power lines feeding the Personalized Rapid Transit (PRT) systems at Dulles Airport with each system operating individually.

The purpose of the measurement effort was to evaluate the electrical environment existing on each of the PRT "hot" and neutral A.C. power lines and to assess the effect of each system on the power line with all other PRT systems turned off.

The measurements obtained during this test will be used for a comparison with data obtained with no PRT systems operating and with all four PRT systems operating simultaneously.

TITLE: ELECTROMAGNETIC ENVIRONMENT MEASUREMENTS OF PRT SYSTEMS AT "TRANSPO
72 . Volume XI: TTI System

AUTHOR: National Scientific Laboratories, Inc.
for Transportation Systems Center (Earl E. Jamison)

DATE: January 1974

PROJECT NO.: MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
 2. People Movers, Transportation Technology, Inc.
 3. Safety
 4. Research Operations
-

The work described in this report was performed as part of a test program conducted to evaluate the Safety and Performance characteristics of the four Personalized Rapid Transit Systems (PRT) on display at Transpo[®] 72. Sponsored by the U.S. Department of Transportation, Transpo[®] 72 was the first United States International Transportation Exposition and was intended to demonstrate to the general public new technologies in transportation.

The PRT demonstration program was the responsibility of the Urban Mass Transportation Administration (UMTA) and was conducted to provide detailed engineering test data in addition to providing mature candidates for an urban demonstration.

This report covers the measurements of the broadband conducted noise present on the A.C. power lines feeding the Personalized Rapid Transit (PRT) systems at Dulles Airport with each system operating individually.

The purpose of the measurement effort was to evaluate the electrical environment existing on each of the PRT "hot" and neutral A.C. power lines and to assess the effect of each system on the power line with all other PRT systems turned off.

The measurements obtained during this test will be used for a comparison with data obtained with no PRT systems operating and with all four PRT systems operating simultaneously.

\$3.75

TITLE: ELECTROMAGNETIC ENVIRONMENT MEASUREMENTS OF PRT SYSTEMS AT "TRANSPOR 72". Volume XII: Annual Report

AUTHOR: National Scientific Laboratories, Inc.
for Transportation Systems Center (Earl E. Jamison)

DATE: January 1974 PROJECT NO.: MA-06-0031

KEYWORDS:

1. Personal Rapid Transit
2. People Movers
3. Safety
4. Research Operations

The work described in this report was performed as part of a test program conducted to evaluate the Safety and Performance characteristics of the four Personalized Rapid Transit Systems (PRT) on display at Transpo 72. Sponsored by the U.S. Department of Transportation, Transpo 72 was the first United States International Transportation Exposition and was intended to demonstrate to the general public new technologies in transportation.

The PRT demonstration program was the responsibility of the Urban Mass Transportation Administration (UMTA) and was conducted to provide detailed engineering test data in addition to providing mature candidates for an urban demonstration.

This report covers the measurements of the broadband conducted noise present on the A.C. power lines feeding the Personalized Rapid Transit (PRT) systems with all four systems operating simultaneously.

The purpose of the measurement effort was to evaluate the electrical environment existing on each of the PRT "hot" and neutral A.C. power lines and to assess the effect, if any, on each individual system with all of the other systems operating simultaneously. Each system is isolated from the main high voltage line by a stepdown transformer which should filter out most unwanted higher frequency spikes.

The measurements obtained during this test will be used for a comparison with data obtained with no PRT systems operating and with each system operating individually.

TITLE: SURVEY OF PRT VEHICLE MANAGEMENT ALGORITHMS

AUTHOR: Transportation Systems Center
(Arthur S. Priver)

DATE September 1974

PROJECT NO.: MA-06-0031

KEYWORDS: 1. Personal Rapid Transit
2. Algorithms
3. Information Aids
4. Management

This report summarizes the results of a literature survey of state-of-the-art vehicle management algorithms applicable to Personal Rapid Transit Systems (PRT).

The objective of the survey was to establish a data base of PRT vehicle management algorithms that may be used as a focal information source. While anyone associated with PRT systems use and design would find this survey of interest, it is anticipated that a major use of the survey will be in the evaluation and development of vehicle management algorithms.

The surveyed vehicle management algorithms are organized into a set of five major component subcategories: network routing, merge control, empty vehicle management, station management, and blocked segment management. This classification scheme enables the comparison and description of algorithms in common terms.

In the course of the survey, over 240 documents were examined. These documents embraced PRT, dual mode, dial-a-bus, line haul, and conventional transportation systems.

The appendix contains a list of the documents reviewed, generally ordered by the organizations whose literature formed the base of the survey. Illustrations and tables are included.

\$4.75

NTIS ORDER NO.: PB 238-942/AS

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TITLE: THE ADDITIONAL COST OF PROVIDING MOBILITY FOR THE ELDERLY AND
HANDICAPPED ON THE WASHINGTON METROPOLITAN RAIL RAPID TRANSIT SYSTEM

AUTHOR: Department of Transportation
Office of the Secretary and Urban Mass Transportation Administration

DATE May 1973

PROJECT NO..

MA-06-0034

KEYWORDS:

1. Elderly
 2. Handicapped
 3. Rail, systems planning and design
 4. Safety
 5. Transportation Disadvantaged
-

This report estimates the cost of adding elevators and associated equipment to the Washington Metropolitan Rail Rapid Transit System as part of a planning and designing procedure which would meet the special needs of the elderly and handicapped. Most of the initial data was supplied by the Washington Metropolitan Area Transit Authority. The cost estimates and subsequent findings, however, are the responsibility of the Department of Transportation.

Although the Department recognizes the need to provide greater mobility for the elderly and handicapped in all phases of mass transportation, this particular report addresses itself only to the problems relating to rail rapid transit. The broader issues of providing mobility for the elderly and the handicapped in the area bus systems and the relationship of other public transit services to the rail rapid system will be discussed in a separate study being prepared by the Metropolitan Council of Governments and the Washington Metropolitan Area Transit Authority.

This report covers the following specific areas of study: potential elderly and handicapped users, needs of the elderly and handicapped in rail rapid transit, the Metro system and its accessibility to the elderly and the handicapped, cost of providing additional facilities, security and safety. A list of references is included.

TITLE: THE HANDICAPPED AND ELDERLY MARKET FOR URBAN MASS TRANSIT
Executive Summary

AUTHOR: Transportation Systems Center,
and Urban Mass Transportation Administration

DATE: July 1973

PROJECT NO.: MA-06-0034

KEYWORDS:

1. Elderly
 2. Handicapped
 3. Demand Responsive Systems, dial-a-ride
 4. Transportation Disadvantaged
-

This report is the first of two in a study designed to determine the mass transit needs of the elderly and handicapped in order that the Department might better serve their needs. The second volume in the study is the Technical Report (PB 224-821), which details the study findings, methodology, references, data, etc., and includes census data which provides supportive statistics.

This report provides a brief description of the status, existing services, and transit needs and demands of the elderly and handicapped. Alternative solutions to problems brought out are also discussed. These include the upgrading of existing or planned systems, Dial-a-Ride feasibility, transit stamps, coupon taxi service, and fixed route service. Various impacts are analyzed and recommendations are made concerning further studies and reports as well as suggestions to aid local planners.

TITLE: THE HANDICAPPED AND ELDERLY MARKET FOR URBAN MASS TRANSIT
Technical Report

AUTHOR: Urban Mass Transportation Administration and Transportation Systems
Center

DATE October 1973

PROJECT NO.

MA-06-0034

KEYWORDS:

1. Elderly
 2. Handicapped
 3. Transportation Disadvantaged
-

This study was performed at the request of the Urban Transportation Advisory Council to acquire specific information on the characteristics of the handicapped and elderly population in order to meet their special transit needs. The study is designed to aid local planners as well as being a useful tool for the Department of Transportation.

Assembled data include the size and spatial distribution of the handicapped and elderly, a population study of the handicapped with transportation disfunctions, a measure of the current availability of public urban transportation to the elderly and handicapped compared to their spatial distribution, a study of transit use by the elderly and handicapped, and potential transit use projections dependent on the implementation of improved transit services.

Methodologies employed in this study include: 1) a literature survey and data analysis to identify, review and synthesize previous research on this subject; 2) identification of physically handicapped transit demand through definition, population, current utilization and potential demand, 3) identification of elderly transit demand to determine current and potential use; 4) local level analysis of Cleveland, Syracuse, and Raleigh, cities chosen because they were typical yet represented a wide range of urban types that would result in the collection of a wide range of data, and 5) development of criteria to assess the potential increase in ridership and to analyze the relative costs and benefits which would result from improved service to the handicapped and the elderly by the elimination of physical, operational and service barriers.

This study also includes a Summary Report (PB 222-828) in which the feasibility of innovative transit systems such as Dial-a-Ride, transit stamps, coupon taxi service, and fixed route service are discussed.

There is a glossary of terms and numerous supportive statistical charts.

\$6.25

TITLE: SUMMARY DATA FOR SELECTED NEW URBAN TRANSPORTATION SYSTEMS

AUTHOR: Transportation Systems Center (Robert F. Casey)

DATE November 1972

PROJECT NO.:

MA-06-0035

KEYWORDS:

1. Urban Development and Planning
 2. Vehicle Design
 3. Benefit-Cost Analysis
 4. Personal Rapid Transit
-

This report summarizes the development of new transportation systems through their physical and performance characteristics, costs and availability, and suggests methodologies for incorporating new technology systems into transportation planning. Concentration is on systems which either have great appeal or could be ready for implementation within five years. The selection was made from those systems which offer a substantial departure from existing transit service, employ vehicles which carry fifty or less passengers, or use new methods of suspension or propulsion. Information was supplied by the system proponent or manufacturer.

For ease in comparison, the new systems are classified according to function, which includes the following:

- Personal Rapid Transit Systems - complete network in central cities, possibly extending into suburbs, on-demand, origin to destination, single vehicle service; small vehicles usually operated in trains; low capacities; for high density areas or small activity centers.
- Circulation Systems - loops, shuttles or very small networks; very short trips; small vehicles usually operated in trains; low capacities; high density areas or small activity centers.
- Collection and Distribution Systems - limited network up to a few miles in length, short trips; medium-sized vehicles; moderate capacity; for high density urban areas, large activity centers, or low density areas.
- Line Haul Systems - linear or radial routes of several miles in length; highest capacities per vehicle and per line; for large population densities.

There are numerous illustrations, tables and a glossary of terms.

TITLE: POST-TRANSP0 TEST PROGRAM: TRANSPORTATION PROGRAMS REPORT
Summary Report

AUTHOR: The Johns Hopkins University/Applied Physics Laboratory
(R.T. Cusick and E.E. Mooring, ed.)

DATE: June 1973

PROJECT NO.: MD-06-0008

KEYWORDS:

1. People Movers, Dashaveyor
 2. People Movers, Ford
 3. People Movers, Rohr Monocab
 4. People Movers, Transportation Technology, Inc.
-

As part of a program for the development of new transportation systems in conjunction with TRANSP0 '72, UMTA initiated a project for the construction and testing of four prototype Personal Rapid Transit (PRT) Systems at Dulles International Airport. These systems are the Bendix Dashaveyor, the Ford Motor ACT, the Rohr Monocab and the Transportation Technology TTI.

Each prototype featured two vehicles with a minimum of 1000 feet of guideway, off-line stations and fully automatic control. The TTI used air cushions for vertical support and a linear induction motor for propulsion. The other systems used rubber tires, two supported from a roadway and the other, the Monocab, suspended from an overhead guidebeam. Both scheduled and demand-actuated operations were demonstrated. These four hardware embodiments of state-of-the-art design afforded unique opportunities to collect heretofore unmeasured data. Testing was a joint effort of UMTA and the Transportation Systems Center (TSC) of the Department of Transportation, the Applied Physics Laboratory (APL), the MITRE Corporation, and the four contractors.

This summary report has emerged as a result of the program. It encompasses the Post-TRANSP0 Test Program (PTTP) operations, organization, and instrumentation. The more significant tests are described and a summary of the analyses performed to date is provided. Conclusions and recommendations for further work are presented.

General results of the program included: (1) The TRANSP0 systems are capable of an urban application involving moderate headway requirements, a limited number of vehicles and limited routing alternatives; (2) The technology demonstrated, if suitably refined, could be expected to support headways as short as 10 seconds; (3) Environmental considerations pose no serious problems to automated systems.

Many illustrations and tables support the text. The appendices include Magnetic Tape Data Catalog, Ride Quality Data Analysis Technique, Ride Comfort Test Questionnaire, EMI and Conducted RFI Reports Data Catalog and Emergency Brake Test of the TRANSP0 '72 TTI PRT Vehicle.

TITLE: MOBILITY MEASURES FOR URBAN TRANSPORTATION SYSTEMS

AUTHOR: DTM, Inc. (J. M. McLynn, J. E. I. Heller, and R.H. Watkins)

DATE April 1972

PROJECT NO..

MD-06-0013

KEYWORDS:

1. Ridership
 2. Benefit-Cost Analysis
 3. Quantitative Analysis
 4. Social Benefits and Costs
-

The purpose of this report is to extend, refine and apply previous research of UMTA in developing mobility measures in order to evaluate alternative transit projects and programs. Mobility in this study is determined by the observed performance of a real transit system in a real environment. It is defined as a quantitative measure of the transportation system's performance from the rider's point of view.

The particular considerations viewed in this report are how much movement is provided to the riders and with what facility. A formula is developed which states that mobility is equal to the total service used times the performance level of service. The relationship between socio-economic groups and the mobility measure is explored via the mechanism of fares. In order to show its application to real situations, the mobility measure is applied to the Shirley Highway Project. Other potential areas of application are discussed.

TITLE: COMMAND AND CONTROL STUDIES FOR PERSONAL RAPID TRANSIT,
PROGRAM STATUS, 1973

AUTHOR: The Johns Hopkins University/Applied Physics Laboratory
(E.J. Hinman, ed.)

DATE: December 1973

PROJECT NO.: MD-06-0018

KEYWORDS:

- | | |
|---------------------------|-------------------------|
| 1. Personal Rapid Transit | 3. Headways |
| 2. Communications | 4. Computer Programming |
-

This study reviews the Applied Physics Laboratory effort in command and control systems for circulation and distribution applications. A brief history of the program is given, together with the results of the work and its effects on system performance.

The discussion is divided into an investigation of vehicle management (the controlling of a fleet of vehicles in terms of scheduling, dispatching, empty vehicle allocation, and station operation) and an investigation of vehicle regulation (the controlling of an individual vehicle either alone or within a string of vehicles.)

In the section devoted to command problems and requirements, operational constraints are presented and vehicle management in a Personal Rapid Transit (PRT) network is examined. Current studies are summarized.

Discussion of control constraints and requirements includes headway protection, minimum safe headways and headway regulation subtopics. Computer engineering reliability is examined under the topic of command and control implementation.

Both references and a bibliography are included, along with summary descriptions of the major computer simulations developed for urban transportation studies.

TITLE: CONTROL ALLOCATION INVESTIGATION: SAMPLING RATE SELECTION

AUTHOR: Johns Hopkins University, Applied Physics Laboratory (G. L. Pitts)

DATE: April 1974

PROJECT NO.: MD-06-0018

KEYWORDS:

1. Vehicle, monitoring
 2. Communications
 3. Computer Applications
 4. Models & Modeling
-

One of the major considerations facing the design of high performance automated transit systems is the efficient and economical allocation of the control functions between the transportation vehicle and a digital computer located at the wayside. The choice of allocation also impacts the communications subsystem since propulsion commands and position and velocity measurements are exchanged at the interface between the vehicle and wayside over a bandwidth limited data link.

This report examines the non-emergency control of vehicle speed and spacing (i.e., the vehicle regulation problem). The primary goal is to identify the type of information and the rate at which this information must be exchanged across the vehicle/guideway interface in order to achieve precise vehicle regulation. A successful system design keeps the communication requirements within the available channel capacity.

The effect of control allocation on these requirements is examined by varying the complexity of the onboard vehicle control system. By executing a major portion of the control computations on board the vehicle, a "smart" vehicle allocation model is formed. At the other end of the spectrum is the "dumb" vehicle allocation in which most of the computations are handled by the wayside digital computer.

References are furnished and illustrations and figures complement the text.

TITLE: DISPOSITION OF EMPTY VEHICLES IN A PERSONAL RAPID TRANSPORTATION SYSTEM

AUTHOR: Johns Hopkins University/Applied Physics Lab
(M. C. Waddell, M. B. Williams, and B.M. Ford)

DATE: May 1974

PROJECT NO.

MD-06-0018

KEYWORDS:

1. Personal Rapid Transit
2. Vehicle, monitoring

This report examines a basic vehicle management function associated with the operation of a Personal Rapid Transit (PRT) system. As used in this report, PRT denotes a transit system consisting of a guideway network, off-line stations located at intervals along the guideway and small vehicles operating under automatic control. In such a system a passenger enters a station and is provided with a vehicle that is then routed to his desired destination station with no stops at other stations enroute. Occupancy of a vehicle is presumed to be limited to members of a single party.

Vehicle management functions are those concerned with system-wide operation, such as routing of vehicle and redistributing empty vehicles within the system, as opposed to vehicle regulation (e.g. headway maintenance and merge control). The vehicle management function addressed in this report is that of redistributing empty vehicles.

A procedure for performing the function of continually redistributing empty vehicles throughout the system is developed and carried out periodically (every few minutes) and consists of three steps: (1) estimation of the surplus or deficit of empty vehicles at each station; (2) allocation of surpluses to deficits; and (3) preparation of a dispatch list for each station, based on allocations, the list giving the disposition of successive empty vehicles as they become available.

A brief summary of the report is presented. Problems arising in predicting future needs for vehicles are discussed and the role of buffer vehicle storage is reviewed. A procedure for carrying out the empty-vehicle management function is described and some variations to the procedures are covered.

Two computer simulations were constructed to evaluate the procedure. According to the authors, in a large PRT system in which occupancy of each vehicle is limited to members of a single party, the redistribution of empty vehicles can be carried out satisfactorily.

Illustrations, tables and appendices are provided and references are furnished.

\$5.75

TITLE: DUAL MODE TRANSIT SYSTEM
Final Report

AUTHOR: General Motors Corporation/Transportation Systems Division

DATE: July 1974

PROJECT NO.: MI-06-0016

KEYWORDS:

1. Dual Mode Systems
2. Demand Responsive Systems
3. Guideways

This is the final report by the Transportation Systems Division of the General Motors (GM) Corporation on Phase I of UMTA's Dual Mode Transit System program. The work was performed from September, 1973 to June, 1974.

The purpose of the Phase I effort was to define the GM Dual Mode Transit System concept and to develop a preliminary system design. This report summarizes the effort and concept, with particular emphasis on the rationale behind system and subsystem design decisions. The approach employed and work performed during this phase are presented.

Major features of the concept included the following: demand responsive service, synchronous speeds of 25 m/s on line-haul corridor guideways and 12 m/s on CBD guideways, theoretical capacity of 10,774 passengers per lane-hour, three-level computer hierarchy, and seventeen-passenger vehicle.

Chapters include the description of the GM Dual Mode Transit System concept, system management, cost parametric, description of the GM Phase II Feasibility Demonstration System, and system development.

Appendices are "Failure Mode and Effects Analysis," "Fault Tree Analysis - Vehicle Automatic Control Equipment," "Reliability Prediction - Electric Propulsion System," and brief summaries of related GM reports.

TITLE: AIRPORT ACCESS: Minneapolis and St. Paul

AUTHOR: Metropolitan Transit Commission of St. Paul, Minnesota

DATE: December 1972

PROJECT NO.:

MN-06-0002

KEYWORDS:

1. Transportation Disadvantaged
 2. Inner City
 3. Access, planning and control
 4. Bus, commuter
 5. Airports, access
-

This report studies the effect of providing public transit from high-unemployment, low-income residential sections of a metropolitan area to a labor area which offers higher income with skilled and semi-skilled employment, to determine whether lack of transportation had created a barrier to employment.

The inner cities of Minneapolis and St. Paul were connected to the airport industrial complex by the Twin Cities Route #50 Airport Express. Since August 1968 the service provided express transportation from the Central Business Districts to the airport and convenient transfer arrangements from the regular routes directly serving the target communities. Extensive advertising was devoted to the project on radio, billboards, newspapers, and community service groups within the poverty areas. Airport employers were provided with maps and schedules to dispense to prospective as well as regular employees.

A benefit-cost survey was conducted in Spring, 1970, to evaluate the service. It was found that 50% of the patrons were inner city residents and, although most of the riders chose to select the service rather than being dependent on it, a sizable number of the outbound riders said that the service was critical in helping them to obtain and to hold employment.

The final analysis revealed that employment for many persons was made possible by the creation of the route, enabling many riders to afford an automobile and thereby abandon the transit service. However, the project seems to have achieved its goal of increasing the standard of living, if slightly, in the inner cities, even though patronage of the Airport Express did not justify its continuation as it had been designed, causing service to be reduced. Also brought to light was the need to provide prospective transit users with information on available transportation through improved marketing techniques.

TITLE: CONTROLLER'S CLASS NOTEBOOK FOR IMPLEMENTATION AND OPERATION
OF A DEMAND RESPONSIVE PUBLIC TRANSPORTATION SYSTEM (Haddonfield
Dial-A-Ride) Supplement A

AUTHOR: LEX Systems, Inc., DAVE Systems, Inc., and New Jersey Department
of Transportation

DATE: April 1974 PROJECT NO.: NJ-06-0002

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
2. Manpower and Personnel
3. Management, training techniques

This report is a supplement to "Implementation and Operation of a Demand Responsive Public Transportation System (Haddonfield Dial-A-Ride)," (PB 233-380). This controller's class notebook is presented as an aid to training Control Room personnel in all phases of Control Room operations of a manually controlled Dial-A-Ride.

In the first section of the manual, the Haddonfield, New Jersey Dial-A-Ride Demonstration Project is discussed in terms of objectives, operating area and program organization.

The purpose of this report is to guide and direct those who are responsible for operating the Dial-A-Ride system in Haddonfield and surrounding service areas. It contains the necessary policy and procedures to operate Dial-A-Ride. It is used not only for guidance in operating the system but also for training the control room staff and the vehicle operators who are the integral part of the system. As an adjunct to the operating portion there is also a section on personnel policies and procedures.

In the section on personnel policies, control room staff is discussed in terms of such issues as personnel selection and testing, training, wage and pay policy and dress code. Appendices listed by section include the telephonist, scheduler and dispatcher job descriptions. There is also discussion on policies for vehicle operators.

Another topic presented is contingency/emergency procedures. Examples of this are what to do in case of vehicle and radio breakdown, fires and illness of drivers or passengers.

In the presentation of control room operations, a general system description as well as the control system functional flow are discussed. Supervisory activities and responsibilities are examined.

In terms of radio communications, a general overview is presented and the FCC rules specified. Basic operating instructions and systems description are also included.

In various sections of the report, definitions are presented for ease in understanding.

TITLE: DRIVER'S CLASS NOTEBOOK FOR IMPLEMENTATION AND OPERATION OF A DEMAND RESPONSIVE PUBLIC TRANSPORTATION SYSTEM (Haddonfield Dial-A-Ride) Supplement B

AUTHOR: LEX Systems, Inc., DAVE Systems, Inc., and New Jersey Department of Transportation

DATE: April 1974 PROJECT NO.: NJ-06-0002

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
 2. Manpower & Personnel
 3. Management, training techniques
 4. Bus, driver
-

This report is presented as a supplement to the report entitled, "Implementation and Operation of a Demand Responsive Public Transportation System (Haddonfield Dial-A-Ride)" (PB 233-380). This Driver's Class Notebook is presented as an aid to training drivers for a Dial-A-Ride type operation.

In the first section of the manual, the Haddonfield, New Jersey, Dial-A-Ride Demonstration Project is discussed in terms of objectives, operating area and program organization. Dial-A-Ride is a door-to-door public mass transportation system. Passengers share the use of small, 17-passenger vehicles and benefit from the economies realized by this share-a-ride concept. The prospective passenger requests a ride by means of a telephone call to the Control Center, a vehicle is assigned to pick up the passenger and this assignment is radioed to one of the vehicle drivers.

Attainment of the purpose of Dial-A-Ride is largely in the hands of the vehicle operator; the bus driver who has hour-to-hour contact with the Dial-A-Ride passenger. An effective and efficient system is of no value if the bus driver does not understand the system or his part in it. Therefore, in the section on vehicle operations, topics discussed include public relations, pickup and delivery etiquette, stop procedures, handling cash fares and tickets, vehicle scheduling and driver assignment.

In terms of contingency/emergency procedures, what course to take in case of such incidences as vehicle and radio breakdown and operator and passenger illness are presented.

The Haddonfield PATCO station, the Cherry Hill Mall and other key location accesses are discussed in terms of stop points for pickup/delivery.

System description and authorized operators, transmitting information and base radio log are some of the topics discussed in terms of radio communication. Appendices present the phonetic alphabet and an example of the radio exchange when a vehicle makes a stop.

TITLE: CONTROLLER'S CLASS DESCRIPTION SHEETS FOR IMPLEMENTATION AND OPERATION OF A DEMAND RESPONSIVE PUBLIC TRANSPORTATION SYSTEM (Haddonfield Dial-A-Ride) Supplement C

AUTHOR: LEX Systems, Inc., DAVE Systems, Inc., and New Jersey Department of Transportation

DATE: April 1974 PROJECT NO.: NJ-06-0002

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
 2. Manpower & Personnel
 3. Management, training techniques
-

This report is presented as a supplement to the report entitled "Implementation and Operation of a Demand Responsive Public Transportation System (Haddonfield Dial-A-Ride)" (PB 233-380). Controller's class description sheets are presented as detailed aids in preparing an hour-by-hour training program for Control Room personnel.

Dial-A-Ride is a door-to-door public mass transportation system. Passengers share the use of small, 17-passenger vehicles and benefit from the economies realized by this share-a-ride concept. The prospective passenger requests a ride by means of a telephone call to the Control Center, a vehicle is assigned to pick up the passenger and this assignment is radioed to one of the vehicle drivers.

The description sheets are arranged in the following format: subject, content, what is to be learned, technique(s), references, visual and other aids, handout(s) and test(s). An example of this would be: Subject - Dial-A-Ride Orientation; Content - Overall explanation of the Dial-A-Ride system and how it works; To Be Learned - What Dial-A-Ride is and who operates it; Technique - Lecture; References - Section I, Operating Procedures/Training Manual; Visual Aid and Other Aids - Vu-graphs; Handouts - Applicable sections of Operating Procedures/Training Manual and Dial-A-Ride Service Area Map; Tests - None.

Among the subjects covered by the description sheets are orientation, personnel policies, area familiarization, control map familiarization, public relations, dispatcher, scheduler and telephonist functions and control staff function. Lectures are given by the police, a Haddonfield city official and an UMTA official among others. Tours are arranged. Visual aids include vu-graphs and pretyped trip tickets.

TITLE: DRIVER'S CLASS DESCRIPTION SHEETS FOR IMPLEMENTATION AND
OPERATION OF A DEMAND RESPONSIVE PUBLIC TRANSPORTATION SYSTEM
(Haddonfield Dial-A-Ride) Supplement D

AUTHOR: LEX Systems, Inc., DAVE Systems, Inc., and New Jersey Department
of Transportation

DATE: April 1974 PROJECT NO.: NJ-06-0002

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
2. Manpower & Personnel
3. Management, training techniques
4. Bus, driver

This report is presented as a supplement to the report entitled, "Implementation and Operation of a Demand Responsive Public Transportation System (Haddonfield Dial-A-Ride)" (PB 233-380). Driver's class description sheets are presented as a detailed aid in preparing an hour-by-hour training program for drivers.

Dial-A-Ride is a door-to-door public mass transportation system. Passengers share the use of small, 17-passenger vehicles and benefit from the economies realized by this share-a-ride concept. The prospective passenger requests a ride by means of a telephone call to the Control Center, a vehicle is assigned to pick up the passenger and this assignment is radioed to one of the vehicle drivers. The description sheets are arranged in the following format: subject, content, what is to be learned, technique(s), references, visual and other aids, handout(s) and test(s). An example of this would be: Subject - Dial-A-Ride Orientation; Content - overall explanation of the Dial-A-Ride system and how it works; To Be Learned - what Dial-A-Ride is and who operates it; Technique - lecture; References - Section I, Operating Procedures/Training Manual; Visual and Other Aids - vu-graphs; Handouts - applicable sections of Operating Procedures/Training Manual and Dial-A-Ride Service Area Map; Tests - none.

Among the subjects covered by the description sheets are orientation, personnel policies, area familiarization, public relations, vehicle operations, emergency procedures, simulation, mobile radio operation and driving instruction review. Lectures are given by the police, a New Jersey Department of Transportation official and an UMTA official among others. Tours are arranged. Study of service area maps, vu-graphs and reference maps is one of the teaching techniques.

TITLE: MANUAL CONTROL OPERATING PROCEDURES MANUAL FOR IMPLEMENTATION AND OPERATION OF A DEMAND RESPONSIVE PUBLIC TRANSPORTATION SYSTEM (Haddonfield Dial-A-Ride) Supplement E

AUTHOR: LEX Systems, Inc., DAVE Systems, Inc., and New Jersey Department of Transportation

DATE April 1974

PROJECT NO.: NJ-06-0002

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
 2. Manpower and Personnel
 3. Management, training techniques
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This report is presented as a supplement to the report entitled, "Implementation and Operation of a Demand Responsive Public Transportation System (Haddonfield Dial-A-Ride)" (PB 233-380). This particular manual is presented as an aid to the operation of a manually controlled Dial-A-Ride.

In the first part of the report, the Haddonfield, New Jersey, Dial-A-Ride Demonstration Project is discussed in terms of objectives, operating area and programs. Dial-A-Ride is a door-to-door public mass transportation system. Passengers share the use of small, 17-passenger vehicles and benefit from the economies realized by this share-a-ride concept. The prospective passenger requests a ride by means of a telephone call to the Control Center, a vehicle is assigned to pick up the passenger and this assignment is radioed to one of the vehicle drivers.

Personnel policies toward the vehicle operators and the control room staff (i.e., public contact, wage and pay policy) are presented. Under the topic of vehicle operations, pickup and delivery etiquette, driving policy and vehicle scheduling are among those things discussed. What to do in a case of vehicle or radio breakdown, driver or passenger illness is related in the section on contingency/emergency procedures. The Haddonfield PATCO Station, the Cherry Hill Mall and other key location accesses are examined.

The functions of the telephonist, scheduler, dispatcher and supervisory activities and responsibilities are delineated. Cash fare revenue and bookkeeping are discussed in the section on revenue and accounting. A general overview and statement of the FCC regulations comes under the topic of radio communications. Demand data, vehicle operating data, control room data and revenue data for the Dial-A-Ride project were collected and analyzed and guidelines for this data collection are offered. The liability and responsibility assumed by Transport of New Jersey and LEX/DAVE Systems are specified.

Interim instructions make up the appendices.

TITLE: HADDONFIELD DIAL-A-RIDE
Second Progress Report

AUTHOR: LEX Systems, Inc., DAVE Systems, Inc., and New Jersey
Department of Transportation

DATE: June 1974

PROJECT NO.: NJ-06-0002

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
 2. Qualitative Analysis
 3. Quantitative Analysis
-

The Haddonfield, New Jersey, Dial-A-Ride is one of the many demand-responsive transportation systems currently operating throughout the U.S. and Canada. The prime objective of this particular demonstration project is to obtain accurate and reliable data for evaluation of the Dial-A-Ride concept. The period covered is August 1, 1972 through January 31, 1973.

This report explains the continuation of the demand-activated, door-to-door bus service. It details the ridership trends, vehicle productivity, quality of service and revenue and costs of operation. It includes a quantity of graphs, charts, and tables of the effects of service-area expansion on ridership trends and distributions, productivity, and quality of service (wait and ride times). The objective of this period was to determine maxima for a manually scheduled Dial-A-Ride system by further service expansion, new service, and improvements in control techniques.

Findings and conclusions of the report are as follows. The improved control center procedures, service-area expansion, new types of services, and increased proficiency of personnel all combined to increase ridership and productivity significantly while service quality decreased only a small amount. This was accomplished with no increase in vehicle fleet size or fare change. Furthermore, it was shown that the documented manual-control process can be used as the basis for computerizing the control function even though saturation of the manually controlled system has not been attained. Performance thus far should be analyzed to dictate future system expansion and other experiments.

Other related reports are: "Haddonfield Dial-A-Ride, First Progress Report" (Order No. PB 220-171), "Implementation and Operation of a Demand Responsive Public Transportation System (Haddonfield Dial-A-Ride)" (PB 233-380); "Summary of a Report Covering the Implementation and Operation of a Demand Responsive Public Transportation System (Haddonfield Dial-A-Ride)" (PB 233-379).

TITLE: HADDONFIELD DIAL-A-RIDE
Third Progress Report

AUTHOR: New Jersey Department of Transportation
LEX Systems, Inc., DAVE Systems, Inc., and
MITRE Corporation

DATE July 1974

PROJECT NO.: NJ-06-0002

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
2. Quantitative Analysis
3. Qualitative Analysis

The Haddonfield Dial-A-Ride Demonstration Project is one of more than 40 demand-responsive transportation systems currently being used throughout the world. The prime objective of this particular project is to obtain accurate and reliable data for evaluation of the Dial-A-Ride concept.

This report delineates project direction during Phase II, beginning February 1, 1973 and ending January 31, 1974. It details ridership trends, vehicle productivity, service quality, revenues, and costs of operation. The report includes a quantity of graphs, charts, and tables that show the effects of service-area expansion, fare reduction, fleet expansion and service innovation.

The main objectives of the Project for the period covered by the report were to: (1) determine achievable performance maxima for the Haddonfield manually scheduled Dial-A-Ride system; (2) determine when the manually scheduled system should be abandoned in favor of computer scheduling; (3) develop the system constants required to implement a computer-based scheduling function; and (4) simultaneously expand the service area and introduce new service concepts while maintaining or improving service quality.

In order to meet these objectives, the following changes were made: two service area expansions, addition of six 10-passenger buses, inauguration of a shuttle service, and a basic and senior citizen fare reduction.

Related documents include: "Haddonfield Dial-A-Ride - First Progress Report" (Order No. PB 220-171), "Haddonfield Dial-A-Ride - Second Progress Report" (Order No. PB 233-378); "Implementation and Operation of a Demand Responsive Public Transportation System - (Haddonfield Dial-A-Ride)" (Order No. PB 233-380); and "Demand Responsive Transportation System Planning Guidelines" (Order No. PB 232-970).

HADDONFIELD DIAL-A-RIDE
TITLE: Final Report

AUTHOR: New Jersey Department of Transportation, Wilbur Smith &
Associates, Inc., LEX Systems, Inc., DAVE Systems, Inc.,
and the MITRE Corporation

DATE December 1974

PROJECT NO.: NJ-06-0002

KEYWORDS: 1. Demand Responsive Transportation, dial-a-ride
2. Qualitative Analysis
3. Schedules and Scheduling
4. Quantitative Analysis
5. Computer Applications

The Haddonfield (New Jersey) Dial-A-Ride Project is one of about 60 demand-responsive transportation systems currently being used throughout the U.S. and Canada. The Haddonfield Project was designed, implemented and operated as a research and development project to determine the feasibility of demand-responsive door-to-door transportation service. The prime objective of the Project was to obtain accurate and reliable data for evaluation of the Dial-A-Ride concept.

This final report delineates Project direction during the period beginning February 19, 1972 and ending June 30, 1974. It details ridership trends, vehicle productivity, service quality, revenues and cost of operation. The report includes a quantity of graphs, charts, and tables that show the effects of zonal mode of operation, and elimination of shuttle service.

The main objectives of the Project covered by this report were to: (1) provide accurate data for demand and cost analysis; (2) determine the degree of public acceptance of demand-responsive transit systems; (3) determine limits of a manually controlled scheduling system; (4) determine system parameters for a computer-controlled scheduling system; and, (5) test the developmental computer-controlled scheduling system.

Appendices contain a list of Haddonfield Dial-A-Ride reports and data collection and analysis procedures.

Among the related reports are: "Haddonfield Dial-A-Ride - First Progress Report" (PB 220-171); "Haddonfield Dial-A-Ride - Second Progress Report" (PB 233-378); "Haddonfield Dial-A-Ride - Third Progress Report" (PB 236-094); and "Implementation and Operation of a Demand Responsive Public Transportation System (Haddonfield Dial-A-Ride)" (PB 233-380).

TITLE: IMPLEMENTATION AND OPERATION OF A DEMAND RESPONSIVE PUBLIC
TRANSPORTATION SYSTEM (Haddonfield Dial-A-Ride)

AUTHOR: LEX Systems, Inc., DAVE Systems, Inc., and New Jersey Department of
Transportation

DATE: March 1974

PROJECT NO.: NJ-06-0002

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
 2. Manpower and Personnel
-

This report describes features of installation and operation of the manually scheduled Haddonfield, New Jersey, Dial-A-Ride System. The purpose of this report is to provide guidelines from the experience in the Haddonfield project to assist others in procuring and operating a similar system.

Following a description of the various Dial-A-Ride systems, discussion centers on the facility, equipment and supplies. Among the presentations are detailed descriptions of the control center, vehicle and telephone equipment, specifications and vehicle maintenance. The functions of the telephonist, scheduler, dispatcher, supervisor and driver are included. Other topics are driver-dispatcher interface and contingency/emergency operating and planning. Fares, revenue and accounting are other aspects taken into account. A system description of radio communications and the operating procedures and techniques of that system are presented. Personnel recruiting and selection, along with training, are discussed. To illustrate sales promotion, graphic displays are included. Information for ordering and building equipment as well as operating procedures and forms are reproduced.

Appendices are included. A glossary of terms is provided and illustrations, including photographs, are numerous.

A summary of this report is "Summary of a Report Covering the Implementation and Operation of a Demand Responsive Public Transportation System" (PB 233-379/AS). Supplements to the subject report are: "Controller's Class Notebook" (PB 233-381/AS), "Driver's Class Notebook" (PB 233-382/AS), "Controller's Class Description Sheets" (PB 233-383/AS), "Driver's Class Description Sheets" (PB 233-384/AS), "Manual Control Operating Procedures Manual" (PB 233-385), and "Procedure Logic Diagrams" (PB 233-386/AS.)

TITLE: PROCEDURE LOGIC DESIGN FOR IMPLEMENTATION AND OPERATION OF A
DEMAND RESPONSIVE PUBLIC TRANSPORTATION SYSTEM (Haddonfield
Dial-A-Ride) Supplement F
AUTHOR: LEX Systems, Inc., DAVE Systems, Inc., and New Jersey Department
of Transportation

DATE: April 1974

PROJECT NO.: NJ-06-0002

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
-

This report is a supplement to the main report entitled "Implementation and Operation of a Demand Responsive Public Transportation System (Haddonfield Dial-A-Ride)" (PB 233-380).

This report on the procedure logic design is presented to show the logic flow of all phases of a manually controlled dial-a-ride.

The logical design of the manual Dial-A-Ride Control System is the heart of the system design. From it stem the procedures and training materials. The diagrams shown in this report are after the initial simulation task was completed. The shorthand notational system employed is presented. Arrow flow diagrams show the time sequence and events in the system.

Through the use of these diagrams, questions of timing, branching to new procedures, flow of documents and information storage can be studied. Personnel and equipment requirements for the control room operation can be determined. Results of some time studies made during the simulation of the system's operation are discussed.

Chapters of the report contain the logical design control system description, personnel and equipment requirements, time and motion alternatives, and the accounting, billing and credit system.

TITLE: SUMMARY OF A REPORT COVERING THE IMPLEMENTATION AND OPERATION
OF A DEMAND RESPONSIVE PUBLIC TRANSPORTATION SYSTEM
(Haddonfield Dial-A-Ride)
AUTHOR: LEX Systems, Inc., DAVE Systems, Inc. and New Jersey Department
of Transportation

DATE: March 1974

PROJECT NO.: NJ-06-0002

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
2. Manpower and Personnel

This report has been prepared for the executive or system engineer who wants an overview of the equipment, facilities, personnel, and training required prior to implementation of a demand-responsive, door-to-door, midi-bus transportation system. This report is a condensation of the report entitled "Implementation and Operation of a Demand-Responsive Public Transportation System" (PB 233-380) which describes the manually scheduled Haddonfield, New Jersey, Dial-A-Ride system. The purpose of the subject document is to provide guidelines from the experience in the Haddonfield project to assist others in procuring and operating a Dial-A-Ride system.

Included are sections on: the facility and equipment, operations, handling of and accounting for revenue, communications, personnel training and sales promotion.

In order to serve as a guide for implementing a similar system, information for ordering and building equipment as well as actual operating procedures and forms are reproduced. The appendices in the subject report explain the logic and rationale behind the development of certain procedures.

A table reports statistics of the service area.

Supplements to the subject report and summary are as follows:
"Controller's Class Notebook" (PB 233-381); "Driver's Class Notebook" (PB 233-382); "Controller's Class Description Sheets" (PB 233-383); "Driver's Class Description Sheets" (PB 233-384); "Manual Control Operating Procedures Manual" (PB 233-385); and, "Procedure Logic Diagrams" (PB 233-386).

TITLE: MULTIPLE CAR PERFORMANCE
AC Propulsion Project

AUTHOR: Cleveland Transit System
(W.P. Cymbor and R.D. Smith)

DATE: March 1974

PROJECT NO.: OH-06-0006

KEYWORDS: 1. Computer Applications
2. Propulsion Systems
3. Research Operations
4. Rail, rolling stock

In 1971, the Cleveland Transit System received a grant from UMTA to test, demonstrate and evaluate a solid state AC propulsion system on three rapid transit cars (Project OH-06-0006). The AC propulsion system was developed by the Westinghouse Air Brake Company (WABCO), Wilmerding, Pa. This report is one of a series on various aspects of the project.

The objective of this project was to retrofit three existing Cleveland Transit System Airporter Cars with a new AC propulsion system (Pulse Width Modulation or PWM) developed by WABCO and to develop baseline performance data with these cars.

To demonstrate general performance and applicability of the propulsion system, an on-board computer controlled data acquisition system was used to collect performance data. The data were reduced, analyzed, and plotted by computer.

This report presents the performance data collected during the multiple car operation. General performance characteristics are displayed by means of graphs plotted by computer from the raw data.

Test results are broken down into tests: Test 1 - One AC Car, AC Profile; Test 2 - One Car, DC Profile; Test 3 - Two Car Train (AC/AC); Test 4 - Two Car Train (AC/DC); Test 5 - Three Car Train (AC/AC/AC). Other topics discussed are multiple car rolling resistance and car weights.

Conclusions are presented. Appendices contain a list of recorded signals and equipment used and CTS track profiles. A glossary of terms is provided.

Related reports are: "WABCO Data Acquisition System" (PB 223-898); "Pre Revenue Service Activities" (PB 228-983); "Single Car Performance" (PB 228-987); and "Revenue Service Operation - 1973 (PB 238-568)

TITLE: PRE REVENUE SERVICE ACTIVITIES
AC Propulsion Project

AUTHOR: Cleveland Transit System
(J.R. Pier)

DATE: September 1973

PROJECT NO.

OH-06-0006

KEYWORDS:

1. Propulsion Systems
2. Rail, rolling stock

In 1971, the Cleveland Transit System received a grant contract from UMTA to test, demonstrate and evaluate a solid state AC propulsion system on 3 rapid transit cars. The propulsion system was developed by the Westinghouse Air Brake Company (WABCO), Air Brake Division, of Wilmerding, Pennsylvania.

The objective of the project was to retrofit 3 existing Airporter Cars with a new Pulse Width Modulation (PWM)-AC propulsion system and to generate baseline performance data. The 3 AC equipped cars and 3 standard Airporters were to be equipped with data monitoring equipment and placed in revenue service for a period of 12 months to develop statistical data on power consumption, maintenance costs and passenger reaction to the new propulsion system.

This report summarizes all of the activities preceeding and necessary to the commencement of revenue service. It describes the retrofit program and the system check-out process. Other interim reports, available at NTIS, include descriptions of instrumentation calibration, single car performance (PB 228-987), multiple car performance, compatibility with standard cars and the data acquisition system. (PB 223-898)

Among the conclusions reached were that the installation of high performance PWM Inverter Propulsion Equipment on relatively standard transit cars is feasible and practical and that many of the problems involved in the pre revenue operation were specific to the retrofit and would not occur on new installations. It was found that equipment check-out time, while not appreciably longer than that for some of the recent more standard car orders, could probably be improved by specifying full load burn-in tests of the total equipment by the manufacturer prior to shipment. This would require a dynamometer of some type at the manufacturer's facility. Scheduling of retrofit work of this nature through a transit maintenance facility is difficult when shop space and pit time are limited. A facility dedicated to the effort would permit tighter schedule control.

Appendix "A" is "Operation and Device Description." Major devices are the master controller, logic unit, inverter, line filter, reactor, auxiliary control unit, AC traction motor and friction brake operating unit. Photographs of these and other aspects of the retrofit process are presented.

Appendix "B" is "Compatibility Module Development," the CTS Cam Control Performance Tests. Tables, figures and graphs support the text.

TITLE: SINGLE CAR PERFORMANCE
AC Propulsion Project

AUTHOR: Cleveland Transit System
(W.P. Cymbor and R.D. Smith)

DATE: August 1973

PROJECT NO.: OH-06-0006

KEYWORDS:

1. Propulsion Systems
2. Rail, rolling stock

This is an interim report prepared as part of an UMTA grant contract to the Cleveland Transit System to test, demonstrate and evaluate a solid state AC propulsion system on 3 rapid transit cars. The AC propulsion system was developed by the Westinghouse Air Brake Company (WABCO) and incorporated a pulse width modulated (PWM) inverter to convert constant voltage DC energy to variable frequency, variable voltage AC energy which in turn powers AC induction traction motors. The system operates with regenerative braking, and has the potential of reducing power consumption.

This report presents single car performance data developed from a fully instrumented, AC powered car. Its purpose is to present and evaluate the performance capabilities of the car as demonstrated by the results of data collection and analysis. The results, portrayed in the form of tabular listings and graphs, apply to the performance of the propulsion system as a whole; no effort was made to separate the individual components. Other interim reports of this project describe pre revenue service activities (PB 228-983), instrumentation calibration, multiple car performance, compatibility with standard cars and the data acquisition system, (PB 223-898).

Areas in which these are results of the analyses are rolling resistance, acceleration/deceleration capability, motor torque, line current, power consumption, system efficiency, effect of line voltage on performance, instantaneous performance curves - controlled tests, motor and inverter temperatures, duty cycle and drag tests.

Among the conclusions reached are the following: regeneration is possible from a maximum speed down to approximately 5 m.p.h.; maximum system power capability during normal operation is approximately 1000 horsepower; during normal operation, motor temperatures stabilized between 200 and 250 degrees Fahrenheit; average net power consumption for all tests was 3.84 kilowatt-hours/mile and the average percent energy returned to the line was 29%.

Appendix "A" contains a figure of a block diagram of the WABCO PWM Propulsion System, showing the relationship of the various major devices. The second figure illustrates the typical range of frequency (speed) in each mode of operation. Appendix "B" contains, among other figures, CTS Track Profiles and plotted data tapes.

TITLE: WABCO DATA ACQUISITION SYSTEM
AC Propulsion Project

AUTHOR: Cleveland Transit System

DATE: July 1973

PROJECT NO.: OH-06-0006

KEYWORDS:

1. Rail, systems planning and design
 2. Propulsion Systems, electric
-

The purpose of this report is to test and evaluate an AC propulsion system developed by the Westinghouse Air Brake Company (WABCO) on three rapid transit cars. The AC propulsion system incorporates a pulse width modulated inverter to convert constant voltage DC energy to variable frequency, variable voltage AC energy which in turn powers simple AC traction motors.

This report, one of a series on various aspects of the project, describes the data acquisition system which was developed to measure, record and analyze performance data for the AC-powered rapid transit cars.

The implementation of a computer controlled data system from which substantial evidence of performance capabilities could be drawn quickly, systematically and accurately requires the following efforts: (1) definition of system hardware; (2) software generation for data collection; (3) post processing hardware; and, (4) software generation for post-processing.

Specific performance information will be provided in subsequent reports.

It was found that the use of a computer managed data collection system on a transit vehicle is not only practical but also highly desirable when the volume and complexity of the data to be acquired is high, and when the duration of the program is sufficient to justify the software development time. The program is outlined in detail.

TITLE: COMMUNITY/SCHOOL BUS PROJECT
A Pilot Project Using School Buses for Public Transportation

AUTHOR: Community of Klamath Falls and the State of Oregon

DATE December 1973

PROJECT NO.: OR-06-0001

KEYWORDS:

1. Bus, school bus
 2. Small Cities
 3. Transportation Disadvantaged
-

The Community/School Bus Project was funded by a demonstration grant from UMTA. It was designed to test the feasibility of using school buses for public transportation when not in school service, thus obviating formidable capital investment in equipment.

Klamath Falls, Oregon, is a small urban community (approximately 36,000 population) lying in the heart of a sparsely populated region. Prior to commencement of the Community/School Bus Project, the Klamath Falls area had been without public bus service since 1958. During this period, the number of people most in need of low-cost transportation, namely senior citizens and the young, continued to grow. According to the 1970 Census, nearly 15% of the population was 62 years of age or older.

The combination of a number of conditions, namely, a community without public transportation, a growing demand for such service, the resistance of taxpayers to local budget increases and the existence of idle school buses, led to the conception of this demonstration project.

The three objectives of the project were: (1) to test and report on the feasibility of utilizing school buses during idle hours for public transportation; (2) to evaluate the need for public transportation in the Klamath Falls area; and (3) to lay a foundation for continuing a public bus service after the conclusion of the project if it was determined that sufficient need for such service existed.

The project was conducted in two phases. The first part, conducted during the 1972-73 school year, was limited to part-time service. The school buses continued in service for pupil transportation during the nine-month period. Part two of the project was conducted during the summer months of 1973 when school was not in session and therefore the buses were available continuously for public transportation.

Organization, operations and community response are discussed, as well as the topics of local versus state operation and legislation. Conclusions, recommendations and the future of bus service in Klamath Falls are presented.

Photographs complement the text and appendices include advertising techniques.

TITLE: PROJECT CLEAN AIR '72
LNG Conversion of GM-71 Series Diesel Engine
Final Report
AUTHOR: National Transportation Center,
Apt, Bramer, Conrad and Associates, and
Southwest Research Institute

DATE May 1974

PROJECT NO.

PA-06-0005

KEYWORDS:

1. Environment & Environmental Control
 2. Fuel
 3. Propulsion Systems, diesel
 4. Bus
-

The specific goal of Project Clean Air '72 was to develop and design a conversion procedure for the Detroit Diesel Series 71 engine, the standard engine for transit buses in the U.S., to operate on liquid natural gas (LNG) as a fuel. The conversions would provide dependable, proven transit bus powerplant with low emissions and an extended service life.

Air pollution caused by a transit rubber-tired vehicle as a result of its emissions is the function of its engine and the type of fuel used. Pollution reduction, at the source, can be obtained by altering the vehicle engine, adapting it to the use of a proper fuel, which lends itself to emission control. Other examples of environmental pollutants which can more easily be controlled by engine and fuel are odor and noise level.

A gaseous fuel converted engine, if properly developed, offers the potential of lower exhaust emissions, control of smoke and odor and lower engine noise levels. A few objectives of a gaseous fuel converted engine are: equal or better horsepower than the diesel engine; comparable economy of operation on a BTU basis; meeting proposed 1975 EPA Standards; extending engine life; and providing a powerplant that can be serviced by present personnel with minimal specialized training.

During Phases I and II-A, it was demonstrated that a viable conversion of the GM6V-71 engine is possible. However, a complete conversion, including the development of a fuel control system, has not been completed. The advantages derived from converting the diesel engine to LNG fuel have been identified, but not demonstrated.

TITLE: THE VÖV - STANDARD - LINIENBUS

AUTHOR: Gesellschaft für Verkehrsberatung und Verfahrenstechniken mbH,
Hamburg, Germany for the National Transportation Center

DATE July 1973

PROJECT NO.: PA-06-0007

KEYWORDS

1. Bus, design
2. Brakes and Braking
3. Propulsion Systems
4. Air Pollution
5. Noise and Noise Control

The purpose of this report is to design a transit bus which combines the greatest possible adaptability to people's needs with improved environmental aspects in regard to pollution and noise, within the end product, a standardized bus whose features would be interchangeable with like buses in most major cities of the world. The various meetings which led to the final standard bus concept formulation are discussed.

The first major physical characteristic considered was the vehicle's dimensions and design, including factors such as body structure, floor shape, engine, wheel and tires, and outside and inside dimensions. Drawings are included as examples of each alternative considered.

A shorter version of the standardized bus is included as a vehicle variant.

Components and vehicle equipment considered include glazing, doors for entrances and exits, vehicle service flaps, the driving compartment, seating arrangement and seats, handrails, signs and markings, heating and ventilation, and body accessories.

Power supplies, current consumers, and wiring are all discussed in a section on electrical equipment.

The braking and pneumatic system is described and outlined.

All topics of discussion are illustrated by charts, drawings, and/or photographs. Approximately 6,000 of the final standardized buses have been manufactured in West Germany, Hungary, and France, which produces a smaller version.

A list of references is included.

TITLE: TRANSIT EXPRESSWAY REPORT
Condensation of the Report on Testing and Evaluation

AUTHOR: MPC Corporation

DATE: February 1967 PROJECT NO.: PA-06-0009

KEYWORDS: 1. Pneumatics 6. Vehicle, monitoring
2. Electric Vehicle Guidance
3. Guideways
4. People Movers, Transit Expressway
5. Vehicle, design

Under the sponsorship of the Port Authority of Allegheny County, Pennsylvania, the Transit Expressway was demonstrated and tested in a full scale experimental project. Phase I was carried out between June 1963 and February 1967. Phase II, the subject of this report, included the continuing development, demonstration, testing and evaluation of systems and subsystems in implementation, demonstration, testing and evaluation of systems and subsystems in implementation of some of the recommendations made in the Phase I report. The test facility is located in Allegheny County's South Park, eleven miles south of the Pittsburgh, Pennsylvania CBD.

Transit Expressway envisions a system operating on fixed guideways with continuous headways throughout the day as close as 90 seconds. The system is based on operating compact, minimum weight vehicles to provide economy of operation in off-peak hours and still maintain high frequency service. The all-electric fully automated vehicles resemble buses and run on four pairs of driven pneumatic tires. The South Park demonstration project is comprised of a 9,360 foot long main guideway, principally on an aerial structure with a short section of at-grade guideway. It is arranged to form a complete loop with stations located at the north and south ends. The rolling stock consists of three vehicles which may be operated simultaneously or singularly.

After background material and a general description of the project, specific discussion focuses on spur roadway with 10% grade, emergency walkway, switch, mechanical vehicle alterations, train operations on 4%, 10% and level grade roadways, automatic train operation and power distribution, current collection and grounding. Conclusions and recommendations are clearly delineated.

This report is the summary volume of "Transit Expressway Report: Report on Testing and Evaluation of the Transit Expressway" (PB 174-757). Appendices are not included and text material is reduced dramatically, relating only the highlights of the project. Refer also to "Transit Expressway Report: Phase II" (PB 231-022).

TITLE: TRANSIT EXPRESSWAY REPORT
Phase II

AUTHOR: MPC Corporation

DATE: June 1973

PROJECT NO.:

PA-06-0009

KEYWORDS:

1. Pneumatics
2. Electric Vehicle Guidance
3. Guideways
4. People Movers, Transit Expressway
5. Vehicle, design
6. Vehicle, monitoring

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Photographs, diagrams, tables and figures are presented. The appendices contain a glossary and a summary of the Phase I report.

Other volumes available are "Transit Expressway Report: Report on Testing and Evaluation of the Transit Expressway" (PB 174-757) and "Transit Expressway Report: Condensation of the Report on Testing and Evaluation" (PB 231-021).

TITLE: REPORT ON DEVELOPMENT OF GUIDELINE SPECIFICATION FOR URBAN
RAIL CARS

AUTHOR: Boeing Vertol Company, Surface Transportation Systems Department

DATE: March 1971

PROJECT NO.: PA-06-0023

KEYWORDS:

1. Management, planning and analysis
 2. Quality Control
 3. Rail, systems planning and design
 4. Rail, commuter
 5. Research Operations
 6. Industrial and Labor Relations
-

The purpose of this report is to present the general methodology, industry coordination and pertinent observations on the development of the guideline specification for urban rail commuter cars. The guidelines specification was developed in a series of three drafts which were coordinated in meetings with a review committee of UMTA personnel and industry representatives.

The report reviews the eight meetings, discusses the evolution of the three drafts which resulted and presents a series of recommendations which came out of these meetings. Most of the report consists of a series of appendices which cover matters under consideration including a list of required technical specifications, a series of letters from certain attendees in which they make appropriate comments and present recommendations concerning the first, second and final drafts.

Basic specifications under consideration include: scope, systems requirements, car body, coupler and draft gear, miscellaneous car body items, door operation and control, heating-cooling-ventilating, lighting, auxiliary electrical equipment, power and traction, trucks and suspension systems, friction braking systems, testing, quality assurance, applicable documents and general information.

TITLE: MANUAL OF TRANSIT OPERATIONS IN CIVIL EMERGENCIES

AUTHOR: Simpson & Curtin
For Luzerne County (Pa.) Transportation Authority

DATE: April 1974

PROJECT NO.: PA-06-0028

KEYWORDS:

1. Emergency Vehicles & Services
2. Government, intergovernmental relations

A case study of transit services in Wilkes-Barre, Pennsylvania, following the Hurricane Agnes flood of June 1972, reveals the need for improved nationwide transit disaster procedures. All phases of planning for transit support in civil emergencies -- beginning with overall contingency planning, through evacuation and relief operations and into a transition period to normal services -- require upgrading by Federal, state and local government. This manual describes the actions necessary to accomplish contingency planning, emergency transit evacuation and relief services in a systematic manner.

Recommendations concerning both transit-related governmental disaster practices and emergency transit operations result from an analysis of the Wilkes-Barre experience. These include the following: according to the author, Federal efforts should focus on incorporating disaster preparedness into the existing requirements for capital grants by, for example, expanding "Exhibit O -- Evaluation of Flood Hazards" in the UMTA capital grant application to include fixed-facility vulnerability to the pertinent major disasters; states should avail themselves of Federal matching funds for disaster planning with the state department of transportation or highway department responsible for transit planning input; at the local level, the transit operating agency should carry civil emergency planning responsibility if the system is publicly owned, and, if not, the largest traffic department in the urbanized area is best equipped to assume this responsibility; Civil Defense should incorporate all possible transportation modes into the preparedness effort including freight carriers, ambulances, school buses, taxis, boats and helicopters.

Chapters discuss Federal, state and local emergency frameworks and emergency transit operations preparedness procedures.

References are furnished.

TITLE: INTEGRATION OF TRANSIT SYSTEMS
Summary

AUTHOR: INTERPLAN Corporation
(R. Krzyckowski, et al.)

DATE October 1973 PROJECT NO.: RI-06-0005

KEYWORDS:	1. Intermodal Integration	7. Rail
	2. Government	8. Bus
	3. Interfaces	9. Ferry
	4. International	10. Personal Rapid Transit
	5. Para-Transit	
	6. Private Transportation	

This summary volume contains the conclusions reached in the three main volumes of the report, Integration of Transit Systems. The objective of the report is to assess the potential for interagency and intermodal integration of transit systems in U.S. urban areas, drawing on an analysis of the successful experience of European transit systems.

"Volume I - Concepts, Status, and Criteria" (PB 241-270) documents the need for transit integration in U.S. urban areas, presents the conceptual and evaluative framework, and reviews current transit integration efforts by Federal, state and local governments. "Volume II - Integrated European Transit Systems" (PB 241-271) describes in detail four major European transit systems (London, Hamburg, Paris and Munich); gives brief descriptions of six others; and summarizes and appraises the applicability to U.S. transit systems of techniques which have contributed to the success of these European systems. "Volume III - Transit Integration in U.S. Urban Areas" (PB 241-272) deals with the application of these techniques to Philadelphia, San Francisco and Seattle; to an archetypal smaller urban area, "Middletown"; and, makes a brief assessment of the potential for application in Baltimore, Cleveland, Los Angeles, Miami, New Orleans and San Diego.

This summary volume serves as a guide to the location of detailed factual information upon which the conclusions presented here are based, as well as a summary of the study's findings.

An outline of the scope of the study and the steps in its execution are presented. This summary brings together the salient points of each volume, including definition of the forms which integration may take, an evaluation of the deficiencies of U.S. transit systems, a first-cut approach to identifying transit systems which are ready for integration and estimates the cost of large-scale expansion and improvement of U.S. transit systems.

Also described is the systematic process of elimination resulting in the selection of certain U.S. cities as candidates for transit integration. The essence of a suggested program for these cities and for a "Middletown" is presented.

NTIS ORDER NO.: PB-241-273
\$4.25

Set of 4 Volumes
PB 241-269-SET
\$25.00

TITLE: INTEGRATION OF TRANSIT SYSTEMS
Volume I: Concepts, Status, and Criteria

AUTHOR: INTERPLAN Corporation
(R. Krzyczkowski, et al.)

DATE May 1973

PROJECT NO.: RI-06-0005

KEYWORDS:	1. Intermodal Integration	7. Rail
	2. Government	8. Bus
	3. Interfaces	9. Ferry
	4. International	10. Personal Rapid Transit
	5. Para-Transit	
	6. Private Transportation	

This is the first of a three volume report designed to assess the potential for interagency and intermodal integration of transit systems in U.S. urban areas, drawing on an analysis of the successful experience of European systems.

This volume, "Concepts, Status, and Criteria," documents the need for transit integration in U.S. urban areas, presents the conceptual and evaluative framework, and reviews current transit integration efforts by Federal, State and local governments.

The report defines and relates the three major types of urban transportation: public transit, para-transit, and private transportation, and reviews the current status of public transit in this country.

The institutional, operational and physical forms of transit integration and the intermodal and interagency approaches are defined and discussed. Current transit integration efforts on the part of Federal, State and local governments are described.

Standards for evaluating existing transit systems are developed from a concept of an ideal system and typical deficiencies of U.S. systems and their causes are described. These standards are then used to evaluate and compare transit systems of London, Hamburg and Paris with those of three U.S. urban areas.

Criteria are presented for evaluating the existing deficiencies of a transit system and its integration needs; and, criteria are suggested for evaluating an urban area as the site for a demonstration on the basis of potential for different types of demonstrations and the attitudes and capabilities of local authorities. Also considered are benefits and costs involved in improving public transit through integration and related measures.

Other volumes of this report are subtitled as follows: "Volume II - Integrated European Transit Systems" (PB 241-271); "Volume III - Transit Integration in U.S. Urban Areas" (PB 241-272); and the "Summary" volume (PB 241-273).

NTIS ORDER NO.: PB 241-270
\$5.75

Set of 4 Volumes
PB 241-269-SET
\$25.00

TITLE: INTEGRATION OF TRANSIT SYSTEMS
Volume II: Integrated European Transit Systems

AUTHOR: INTERPLAN Corporation
(R. Krzyczkowski, et al.)

DATE May 1973 PROJECT NO.: RI-06-0005

KEYWORDS:	1. Intermodal Integration	7. Rail
	2. Government	8. Bus
	3. Interfaces	9. Ferry
	4. International	10. Personal Rapid Transit
	5. Para-Transit	
	6. Private Transportation	

This is the second of a three volume report designed to assess the potential for interagency and intermodal integration of transit systems in U.S. urban areas, drawing on an analysis of the successful experience of European systems.

This volume, "Integrated European Transit Systems," describes in detail four major European transit systems (London, Hamburg, Paris and Munich); gives brief descriptions of six others (Newcastle upon Tyne, Edinburgh, Stockholm, Gotenburg, Copenhagen, and Oslo); and summarizes and appraises the applicability to U.S. transit systems of techniques which have contributed to the success of these European systems.

The detailed descriptions of London, Hamburg, Paris and Munich cover transit network, transportation policy, history of transit integration, trends in ridership, specific integration techniques, financial arrangements and system evaluations. These same topics are briefly reviewed for the six other cities.

An in-depth analysis comparing experience in the ten cities is presented, summarizing the techniques used, and evaluating their applicability to U.S. transit systems.

For the purpose of easy reference, Appendix "A" presents one-table summaries of information for each city covered in the text. Appendix "B" offers additional descriptive material on the London system.

Other volumes of this report are subtitled as follows: "Volume I - Concepts, Status, and Criteria" (PB 241-270); "Volume III - Transit Integration in U.S. Urban Areas" (PB 241-272); and the "Summary" volume (PB 241-273).

NTIS ORDER NO.: PB 241-271
\$9.25

Set of 4 Volumes
PB 241-269-SET
\$25.00

TITLE: INTEGRATION OF TRANSIT SYSTEMS
Volume III: Transit Integration in U.S. Urban Areas

AUTHOR: INTERPLAN Corporation
(R. Krzyczkowski, et al.)

DATE June 1973

PROJECT NO.: RI-06-0005

KEYWORDS:	1. Intermodal Integration	7. Rail
	2. Government	8. Bus
	3. Interfaces	9. Ferry
	4. International	10. Personal Rapid Transit
	5. Para-Transit	
	6. Private Transportation	

This is the third of a three volume report designed to assess the potential for interagency and intermodal integration of transit systems in U.S. urban areas, drawing on an analysis of the successful experience of European systems.

This volume, "Transit Integration in U.S. Urban Areas," deals with the application of techniques which have contributed to the success of European systems, to three major U.S. cities--Philadelphia, San Francisco and Seattle. This application of techniques is also tested in an archetypal smaller urban area, "Middletown."

The procedure is described by which a selection was made of representative areas for investigation from 243 SMSA's in the U.S. Also described is a preliminary investigation of 30 major metropolitan areas and the further investigation of 17 of these by means of literature search, questionnaires, wish lists, and field investigations. The report then reviews the final selection of three areas where different European approaches to integration could be applied.

The report contains a number of profiles and includes an assessment of the potential for transit integration in Baltimore, Cleveland, Los Angeles, Miami, New Orleans and San Diego.

Suggested programs for transit integration are presented for Philadelphia, San Francisco, Seattle, and "Middletown." Other discussions present descriptions of area characteristics, existing public transit services, local transportation planning and efforts at transit integration, and a program outline to integrate metropolitan area public transit services.

Appendices include contacts established in U.S. cities during the course of the study, a list of the SMSA's with 1970 population statistics, the questionnaire and wish list, and items on the integration checklist.

Other volumes of this report are subtitled as follows: "Volume I - Concepts, Status, and Criteria" (PB 241-270); "Volume II - "Integrated European Transit Systems" (PB 241-271); and the "Summary" volume (PB 241-273).

NTIS ORDER NO.: PB 241-272
\$9.50

Set of 4 Volumes
PB 241-269
\$25.00

TITLE: ORGANIC RANKINE CYCLE PROPULSION SYSTEM FOR USE ON A 25-PASSENGER BUS

AUTHOR: Dallas Transit System
(E.H. Watkins)

DATE June 1974

PROJECT NO.: TX-06-0004

KEYWORDS:

1. Bus
 2. Propulsion Systems, external combustion
 3. Research Operations
 4. Environment and Environmental Control
-

Since the early 1960's, the Federal government, mindful that motor vehicles are the major source of air pollution, has developed increasingly stringent vehicle emission standards. In the late 1960's Federal and state agencies initiated a series of studies and demonstrations aimed at determining the feasibility of certain alternatives to the internal combustion engine (ICE). The studies suggested that the external combustion engine (ECE) could become a workable alternative to the ICE. Although there are several classes of the ECE, the application of modern technology appeared, to the authors, most promising in the case of the Rankine cycle engine.

In early 1971, the Dallas Transit System received an UMTA grant to develop and test an ECE engine in a small coach. The objective of the program was to determine the feasibility and assess the pollution reduction value of installing and operating an organic Rankine cycle propulsion system in a 25-passenger bus.

The Phase I program consisted of the system definition, fabrication, systems integration, installation and operational checkout of an Organic Rankine Cycle (ORC) propulsion system consisting of a burner heater, a turbine engine, regenerator, condenser, feed pump, reduction gearbox, automatic transmission, controls and all interconnecting piping and drives. The transit bus used in the program was a Twin Coach, model TC-25, manufactured by Highway Products, Inc. of Kent, Ohio. This phase successfully demonstrated the feasibility of installing and operating an ORC engine in an urban bus.

Phase IA accomplished the following: Phase I data analysis, installation of improved components, prototype engine analysis, performance specification definition, continued development testing and emission testing. Results of the latter indicate that the ORC engine powered bus meets the 1975 Heavy Duty Diesel emission limits.

Conclusions are presented and references are furnished. Tables support the text.

TITLE: MASS TRANSIT TRAINING NEEDS
Volumes I through V

AUTHOR: MITRE Corporation
(E.J. Thrasher and P. Wood)

DATE: May through August 1974

PROJECT NO.: VA-06-0004

KEYWORDS:

1. Bus
 2. Rail
 3. Manpower & Personnel
 4. Management, training techniques
 5. Maintenance, personnel
-

This is a five-volume series of reports that recounts the findings, conclusions and recommendations of a study of urban mass transit training needs. The study included: a detailed analysis of training requirements; an investigation into the availability of training programs to meet the needs of the industry; an outline of supplementary material needed; and, proposals for programs to upgrade the standard of training as it currently exists.

Volume I, the "Executive Summary" (Order No. PB 236-000/AS, \$3.75), summarizes the results of an inquiry into industry needs for standardized programs regarding training of (1) bus operators; (2) bus operator instructors; (3) bus mechanics; (4) bus mechanic instructors, and (5) rapid transit rail car repairmen. Following a description of programs currently in use at transit properties, the general contents of the respective standardized programs are outlined, the role of the Federal government in funding is examined, alternative methods of delivering the programs are discussed, and costs of development and demonstration are estimated.

Volume II, "History and Methodology," (Order No. PB 236-001/AS, \$5.25) describes the history and methodology of the program. Statistics relating to transit industry training are derived.

Volume III, "Bus Operator Training Program, Bus Operator Instructor Training Program," (Order No. PB 236-002/AS, \$5.50) recommends standardized courses for bus operators, together with sources of suitable training materials.

Volume IV, "Bus Mechanic Training Program, Bus Mechanic Instructor Training Program" (Order No. PB 236-003/AS, \$5.25), presents an outline of a general training program containing ten independent modules, and sources of material for use in the course.

Volume V is entitled "Railcar Repairman Training Needs", (Order No. PB 236-004/AS, \$4.25). About half of the training is generalized enough to allow a standardized course to be developed. An outline of such a course and sources of training material which would be included are presented.

TITLE: SIMS OVERVIEW
Service, Inventory, and Maintenance System

AUTHOR: MITRE Corporation
(Virgil S. Thurlow)

DATE: October 1973

PROJECT NO.: VA-06-0004

KEYWORDS: 1. Computer Applications
2. Maintenance, costs
3. Management, operations and techniques
4. Bus
5. Information Aids

The Urban Mass Transportation Administration's Transit Operations and Management (TOMS) project includes development of a maintenance management information system for use by the urban mass transportation industry in the maintenance of bus fleets.

The Service, Inventory, and Maintenance System (SIMS) has been developed to operate as a software package at computer service bureaus or on computers operated by transit properties. SIMS consists of a package of computer programs written on ANSI COBOL language and currently operates on an IBM 360/50 or larger computer.

Practical design has been enhanced by experience from field tests at the Dallas Transit System (DTS) of Dallas, Texas and Alameda-Contra Costa Transit District (ACTD) of Oakland, California. The system has been operating daily at both DTS and ACTD on a demonstration basis.

This report provides an overview of the system, using illustrations of the reports produced by SIMS. Information displayed in the reports allows management to plan repair actions, avoid road calls, and control expenses. The Service module helps to identify consumption of oil and coolant. Transit property stock room supplies are monitored through the use of the SIMS Inventory module. The Maintenance (Repair Cost) Module provides repair costs data for individual buses and divisions, segregating costs into subassemblies, inspections, accidents, and vandalism repairs, and provides information about total maintenance labor utilization.

The appendix contains computer requirements and a glossary.

TITLE: VEHICLE SCHEDULING AND DRIVER RUN CUTTING: RUCUS
PACKAGE OVERVIEW

AUTHOR: MITRE Corporation
(Kenneth R. Roberts)

DATE May 1973 PROJECT NO.: VA-06-0004

KEYWORDS: 1. Computer Applications
2. Computer Programming
3. Schedules and Scheduling
4. Bus, driver
5. Management, operations and techniques

This report describes the Run Cutting and Scheduling (RUCUS) package, which is a set of computer programs designed to assist in headway sheet development, vehicle scheduling and driver run cutting. The purpose of using computer programs for this task is to cut down on the time involved in designing schedules while improving the accuracy of the finished product.

The RUCUS package seeks to avoid the three major pitfalls which have been responsible for a lack of success in previous attempts to design a computer scheduling system. These include: (1) Partial computer implementations were hard to integrate into an existing process; (2) Industry is not computer-oriented and analytical personnel attempting computer implementations were not familiar with industry problems; and, (3) The computer equipment used previously was not large enough or fast enough.

There are four components in the RUCUS package: TRIPS, BLOCKS, RUNS, and DATA MANAGEMENT. Headway sheet generation or revision is accomplished using the programs in the TRIPS component. After new headway sheets are developed for each line, new vehicle schedules are developed using the BLOCKS component based on input factors such as deadhead times, turn-around times, various schedule-controlled program parameters, etc. Driver schedules (RUNS) must then be developed for the new service after headway sheets and vehicle BLOCKS are determined. The RUNS package develops driver schedules, the driver run cutting program, from vehicle schedules. The programs in the data management component are utility routines which manage the four basic files of data used by the RUCUS package.

Formal field tests were negotiated with Baltimore Transit, D.C. Transit and San Diego Transit. These organizations supplied master files and consulting advice in conjunction with a demonstration at their properties. Field tests were also conducted on a smaller scale in Vancouver, B. C. and Akron, Ohio. Results of these field tests are given.

TITLE: TRANSIT PLANTING: A MANUAL FOR THE HORTICULTURAL DEVELOPMENT OF PUBLIC TRANSPORTATION ENVIRONMENTS

AUTHOR: The American Horticultural Society

DATE August 1973

PROJECT NO.: VA-06-0006

KEYWORDS:

1. Environment and Environmental Control
 2. Urban Development and Planning
 3. Weather Effects
 4. Land Use
-

This report is a manual for the horticultural development of public transportation environments. It envisions an urban landscape of the future brought about by the sensitive and knowledgeable introduction of natural plant elements. The intention of the project is to show that urban public transportation environments could be more attractive, function more efficiently and be more comfortable for the populace through careful attention to ecology and horticultural factors.

Various landscape designs are introduced in which highly reliable, all-season plants would be prime contributors to the overall design and functional purpose. There is also a guide which would enable planners anywhere in the nation to make the best possible selection of planting materials for their particular region so that materials once chosen would provide an assurance of successful and economical maintenance. Judgments on the suitability of specific plants in specific environments are based on ecological adaptability, taking into account such factors as climate, the plant's ability to resist pollution, and the amount of care required to maintain the plant.

National zones are analyzed according to mean temperature, with corresponding lists of appropriate plants by both common and scientific names. Specific applications are discussed in relation to bus stops, suburban terminals, and downtown stations. Trees are analyzed individually according to size, shape, growth rate, shade, flowers, ornamental value, possibilities of training into a large shrub, and types of soil required, whether moist or dry. Shrubs are analyzed according to height, seasonal color (whether they have spring, summer or winter flowers), whether they are good for shearing or good in containers, whether they are tolerant of shade, whether they can be trained for espalier, and whether they bear fruit. Ground covers are analyzed according to height, density, whether they spread rapidly, pruning requirements, sun resistance, and shade tolerance. Interior plants are classified according to size and shape.

The report contains numerous drawings, which are both informative and entertaining.

TITLE: THE STATE OF URBAN MASS TRANSPORTATION RESEARCH, DEVELOPMENT,
AND DEMONSTRATION

Volume I: Summary

AUTHOR: Institute for Defense Analyses, Systems Evaluation Division
(P.B. Buck, Murray Kamrass, Howard Margolis)

DATE: March 1972

PROJECT NO.: VA-06-0007

KEYWORDS:

1. Research Operations
2. Rail, systems planning and design
3. Bus
4. Management, operations and techniques
5. Qualitative Analysis

This study is intended to: (1) summarize, aggregate, and extract the essence of results of research, development, and demonstration (RD&D) projects, transit innovations and recent urban experiences; (2) develop categorization of subject matter in the field of Urban Mass Transportation RD&D; (3) identify and discuss major areas of insufficient knowledge in each category; (4) assess the relative importance of overcoming the identified deficiencies; and, (5) develop recommendations for the continuation of or enlarged emphasis on previous or ongoing UMTA RD&D program areas.

The specific purpose of RD&D is to develop, demonstrate, and evaluate a spectrum of feasible improvements in urban mass transportation technology and methods which can be implemented to solve local transportation problems.

Volume I contains the summaries, conclusions and recommendation from each of the subsequent volumes of the report.

Every completed UMTA project was categorized as indicated in Table 2 of the report and by transit mission (i.e., suburb-urban, urban circulation, suburb circulation, airport access, etc.), RD&D area (i.e., basic hardware, ancillary hardware, operation and management software, etc.), problem addressed and proposed solution categories.

The reports were reviewed and the findings were extracted based on their significance to further RD&D efforts. Syntheses of findings were presented for the topics of bus technology, bus traffic systems and service innovations, bus transit operations and management systems, rapid rail vehicles and systems, commuter rail vehicles and systems, light rail vehicles and systems, rail supporting technology, new systems, systems analysis and planning research.

Gaps in effort are identified and summarized. Tables present a summary of "UMTA RD&D Initiated Since 1 January 1969--Completed, Ongoing, and Planned Projects."

The six volumes in this project are: Volume I - Summary (PB 229-439), Volume II - UMTA RD&D Findings and Projects (PB 229-440), Volume III - Bus Transit (PB 229-441), Volume IV - Rail Transit (PB 229-442), Volume V - New Systems (PB 229-443), and Volume VI - Systems Analysis (PB 229-444). To obtain all 6 volumes, the PB number is 229-438-SET (\$24.00).

NTIS ORDER NO.: PB 229-439/AS

TITLE: THE STATE OF URBAN MASS TRANSPORTATION RESEARCH, DEVELOPMENT,
AND DEMONSTRATION Volume II: UMTA RD&D Findings and Projects

AUTHOR: Institute for Defense Analyses, Systems Evaluation Division
(P.B. Buck)

DATE March 1972

PROJECT NO.:

VA-06-0007

KEYWORDS:

1. Research Operations
2. Quantitative Analysis
3. Qualitative Analysis

This study is intended to: (1) summarize, aggregate, and extract the essence of results of research, development, and demonstration (RD&D) projects, transit innovations and recent urban experiences; (2) develop categorization of subject matter in the field of Urban Mass Transportation RD&D; (3) identify and discuss major areas of insufficient knowledge in each category; (4) assess the relative importance of overcoming the identified deficiencies; and, (5) develop recommendations for the continuation of or enlarged emphasis on previous or ongoing UMTA RD&D program areas.

The specific purpose of RD&D is to develop, demonstrate, and evaluate a spectrum of feasible improvements in urban mass transportation technology and methods which can be implemented to solve local transportation problems.

The primary basis for the structure of this report, Volume II, is the UMTA categorization system. The five primary categories are Bus Transit, Rail Transit, New Systems, Systems Analysis, and Planning and Service Development.

The review of the UMTA RD&D program is covered in detail. It involved a review of approximately 90 available reports initiated since January 1, 1969. All projects and their findings were categorized not only by UMTA general categories but also by sub-categories according to principal subject areas addressed. The subject areas addressed were also placed in category outlines by transport mission and RD&D area in order to locate possible gaps in coverage. From the review of each project, findings were extracted and categorized according to impact area; then aggregated and summarized.

A bibliography is furnished. The appendix is "Project Categorization."

\$5.25

NTIS ORDER NO.: PB 229-440/AS

TITLE: THE STATE OF URBAN MASS TRANSPORTATION RESEARCH, DEVELOPMENT,
AND DEMONSTRATION, Volume III: Bus Transit

AUTHOR: Institute for Defense Analyses, Systems Evaluation Division
(Elizabeth Stabler, Howard Margolis, Sandra F. Ugel)

DATE May 1972

PROJECT NO: VA-06-0007

KEYWORDS: 1. Bus 6. International
2. Management, operations & techniques
3. Bus, priorities
4. Lane, reserved
5. Qualitative Analysis

This study is intended to: (1) summarize, aggregate, and extract the essence of results of research, development, and demonstration (RD&D) projects, transit innovations and recent urban experiences; (2) develop categorization of subject matter in the field of Urban Mass Transportation RD&D; (3) identify and discuss major areas of insufficient knowledge in each category; (4) assess the relative importance of overcoming the identified deficiencies; and, (5) develop recommendations for the continuation of or enlarged emphasis on previous or ongoing UMTA RD&D program areas.

The specific purpose of RD&D is to develop, demonstrate, and evaluate a spectrum of feasible improvements in urban mass transportation technology and methods which can be implemented to solve local transportation problems.

In Volume III, urban bus systems are described and related to other transportation modes. The market for bus transit and costs are discussed and the impacts of urban bus transit on riders, operators, the public and industry are presented.

Area studies in the bus transit field include UMTA RD&D categories of Bus Technology, Bus Traffic Systems and Service Innovations, and Bus Transit Operations and Management. The information sources have been literature searches, interviews, and reviews of current and earlier (before 1969) UMTA RD&D work where appropriate. Special attention has been given to Busways because this is an area currently of wide interest and considerable application. Information on foreign innovations has also been included.

Appendix "A" is "Recent Improvements in Bus Transit: Two Examples" and Appendix "B" is "Foreign Bus Transit Innovations: Selected Examples." A bibliography is included.

\$4.75

NTIS ORDER NO.: PB 229-441/AS

TITLE: THE STATE OF URBAN MASS TRANSPORTATION RESEARCH, DEVELOPMENT,
AND DEMONSTRATION, Volume IV: Rail Transit

AUTHOR: Institute for Defense Analyses, Systems Evaluation Division and
Louis T. Klauder & Associates, (Murray Kamrass, Elizabeth Stabler,
Sandra F. Ugel)

DATE: March 1972

PROJECT NO.:

VA-06-0007

KEYWORDS:

- | | |
|--------------------------------------|--------------------------------------|
| 1. Rail, commuter | 5. Airport, access |
| 2. Rail, systems planning and design | 6. People Movers, Transit Expressway |
| 3. Qualitative Analysis | 7. International |
| 4. Rail, stations and terminals | |

This study is intended to: (1) summarize, aggregate, and extract the essence of results of research, development, and demonstration (RD&D) projects, transit innovations and recent urban experience; (2) develop categorization of subject matter in the field of Urban Mass Transportation RD&D; (3) identify and discuss major areas of insufficient knowledge in each category; (4) assess the relative importance of overcoming the identified deficiencies; and, (5) develop recommendations for the continuation of or enlarged emphasis on previous or ongoing UMTA RD&D program areas.

The specific purpose of RD&D is to develop, demonstrate, and evaluate a spectrum of feasible improvements in urban mass transportation technology and methods which can be implemented to solve local transportation problems.

This report, Volume IV, contains an overview of rail systems. In the section on rapid rail vehicles and systems, the state-of-the-art in rapid transit is examined and research requirements discussed. The appendices are "Evaluation of the Rapid Transit Extension to Cleveland's Airport," and "Impact of the Proposed Allegheny County Transit Expressway."

A survey of recent trends and UMTA RD&D projects in the area of commuter rail transit follows, with a discussion of impact and potential. The appendix is entitled, "GO Transit: A New Approach to Urban Transportation."

Rail systems and technology topics include vehicles and equipment, electrification, train protection and system control, communications, fare collection, shop facilities, track and personal security.

In the discussion of foreign rail developments, categories are rapid rail vehicles, special systems--airport access, automatic fare collection, commuter rail vehicles and light rail vehicles and systems. Cities referred to include London, Paris, Munich, Vienna, Madrid, Warsaw, Budapest, Mexico City, Brazil, Barcelona and Stockholm.

References are furnished.

TITLE: THE STATE OF URBAN MASS TRANSPORTATION RESEARCH, DEVELOPMENT, AND DEMONSTRATION, Volume V: New Systems

AUTHOR: Institute for Defense Analyses, Systems Evaluation Division (Murray Kamrass, Howard Margolis, Sandra F. Ugel)

DATE: March 1972

PROJECT NO.: VA-06-0007

KEYWORDS:

- | | |
|---|---------------------------------|
| 1. Qualitative Analysis | 6. International |
| 2. Demand-Responsive Systems | 7. Intermodal Integration |
| 3. Demand-Responsive Systems, dial-a-ride | 8. Transportation Disadvantaged |
| 4. Personal Rapid Transit | |
| 5. Dual Mode Systems | |

This study is intended to: (1) summarize, aggregate, and extract the essence of results of research, development, and demonstration (RD&D) projects, transit innovations and recent urban experience; (2) develop categorization of subject matter in the field of Urban Mass Transportation RD&D; (3) identify and discuss major areas of insufficient knowledge in each category; (4) assess the relative importance of overcoming the identified deficiencies; and, (5) develop recommendations for the continuation of or enlarged emphasis on previous or ongoing UMTA RD&D program areas.

The specific purpose of RD&D is to develop, demonstrate, and evaluate a spectrum of feasible improvements in urban mass transportation technology and methods which can be implemented to solve local transportation problems.

A summary of the current status of demand responsive transportation systems is presented. Technology, legal and regulatory aspects and the current status of dial-a-ride are discussed. The appendix for this section is entitled, "Dial-A-Ride and the Poor."

In the review of the PRT and dual mode, topics under consideration are the types of PRT and dual mode Systems, a comparison of dual mode versus PRT3 plus feeder bus, comments on R&D for automated guideway operations and the need for risk insurance.

Information on foreign systems and research is included in this report. Among the innovations discussed are the overwater transit on the Thames River in London, moving walkways in South Africa, Tokyo's monorail, the dial-a-bus in Emmen, the Netherlands, and the incorporation of intermodal integration into the transport system in Hamburg.

References are included.

\$5.25

NTIS ORDER NO.: PB 229-443/AS

TITLE: THE STATE OF URBAN MASS TRANSPORTATION RESEARCH, DEVELOPMENT,
AND DEMONSTRATION, Volume VI: Systems Analysis

AUTHOR: Institute for Defense Analyses, Systems Evaluation Division
(Murray Kamrass)

DATE: March 1972

PROJECT NO.:

VA-06-0007

KEYWORDS:

- | | |
|--|---------------------------|
| 1. Qualitative Analysis | 5. Intermodal Integration |
| 2. Bi-Modal Systems | 6. International |
| 3. Dual Mode Systems | |
| 4. Management, operations and techniques | |
-

This study is intended to: (1) summarize, aggregate, and extract the essence of results of research, development, and demonstration (RD&D) projects, transit innovations and recent urban experience; (2) develop categorization of subject matter in the field of Urban Mass Transportation RD&D; (3) identify and discuss major areas of insufficient knowledge in each category; (4) assess the relative importance of overcoming the identified deficiencies; and, (5) develop recommendations for the continuation of or enlarged emphasis on previous or ongoing UMTA RD&D program areas.

The specific purpose of RD&D is to develop, demonstrate, and evaluate a spectrum of feasible improvements in urban mass transportation technology and methods which can be implemented to solve local transportation problems.

In the introduction of Volume VI, a description of intermodal integration is offered and the general forms of transport integration discussed. Conclusions and recommendations are also included.

Under the topic of administrative integration mergers, formation of a consortium, association or operating company, route section association, work sharing, limited agreements and special purpose cooperation are presented.

The scope of service integration is put forth and combined fares, community fares and schedule and route coordination discussed.

Terminals, equipment, standardization of fare collection equipment, passenger information and integration through dual mode technology are included in the presentation on system integration.

Examples of urban area transport integration in the areas of New York, Chicago, Boston, Southeastern Pennsylvania Transportation Authority (SEPTA), San Francisco, Los Angeles, Cleveland, Toronto, Montreal, and Minneapolis are given. Integration activities in other U.S. areas, along with the DOT role and foreign activities in intermodal integration are discussed.

Also studied in this project are the impacts of transportation integration on riders, operators, the public, the transit industry, and the indirect beneficiaries.

Appendices include discussions of the systems in London, Chicago, Hamburg, Stockholm, and the Path-Aldene plan. A bibliography is included.

TITLE: DEMAND-RESPONSIVE TRANSPORTATION SYSTEM PLANNING GUIDELINES

AUTHOR: MITRE Corporation
(Bert Arrillaga and George E. Mouchahoir)

DATE April 1974

PROJECT NO. VA-06-0012

KEYWORDS:

1. Demand Responsive Systems
 2. Benefit Cost Analysis
 3. Fares, cost determination
 4. Planning
 5. Socio-Economic Analysis
-

This report provides preliminary planning guidelines to aid in the selection and design of demand-responsive transportation systems and presents, in summary form, major characteristics of 12 demand-responsive systems operating in the United States and Canada. These are: Ann Arbor, Michigan; Batavia, New York; Bay Ridges, Ontario; Buffalo, New York; Columbia, Maryland; Columbus, Ohio; Detroit, Michigan; Haddonfield, New Jersey; Kingston, Ontario; Regina, Saskatchewan; Stratford, Ontario; and Toledo, Ohio.

The information summarizing each system includes service and demographic characteristics, special service and generators, transportation competition, operating parameters, support and control staff, and system economics. The information reflects first-hand data that were obtained through the administration of a questionnaire to the managers of the systems surveyed.

The guidelines, which were developed using the information from these 12 systems, are in the form of a systematic procedure designed to provide estimates of operating parameters and to aid in a preliminary economic evaluation of the planned system. Estimates may be obtained of ridership, fleet size, staff requirements, and system capital and operating costs. Based on a desirable fare, ridership and operating costs, an estimate may then be made of the expected profit or loss. One of the limitations of the guidelines which should be taken into account is the limited amount of empirical information provided by using only 12 systems.

Figures include: daily and peak-hour ridership versus population; fleet size per square mile versus peak hour demand density; and daily operating cost versus fleet size.

TITLE: THE HADDONFIELD DIAL-A-RIDE DEMONSTRATION
Demographic, System and User Characteristics

AUTHOR: MITRE Corporation
(Douglas Medville and Bert Arrillaga)

DATE: March 1974

PROJECT NO.: VA-06-0012

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
 2. Demography
 3. Qualitative Analysis
-

This report contains data concerning the UMTA-sponsored Dial-A-Ride demonstration in the Haddonfield, New Jersey area. The data are presented in tables and graphs. This information was obtained from household surveys conducted during October 1971 and January 1973, from trip ticket data through October 1973, and from three on-board surveys conducted in January, July, and September 1973.

The following data were compiled in relation to area characteristics: service area socioeconomic and expansion characteristics; dial-a-ride market share - all local trips; mode split for all trips made by service area residents; mode split for work trips; work locations of service area residents; and, cost of using other transportation modes in service area. Maps are included.

The section on dial-a-ride characteristics contains the following information: service types and fares charges; vehicle description; weekly and a daily dial-a-ride ridership; average weekday hourly ridership; origin-destination characteristics; dial-a-ride productivity; dial-a-ride service quality: many-to-many trips; ride time by trip type; and, the wait time distribution.

The variables considered in the examination of user characteristics were age, sex, income, automobile ownership, drivers licenses and auto availability, tenure status, and trip frequency, purpose and ends.

Related documents include: "Haddonfield Dial-A-Ride - First Progress Report" (Order No. PB 220-171, \$3.75); "Implementation and Operation of a Demand Responsive Public Transportation System - Haddonfield Dial-A-Ride" (Order No. PB 233-380, \$7.25); "Demand Responsive Transportation System Planning Guidelines" (Order No. PB 232-970, \$3.75), and "Haddonfield Dial-A-Ride - Second Progress Report" (Order No. PB 233-378, \$4.25).

TITLE: SOCIOECONOMIC AND TRAVELING CHARACTERISTICS OF
DIAL-A-RIDE USERS

AUTHOR: MITRE Corporation
(B. Arrillaga)

DATE July 1974

PROJECT NO.: VA-06-0012

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
 2. Qualitative Analysis
 3. Socioeconomic Analysis
-

Tabulations of the socioeconomic and traveling characteristics of the users of the Dial-A-Ride system in Haddonfield, New Jersey are presented in this report. The information was obtained during two on-board surveys conducted on Tuesday, 10 July 1973 and Tuesday, 18 September 1973.

The specific objectives of the surveys were: (1) to obtain a socioeconomic profile of the Dial-A-Ride users; (2) to obtain certain characteristics of the trips for which Dial-A-Ride is being used; and (3) to develop, through a rating and ranking of Dial-A-Ride attributes, an estimate of the quality of the service as perceived by the users.

Ten socioeconomic characteristics of the average daily users of the system were obtained and compared with the characteristics of the residents of the entire service area. Five questions were asked on the trip characteristics, including frequency of Dial-A-Ride use during the week and weekend, trip purpose, trip distance and the usual means of transportation. Ratings and rankings of seven Dial-A-Ride system characteristics were obtained using a seven-part semantic scale.

Among the conclusions were: socioeconomic characteristics of users generally differ from those of the total population of the service areas; about three-quarters of the users are women; one-half are single, widowed or divorced; a larger percentage do not own homes or have autos or drivers' licenses; and, users average annual income is smaller. The system is being used mainly for purposes of work, shopping or attending to personal business.

Findings are presented in tables. The appendix contains the questionnaire.

TITLE: SUMMARY OF AUTOMATED SCHEDULING SYSTEM FOR DEMAND RESPONSIVE PUBLIC TRANSPORTATION

AUTHOR: MITRE Corporation,
(Kathy K. Rebibo, et al.)

DATE: March 1974

PROJECT NO.: VA-06-0012

KEYWORDS:

1. Demand Responsive Systems, dial-a-ride
 2. Schedules & Scheduling
 3. Computer Applications
-

The Dial-A-Ride Automated Scheduling System is a package of computer programs developed on a Westinghouse 2500 minicomputer by The MITRE Corporation under sponsorship of UMTA. The system contains an automated scheduler that (1) dynamically assigns customer requests for trips to vehicle tours and dispatches the vehicles through their stops (2) provides data analysis programs that produce statistical reports on system performance; and (3) produces programs to generate and maintain the data files required by the scheduler, such as the file of related street names.

The automated scheduler accepts messages from control room personnel through computer terminals. The messages are processed by an interactive message editor that verifies the message and initiates the appropriate function. Functions performed by the real-time scheduler include the assignment of trip requests, deferment of trip requests to be assigned later, cancellation of trip requests, vehicle dispatching, vehicle positioning, reassignment of stops of a disabled vehicle, and complete monitoring capabilities. In addition, the system supports a file containing trip requests that are automatically scheduled on a periodic basis. During scheduling, vehicle tours are printed in the event of failure of the automated system and a tape file is created for use by the data analysis programs.

The primary purpose of implementing the automated scheduling system was to test the theoretical designs of Many-to-Many service. This system is the first operational computerized Dial-A-Ride scheduler. Among its benefits is the flexible, convenient interactive user interface that allows control room personnel to communicate effectively with the system with a minimum of effort. The statistical analysis reports provide management with a daily system performance evaluation that is extremely difficult to obtain from manual operations.

References are furnished.

TITLE: URBAN FIELD TESTS OF FOUR VEHICLE LOCATION TECHNIQUES

AUTHOR: MITRE Corporation (W. Scales)

DATE April 1973

PROJECT NO: VA-06-0012

KEYWORDS:

1. Vehicle, monitoring
 2. Schedules and Scheduling
-

A wide variety of electronic techniques has been proposed for locating fleet vehicles in urban areas but few of these techniques have heretofore been objectively and comprehensively tested. This report summarizes an effort to test four vehicle location techniques in order to measure the accuracy and coverage capabilities of each technique under realistic conditions.

The four location techniques tested are: LORAN C, narrowband phase multilateration, wideband phase multilateration, and microwave proximity. The tests indicate that microwave proximity techniques can be used to achieve accuracies of about 330 feet with 95 percent confidence. The measured accuracies of LORAN C and narrowband phase multilateration are on the order of 1100 to 2000 feet, with 95 percent confidence, depending on the vehicle's environment. Wideband phase multilateration, which achieved accuracies on the order of 2800 to 5000 feet, showed no significant advantage over the narrowband phase technique.

TITLE: OVERVIEW OF AUTOMATIC VEHICLE MONITORING SYSTEMS

AUTHOR: MITRE Corporation
(William S. Murray and
Walter C. Scales

DATE: August 1973

PROJECT NO.: VA-06-0017

KEYWORDS:

1. Vehicle monitoring
 2. Schedules and Scheduling
 3. Communications
-

This report is an overview of Automatic Vehicle Monitoring (AVM) systems, which automatically determine and make available to a central control point the position of a vehicle or a group of vehicles. AVM systems used in urban applications are based upon, or are varieties of, four basic techniques: radio propagation time, proximity, dead reckoning, and triangulation. The relative merits of each of these systems are also discussed and, where test or simulation data and cost information are available, these too are provided. Also included is a discussion of secondary systems' functions (polling, computation, telemetry, etc.) that must be addressed before a workable AVM system can be implemented.

Potential applications for AVM systems include: transit buses, police vehicles, taxi fleets, delivery services, maintenance services, and possibly even moving vans, which would require inter-city capabilities in order to be completely responsive. The report opens with a brief discussion of these applications, followed by a more detailed analysis of AVM techniques that have been demonstrated, tested, or proposed. The best available technical and cost data have been used throughout. The report concludes with a discussion of the system considerations. An appendix summarizes the cost data for one specific AVM system. There is a full list of references and an extensive bibliography.

Other reports on the Automatic Vehicle Monitoring System include: LORAN-C Automatic Vehicle Monitoring (AVM) System (Philadelphia field test report), Teledyne Systems Co., (PB 216-332); AVM Systems (Philadelphia field test report), RCA, (PB 219-083); AVM Systems (Philadelphia field test report), Cubic Corp., (PB 221-046); AVM Systems (Philadelphia field test report), Sierra Research Corp., (PB 216-165); AVM Technology Review, MITRE Corp., (PB 217-849); Urban Field Tests of Four Vehicle Location Techniques, MITRE Corp., (PB 221-732); Monitor CTA, Chicago Transit Authority, (PB 223-878).

TITLE: BLUE STREAK BUS RAPID TRANSIT DEMONSTRATION PROJECT
Final Report

AUTHOR: Alan M. Voorhees & Associates, Inc.

DATE: June 1973

PROJECT NO.. WA-06-0004

KEYWORDS:

1. Bus, express
 2. Parking, park-and-ride
 3. Ridership, attraction
 4. Bus, rapid transit
 5. Bus, priorities
-

This final report is on "Blue Streak", a bus demonstration project in Seattle, Washington designed to measure the effect of substantial improvements in bus transit service and to measure the impact of a park-and-ride lot with express service to the downtown area. In this project, Blue Streak buses use the reversible lanes of Interstate 5 (the Seattle Freeway) from the CBD north to the city limits.

The Blue Streak demonstration project produced patronage increases in the face of system-wide ridership losses and a general decline in area travel. If the economic and travel conditions of the study area had not declined during the demonstration, advantages of Blue Streak would have been more dramatically demonstrated in a greater patronage shift. Nevertheless, ridership increased from about 7,500 to over 10,000 passengers per day. The greatest increases occurred on routes that included the park-and-ride lot in their service for a round trip fare of \$.70.

Typical transit travel time southbound in the morning peak period went from 49 minutes to 38 minutes. Blue Streak routes averaged nearly 17 mph where non-Blue Streak routes are around 11 mph. The safety record of Blue Streak buses was impressively good. Maintenance costs were low.

The Blue Streak modal split model, calibrated for downtown travel in a major transportation corridor, showed the relationship between transit use and trip purpose, user income, auto and transit running time differences, auto and transit waiting time differences, fare, parking cost, and auto out-of-pocket costs. Also developed in the project was a ramp simulation model to test the impact of exclusive bus ramps. A procedure was also devised to test the location of park-and-ride facilities.

An appendix volume to this final report (PB 222-128/AS) contains supporting charts, figures, illustrations, etc.

TITLE: BLUE STREAK BUS RAPID TRANSIT DEMONSTRATION PROJECT
Final Report Appendix

AUTHOR: Alan M. Voorhees & Associates, Inc.

DATE: June 1973

PROJECT NO.: WA-06-0004

KEYWORDS:

1. Bus, express
 2. Parking, park-and-ride
 3. Ridership, attraction
 4. Bus, rapid transit
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This report is the appendix to the final Blue Streak report (PB 222 126), a two and one half year demonstration project designed to test the effects of increased levels of service on transit routes and the overall impact of a park-and-ride lot with express service to downtown Seattle. Guidelines were studied for the location of park-and-ride lots, the impact of exclusive transit freeway ramps was simulated, and a modal-split model was calibrated.

The appendix contains an introduction, a description of Blue Streak, an outline of the routes, a description of the data collection and, as the bulk of the report, a series of charts and figures which illustrate the main body of the final report.

TITLE: SHORT-RANGE TRANSIT PLANNING

AUTHOR: Alan M. Voorhees & Associates Inc.

DATE: July 1973

PROJECT NO.: DOT-OS-10063

KEYWORDS:

- | | |
|-----------------------------|-------------------|
| 1. Small Cities | 6. Financing Mass |
| 2. Market Research | Transportation |
| 3. Fare, cost determination | 7. Planning |
| 4. Community Response | |
| 5. Routes and Routing | |
-

This report is a reference document for communities contemplating the preparation of short-range development programs. The basic objectives of these programs are the revitalization of public transportation and the provision of greater mobility for substantial groups of transit dependent persons. The report should be of particular interest to local elected officials, regional planning agencies, and transit operators.

The material in this report was designed for communities with less than one million population because larger areas have increased complexities of transportation/general planning relationships. Seven monographs on selected phases of transit planning were prepared for this report. The monographs are not meant to increase the state-of-the-art by presenting new and untried procedures or methods nor do they advocate the use of specific techniques over others. They do present techniques which have been used successfully in selected urban areas across the country.

The following functional areas are covered in the monographs: routes and schedules; fare structure and pricing; fleet mix; marketing; management; financial planning; and citizen involvement.

The report is also available from the Government Printing Office (Stock #5014-00002, Catalog #TD7.2:T68).

TITLE: NEW SYSTEMS REQUIREMENTS ANALYSIS PROGRAM, A PROCEDURE FOR
LONG RANGE TRANSPORTATION (SKETCH) PLANNING
Technical Report
AUTHOR: Urban Mass Transportation Administration

DATE: July 1973

PROJECT NO.: RDD-7

KEYWORDS:

1. Planning
2. Planning, tools
3. Computer Applications
4. Algorithms

This report is part of the UMTA Transportation Planning System (UTPS), a set of tools designed to aid planners at all levels of transportation planning. It provides an overview of the entire UTPS package and its development plan, and contains a detailed description of the sketch planning procedure as well as other UTPS modules used with the procedure.

The goal of sketch planning is to overcome the traditional problems of high cost in specifying and evaluating planning alternatives, and the inability to consider all modes simultaneously. The procedure provides an efficient means of describing and analyzing many alternative transportation networks, each composed of a large variety of modes, at a level of data aggregation appropriate to long range planning and to required policy decisions. Specific objectives are to have a planning tool which is relatively easy to use, can be implemented with minimal future network and host environmental data, and is efficient in terms of the computer and human resources, while at the same time providing useful information regarding expected travel demand, travel cost, and environmental impacts.

Among the procedure's unique characteristics are the ability to consider scores of network alternatives expressed as a "basic" network with appended tree-structured set of modifications, its algorithm for finding multiple paths through a multi-modal network, and its estimation of travel demand using a multi-modal model. The procedure will provide for interactive operation using a time-shared computer and on-line graphics for phase network modification and evaluation. Initial modules of the procedure will be made available to the public in fall 1973. A bibliography is included.

TITLE: OPERATING POLICIES FOR PERSONAL RAPID TRANSIT

AUTHOR: David Morag

DATE: May 1974

PROJECT NO.: RDD-8

KEYWORDS:

1. Headways
 2. Personal Rapid Transit
 3. Computer Applications
-

Personalized Rapid Transit (PRT) systems development is concerned with the more complex new generation of PRT systems that will utilize small automated vehicles closely spaced on an exclusive right-of-way to achieve a higher lane capacity and non-stop service, along with reduction of traffic congestion and pollution. The author perceives a need to carefully define and study operating policies relating vehicle separation, and velocity as the capacity of the system increases.

This report describes and evaluates operating policies for PRT systems and illustrates their implementation in a PRT vehicle autopilot. The vehicles frequency of passage and the considerations that contribute to the selection of such frequencies are the major topics of the report. Also studied are the various effects on system parameters and performance that follow the selection of an operating policy.

The report examines three potential operating policies for PRT systems and defines the necessary limitations on headways resulting from design parameters and the effects of maneuvers. The operating policies considered are constant separation, constant K factor, and constant headway operation. A longitudinal control system was devised for the purpose of testing implementation of each operating policy. This test was accomplished by a digital computer simulation of a string of PRT vehicles controlled by the longitudinal control system models and operating according to the various policies.

A table of references, bibliography, and glossary are provided. Appendices are: "Emergency Stopping Distance Equations," "K Factor Equations for Deceleration Lanes," "K Factor Equations for Small Speed Reduction Zones," and "Simulation."

TITLE: UMTA TRANSPORTATION PLANNING SYSTEM REFERENCE MANUAL

AUTHOR: Urban Mass Transportation Administration

DATE April 1974

PROJECT NO.. RDD-8

KEYWORDS:

1. Computer Applications
 2. Computer Programming
 3. Codes and Coding
 4. Planning
-

The UMTA Transportation Planning System (UTPS) is a collection of IBM System/360 computer programs for use in planning multi-modal transportation systems. The objective of UTPS is to provide a readily available, easy-to-use, and fully tested program package for transportation planners attempting to solve a wide variety of problems. UTPS presently consists of 13 separate but interrelated computer programs designed for use in the IBM 360 operating system.

This document, the reference manual, summarizes relevant information for operators of the UTPS system and it is intended to be used as a concise reference for persons already familiar with the usage of the programs. Specific selections include statements of system controls, subject program controls, program writeup organization, software system description, catalogued procedures, and actual program writeups.

TITLE: ANALYSIS AND DESIGN OF A TRANSPORTATION INFORMATION CENTER

AUTHOR: Stanford University, Department of Industrial Engineering
(Randolph F. Buckley)

DATE August 1973

PROJECT NO.: CA-11-0008

KEYWORDS:

1. Computer Applications
2. Information Aids
3. Routes and Routing

This report is concerned with the computerization of a public transportation information center. The costs and benefits of such a system are outlined and investigated. The computerized system is compared to the manual system and the capabilities and limitations of the manual system are explored. Four computer systems were chosen for evaluation in a hypothetical information center. The computer systems were configured according to a set of criteria which matched the needs of an information center. The economic analysis of the four computer systems includes a buy/lease study based on multiple estimated system lines and on multiple capitalization factors.

The report also examines additional services which computers can provide for the information center and uses which can be applied to other departments in the transit organization. Certain limitations inherent to the computerized system are also discussed.

The author concludes that further study should be made of the relationship between better information and increased ridership to determine the economic justification of a computer information center. However, it is also pointed out that large regional multi-modal transportation systems are a more efficient means of organizing the transportation function and that previously simple tasks would be much more complex in such systems, making the computer a more necessary tool.

TITLE: A COMPARATIVE ANALYSIS OF TRIP DISTRIBUTION AND ASSIGNMENT PROCEDURES FOR TRANSPORTATION PLANNING IN DEVELOPING REGIONS

AUTHOR: Stanford University, Department of Industrial Engineering
(Richard Jere Morris)

DATE: December 1973

PROJECT NO.: CA-11-0008

KEYWORDS:

1. Models and Modeling
2. Trip Generation
3. Traffic, analysis
4. Highway

Several different models have been developed in the past decade for the performance of trip distribution and traffic assignment functions in the modeling of transportation systems. Few have been designed for application to intercity planning in developing regions, a setting in which high degree of uncertainty in the available data poses special problems. Four trip generation distribution models--the Furness growth factor model, gravity model, intervening opportunities model and preferencing model--and four traffic assignment models--the all-or-nothing model, one pass multiple routing by centroid model, incremental assignment model and DIAL multipath assignment model--are described and compared in order to provide insight into the problem of model selection.

The research hypothesis tested is that differences in results obtained from the various models are much more sensitive to the uncertainty in input data than to effects of the different models tested.

To test this hypothesis the models were calibrated, and each of the possible 16 combinations was applied to the highway network of Northeast Brazil, using data obtained from the 1967 Brazil Transport Survey. The principal techniques used for analyzing results were a two-way analysis of variance procedure and procedures based on Friedman rank sums.

Based on these analyses, it was concluded that significant differences in the trip distribution models did exist, although similarities were noted between the growth factor and gravity models, and between the intervening opportunities and preferencing models. The differences in the link flows resulting from the effects of the traffic assignment models were much less than the differences resulting from the effects of the trip distribution models.

Data compilations are spread throughout the text. A bibliography is included and among the appendices is the "Total Network Costs for Each of the Sixteen Model Combinations."

TITLE: DESIGN AND ANALYSIS OF AN AUTOMATIC CREDIT CARD FARE
COLLECTION SYSTEM

AUTHOR: Stanford University Department of Industrial Engineering
(Randolph F. Buckley, Robert C. Carlson, James V. Jucker)

DATE: August 1974

PROJECT NO.: CA-11-0008

KEYWORDS:

1. Fare, collection
2. Bus
3. Management, operations & techniques

In this report, an automatic credit card fare collection system is proposed for use in buses operating in an urban environment. This system would accept payment of transit fares by bank credit cards, such as Master Charge or BankAmericard, or by a special credit card issued by the transit district itself.

To use the system, a transit user simply inserts an acceptable credit card into an on-vehicle unit which reads the information from the card and records it on a digital magnetic tape cassette. The cassette is recovered at the end of the day and processed by the data processing system. User charges would be accumulated, and billed periodically. The billing could be as simple as a monthly accumulated charge, or could resemble a toll telephone bill in that individual trips would be listed with the corresponding charge and date of each of the trips.

The fare collection system is composed of two major sub-systems. The on-vehicle system includes all fare-related activities conducted inside the vehicle. The off-vehicle system is all fare-related activities separated from user transactions in the vehicle, by time and space.

Various possible configurations of on-vehicle hardware are studied and a more detailed study is made for hardware applicable to the Santa Clara County (California) Transit District's bus system. Some problems encountered when implementing an operating bus system with the automatic credit card fare collection system are examined.

According to the authors, the decision to implement an automatic fare collection system must stand on an evaluation of its costs and benefits. A consumer study is recommended which will evaluate consumer acceptance of a system similar in design to the one outlined in this study.

Tables and figures complement the text. Appendices are "Data Element Definition" and "Flow Diagrams for the Zone Fare Structure." References are furnished.

TITLE: A DYNAMIC TRAFFIC ASSIGNMENT MODEL FOR CONGESTED NETWORKS WITH SHOCK WAVES

AUTHOR: Stanford University, Department of Industrial Engineering
(William Carleton Brastow, Jr.)

DATE: December 1973

PROJECT NO..

CA-11-0008

KEYWORDS.

1. Models and Modeling
 2. Traffic, analysis
 3. Traffic, congestion
 4. Algorithms
-

A mathematical formulation of a dynamic, deterministic traffic assignment algorithm particularly applicable to congested networks is specified. The model lies between the traditional stochastic simulation models, and the static, multi-commodity flow formulations of the traffic assignment problem in level of detail. The following properties make the model appear to be useful for the investigation of time varying flows in congested networks of moderately large size. Exogenous demands for travel between trip origins and destinations are treated as piecewise-constant functions of time. These demands are transformed via flow/density relations, which are assumed known for each network link, into piecewise constant functions of distance ("flow packets") which approximate the time and space-varying distributions of vehicle density on network links. The increased densities characteristic of congestion are propagated backward resulting in increased travel times, not only on the under-capacity links, but also on the upstream links feeding them. The model forces the distribution of flows to approach those of "user optimized" flows at any instant by dynamically reassigning flow elements to their shortest-time paths whenever these elements reach nodes which intersect alternative partial paths to their destinations.

Appendices are "Link Update Algorithm" and "Flow-Packet Algorithm Summary." References are furnished.

TITLE: AN EXPERIMENTAL DESIGN FOR THE HADDONFIELD DIAL-A-RIDE
Experimental Demonstration

AUTHOR: Stanford University, Department of Industrial Engineering
(Robert C. Carlson, et al.)

DATE: July 1974

PROJECT NO.: CA-11-0008

KEYWORDS: 1. Demand Responsive Systems, dial-a-ride
2. Qualitative Analysis
3. Benefit-Cost Analysis
4. Computer Application
5. Quantitative Analysis

This report describes an experimental design for the Haddonfield, NJ Dial-A-Ride Demonstration Program, an UMTA-sponsored experiment in demand responsive transportation service which began in February 1972. The overall experimental design was developed and described in this report as three separate but related experiments that deal with estimation and explanation of ridership, estimation and explanation of costs, and identification and evaluation of benefits.

Objective of the Haddonfield Dial-A-Ride (DAR) Experimental Design study was to provide measurable objectives in the following areas: (1) determine the reach, coverage and penetration (market share) of the DAR service in its initial form and after increasing service areas; (2) determine the DAR and potential riders' assessment of the value of DAR; (3) measure the DAR ridership and determine the purpose of trips; (4) measure the change in ridership after a variety of changes are introduced, including increased service area, mix of vehicle size, fare increase/decrease, and computer scheduling and dispatching; (5) assess the quality of service in terms of mean wait times, mean lateness and trip times before and after computer scheduling is introduced; (6) determine the degree of modal shift from car, bus, taxi or walking as a principal mode of travel during peak and off-peak periods; (7) determine if new transit ridership is generated by DAR service; (8) determine the socio-economic characteristics of DAR and potential users; (9) assess the residents' knowledge and perception of the DAR system; and, (10) calculate the capital, operating, and maintenance cost of DAR with and without computer scheduling. An explanation of how data will be defined for each of these and other objectives is provided.

The detailed experimental design described identifies specific data to be collected, means of data collection, and provides a descriptive scheme of data analysis for the Haddonfield Dial-A-Ride Demonstration Project.

Tables, figures and references are provided.

NTIS ORDER NO.: PB 241-426

TITLE: MARKET SEGMENTATION DEVELOPMENT FOR PUBLIC TRANSPORTATION

AUTHOR: Stanford University, Department of Industrial Engineering
(Richard R. Reed)

DATE: August 1973

PROJECT NO.: CA-11-0008

KEYWORDS:

1. Market Research
 2. Ridership, attraction
 3. Quantitative Analysis
 4. Qualitative Analysis
-

This report presents examples of new specialized transit services, a discussion of specific operating problems and presents the question of how to manage the emergence of a new market style based on market segmentation. Questions raised by the conflict between segmentation and conventional practices of the industry are outlined along with research methods used to answer them.

The report goes on to trace the course of the transit industry's decline and characterizes its present status as an industry. Contemporary data on modal choice and ridership are examined to describe reasons why transit management is pessimistic. The existing transit markets are examined and the authors conclude that none of them show very much potential for growth or increased revenue.

Social science findings are outlined to augment the more quantitative variables explored in modal split studies. It was found that transit demand is falling as its potential market grows more affluent.

Experiences in other industries in reversing sales declines and ways in which transit can expand its market through specialized offerings are examined. The report concludes with a chapter on how transit practices could be modified to implement a segmentation strategy. The managerial and operational difficulties are discussed. A bibliography is included.

TITLE: A MODEL FOR MULTIPLE-CRITERIA ANALYSIS OF LAND USE PLANS

AUTHOR: Stanford University, Department of Industrial Engineering
(Anthony John Pellegrini)

DATE: December 1972

PROJECT NO.: CA-11-0008

KEYWORDS.

1. Land Use
2. Computer Applications
3. Demography
4. Quantitative Analysis
5. Trip Generation

The purpose of this report is to provide a methodology which would help local or regional planning commissions to develop a land use plan for a given area. The resulting approach derived from the study was tested in the Morgan Hill area of southern Santa Clara County, California.

A computer model was developed which determined the levels of quantitative measures of the community wide impact of alternative land use patterns. Specific matters under study include: average commuter transit time; average recreational transit time; average commercial and shopping transit time, government revenues spent for transit; and expected retail sales dollars spent locally and in nearby communities.

Various types of land use that were included in the study are high density residential, medium density residential, low density residential, estate density residential, commercial, industrial, recreational, and un-urbanized land including agricultural land.

Among the conclusions by the author were: the physical relationship between home and work was found to have very little effect on travel time; where work and home areas were distributed evenly within a zone, the travel time was the same as compared to a central location of industry, and less as compared to an outlying industrial location; and, a dispersed pattern of shopping areas reduced shopping travel time over other patterns. A discussion is presented concerning the financial relationships between land use patterns and school districts.

The author also makes recommendations for further study in this field. A bibliography is included.

TITLE: MUST WE TRAVEL? THE POTENTIAL OF COMMUNICATION AS A
SUBSTITUTE FOR URBAN TRAVEL

AUTHOR: Stanford University, Institute for Communications Research
(David W. Jones, Jr.)

DATE March 1973

PROJECT NO.: CA-11-0008

KEYWORDS: 1. Communications 5. Trip Generation
2. Surveys 6. Travel Demand
3. Ridership, volume
4. Computer Applications

Future speculation on electronic communications techniques which would link the home to banking services, schools, libraries, teleconferences, company files, and retail and wholesale shopping has generated considerable thought about the possibility of substituting communications for physical travel in relation to employment.

This report estimates the home-to-work rush-hour traffic which is susceptible to communication substitution through the use of home or neighborhood information utilities. The study reports the percentage of home-to-work travel which could either be eliminated through the use of a centrally controlled communications network or shifted out of the rush-hour period by the performance of part of the work task from home.

Also examined are the destination, routes, times, origins and durations of home-to-work travel which might be substituted by communications, including the use of electronic equipment to convey audio, visual, moving audio or digital messages, providing thereby an alternative to face-to-face interaction. Occupations were coded to determine their substitution susceptibility.

Of great value to the study was a survey conducted in 1965 on Bay Area travel behavior and occupational characteristics by the San Francisco Bay Area Transportation Study Commission (BATSC). For this and other reasons which are outlined in the report, San Francisco was chosen as the study area.

The authors obtained very favorable conclusions on the future of communications as an urban travel substitute. A list of references is included.

TITLE: PUBLIC TRANSIT INFORMATION SYSTEMS: WHAT LEVEL OF
SOPHISTICATION?

AUTHOR: Stanford University, Department of Industrial Engineering
(William R. Wells)

DATE May 1973

PROJECT NO.

CA-11-0008

KEYWORDS:

1. Information Aids
 2. Computer Applications
 3. Schedules and Scheduling
 4. Manpower and Personnel
 5. Communications
-

This report describes a transportation information center which is designed to perform the following functions: (1) provide simple route and schedule information; (2) provide information on special transit offerings such as commuter specials, holiday specials, etc.; (3) provide a public transit sightseeing trip service; and, (4) refer calls to other transit district services such as a community representative. The telephone based system would be staffed by multilingual operators and would be open twenty-four hours a day.

Three different information retrieval systems are discussed. System A is a manual, hardcopy file system containing maps and schedules coded for rapid use. System B utilizes a microfiche video display with the route and schedule information on slides. System C is an interactive computer system with video display and light pen interaction. Operators and phone lines required and the annual cost of each system are analyzed.

The author concludes that the computer system would be the most costly system and that the volume of information would not be so large that it could not be handled just as efficiently by a trained operator.

TITLE: SOLUTION ALGORITHMS FOR RESOURCE AND ROUTE CONSTRAINED SHORTEST PATH PROBLEMS IN TIME-DEPENDENT TRANSPORTATION NETWORKS

AUTHOR: Stanford University, Department of Industrial Engineering
(Erkut Yucaoglu)

DATE: July 1973

PROJECT NO.: CA-11-0008

KEYWORDS:

1. Algorithms
2. Quantitative Analysis
3. Routes and Routing

Several problems within the class of deterministic linear network optimization problems have been formulated and solved. They can be described as constrained shortest path problems which occur in transportation networks. The constraints involve specified route, resource, and schedule restrictions. The network represents a single mode configuration of transportation routes, and consists of a given set of nodes and directed arcs.

The mathematical formulations of four related problems are given. The first shortest path problem is constrained only by schedule restrictions. The second problem has an additional resource constraint. Each of these two problems is then complicated by the addition of route constraints to form two other problems. Two different cases for each of the last two problems are formulated. A survey of available programming techniques and their extensions for the above problems is presented. The potential of these mathematical tools for the posed practical problems is explored, and six exact algorithms are developed.

The two algorithms constructed for the first pair of problems are labeling procedures which use a "tree-building" method for the generation of partial solutions and a dynamic programming technique for determining the optimal solution. The other four algorithms for the remaining problems are branch and bound techniques. A different procedure for generating partial solutions is used in each of the above four branch and bound algorithms. The last two algorithms also include a comprehensive feasibility check in their solution generation schemes. The first two labeling algorithms are used as lower bound finding procedures in the other four algorithms.

The performance of the algorithms in different types of networks and their computational aspects are analyzed. Discussion of some practical applications and possible theoretical extensions conclude the test. Illustrative sample problems are solved in the Appendices.

TITLE: THE FEASIBILITY OF FARE-FREE TRANSIT FOR LOS ANGELES

AUTHOR: University of California, School of Architecture and Urban Planning

DATE: June 1973

PROJECT NO.:

CA-11-0009

KEYWORDS:

1. Fares, reduction
2. Fares, cost determination
3. Financing Mass Transportation

This report explores the feasibility of fare-free transit in Los Angeles from four main perspectives: the history of transportation in Los Angeles; ridership aspects of fare-free transit; financial considerations; and, social, political and environmental concerns.

There are specific recommendations regarding each of these considerations and a summary of all the conclusions reached on the subject. A simulation model was used to derive a position on the effect of no fare on ridership.

It was concluded that it would not be feasible to undertake fare-free transit in Los Angeles at this time since cost alone would not significantly affect established ridership patterns. The main reason for this is that Los Angeles has become an automobile-intensive city and to alter that condition, transportation planners must first improve the convenience of mass transit service. However, the study group does recommend the lowering of fares and stresses the environmental perspective which emphasizes the need to reduce the use of automobiles in the City of Los Angeles through improved transit service.

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TITLE: THE PREFERENTIAL TREATMENT OF MULTIPLE OCCUPANCY VEHICLES IN AN URBAN TRANSPORTATION CORRIDOR

AUTHOR: University of California-Los Angeles, School of Architecture and Urban Planning

DATE: June 1973

PROJECT NO.: CA-11-0009

KEYWORDS:

- | | |
|--|-----------------------|
| 1. Private Transportation, carpools | 6. Traffic Congestion |
| 2. Traffic Analysis | 7. Highway |
| 3. Lane, reserved | 8. Bus, priorities |
| 4. Bus, busway | |
| 5. Environment and Environmental Control | |

This report is concerned with the growing traffic congestion on metropolitan highways, a situation which has become self-perpetuating. Because of increased concern for environmental quality, the trend is beginning to change with the tendency to improve existing systems in order to move more people using fewer vehicles by providing incentives which would encourage people to use higher occupancy vehicles such as buses and carpools. These incentives could be provided by giving preferential treatment to multiple capacity vehicles on highways in metropolitan areas.

Using the Hollywood/Golden State Freeway corridor in Los Angeles as an example, this report studies various preferential treatment schemes which would improve the passenger flow rate through the corridor, adding to the existing system as few physical facilities as possible.

The investigation is made along the major criteria of transportation potential, engineering feasibility, and cost, as well as several minor criteria. The final ratings are provided by a relative importance scale coupled with a performance rating of each alternative by each criterion. Two improvement schemes are recommended: (1) Multiple occupancy vehicles by-passing other traffic at metered on-ramps, and (2) Contraflow lanes on the off-peak directional roadways. The report concludes with a discussion of the arrangements, potential, and consequences of the recommended practices.

A list of references is also included.

UP-70
11-5

TITLE: EVALUATION OF BUS MAINTENANCE PROCEDURES THROUGH SYSTEMS ANALYSIS

AUTHOR: University of Colorado at Denver, Center for Urban Transportation Studies (Vasant H. Surti and Jen de Hsu)

DATE September 1973

PROJECT NO. CO-11-0001

KEYWORDS:

1. Models & Modeling
 2. Maintenance, facilities
-

Every transit property is faced with the maintenance operations of buses. Each bus that is in the garage is a loss of revenue. In order for the transit system to operate in an efficient manner, its maintenance procedures must be such that the buses receive proper maintenance and repairs with a minimum loss of time.

The main purpose of this study was to provide an analytical basis for a bus maintenance shop. The bus maintenance procedure is primarily based on the mileage of the buses and the life mileages of major parts on each bus. This procedure becomes complicated as the variety of bus types increases as well as when the number of parts taken into consideration grows. To make the formal analysis possible a generalized model was constructed. This model consisted of submodels of the inspection shop, the repair shop and a cost minimization submodel. The validity of the models was established through comparison between observed data and that produced by the model. Information made available by the Denver Metro Transit Company (DMT), which is owned and operated by the City and County of Denver, was used as the observed data base.

The model, although very simple, provides insight into the problems and complexities of a maintenance shop. If a computer simulation were applied, the model could be modified to become even more realistic.

Figures include distribution of inspection and arrival rates and one of the tables delineates the characteristics of the major parts in terms of the life mileage and removal and repair times.

References are furnished and the appendix contains the procedure for model implementation.

TITLE: WORK TRAVEL DEMANDS AND TRANSIT PLAN: A CASE STUDY OF DENVER

AUTHOR: University of Colorado at Denver, Center for Urban Transportation Studies (Valdis Zebauers and Vasant H. Surti)

DATE: September 1973

PROJECT NO.: CO-11-0001

KEYWORDS:

-
- | | |
|--------------------------|------------------|
| 1. Computer Applications | 6. Travel Demand |
| 2. Maps and Mapping | |
| 3. Planning, tools | |
| 4. Ridership, volume | |
| 5. Trip Generation | |
-

Approximately 75% of the Denver Metro Transit ridership is for work trips, most of these taking place within the CBD. However, only around 12% of the total metropolitan area employment is located within this area. The objective of this study, therefore, is to develop the main procedures and techniques to be utilized in detailed transportation planning, concentrating on providing needed transit service to centers of secondary employment.

The methodology chosen by the authors to examine this problem is as follows. Using the already established data of the Home Based Work Trip Table derived from a recent origin and destination survey, travel patterns and trip concentration to high employment zones were identified. These trip concentrations were then plotted on a series of maps. The resulting traffic zone maps each portray only a few high employment zones so that clarity of location of travel is preserved.

Although the relative merits of the Cartographatron and the Interactive Graphic Simulator were discussed as techniques, the authors opted to use the graphic tool of map overlays in doing their analysis. The existing bus network was evaluated by overlaying the route network to the trip concentration map and recording on the overlay the concentrations of trips served by route network links. This process yielded the low demand service route links. A similar overlay procedure resulted in a guide for locating new routes or altering existing ones to accommodate more work trip demand.

Comments were made about inadequacies of transportation planning methods and tools. Rather than reducing the amount and reliability of sampling, consideration should, according to the authors, be given to improving sampling techniques and perhaps reducing the amount of information to be derived to primarily trip information. The use of the 24 hours day as the basic unit of travel analysis and the frequently used estimate of peak hour travel, constituting 10% of the 24 hour period, proved inadequate in many instances. It is further suggested that the origin-destination trip tables which are utilized to serve as the intermediate step for traffic assignment could be supplanted by the use of production and attraction tables which offer more information.

According to this study, the presentation of travel demand information within a limited time frame of reference, such as peak periods, and a directional sense can serve to establish a starting point for a program of optimal transit planning.

\$4.25

TITLE: DOOR-TO-DOOR BUSPOOLS: RECOMMENDATIONS FOR PUBLIC POLICY

AUTHOR: Consortium of Universities
(T. James Truby, The American University)

DATE: November 1973

PROJECT NO.: DC-11-0003

KEYWORDS:

1. Bus, commuter
 2. Parking, park-and-ride
 3. Para-Transit
-

Buspools, based on a partnership between a group of riders and a privately-owned bus company, provide a potentially higher level of efficiency for commuter travel than traditional bus service. Pickup and discharge close to home and office eliminate the necessity of transfers. Routes and schedules may be tailored to a specific group of commuters. Overcrowding is reduced. Multiple-trip tickets diminish the demand for exact change and offer discount fares. There is personnel on-board, in addition to the driver, available to receive complaints, supervise and generally make the trip more comfortable for passengers as well as drivers. For these reasons, it is suggested in this report that buspools be given serious consideration in formulating public transportation policy relating to commuter travel.

The purpose of this report is to aid that consideration by first describing the planning, implementation, expansion, refinement and problem areas of the community initiated and operated buspools based in Columbia, Maryland, servicing Washington, D.C. and Baltimore, Maryland, and then by identifying ways in which public policy can encourage the creation of buspools.

Buspools in Reston, Virginia, Columbia, Maryland, Flint, Michigan, and Peoria and Decatur, Illinois, are compared. The overall advantages of having consumers (riders) participate in the operation of the services and of having privately-owned companies rather than public transit authorities provide the buses and drivers are indicated.

The analysis also points to the ways that public policy could encourage the consumers' attempts to develop buspools by facilitating the matching of time-origin-destination data, providing money to cover deficits in the initial period of operation and devising attractive pricing policies for the charter of public transit equipment and drivers.

Data on surveys conducted among riders, routes and scheduling, population characteristics and location maps are provided. The appendix contains WMATA's Proposed Pricing Policy for "Community-type Regular Route Transit Service." References are furnished.

TITLE: FACTORS AFFECTING CARGO LIABILITY PROBLEMS IN URBAN GOODS
MOVEMENT AND PROPOSED SOLUTIONS

AUTHOR: Consortium of Universities
(John J. Kenkel - Catholic University)

DATE May 1974

PROJECT NO..

DC-11-0003

KEYWORDS:

1. Freight Movement
-

Since so much of intercity goods transport is multimodal, there exists the problem of cargo liability, especially when loss and damage are concerned. This simply cannot be expressed totally within the urban area and totally within one mode---truck. Thus, the scope of this report focuses on the problems of cargo liability in urban goods movement where the urban portion interfaces with the intercity journey.

It is not during intercity movement that cargo is apt to be lost, damaged, stolen or delayed. Rather, most of these occurrences take place at the terminals on the city streets. With the great increase in the utilization of containers, it is difficult, if possible at all, to ascertain the mode on which such occurrences take place. For these reasons (by no means all-inclusive) the U.S. Department of Transportation (DOT) is tackling this little-publicized, yet very important problem.

The purpose of this report is to review the foundations for the problems of today's world of cargo liability and seek answers, or at least avenues of approach, to modernize the present system to meet the demands of tomorrow's transportation system.

The objectives and scope of this report are designed to: (1) synthesize past and current efforts of DOT related to this problem; (2) review present and future parameters affecting cargo liability; (3) set forth the goals to mitigate the problem; (4) review the adequacy of today's cargo liability procedures; and (5) enumerate proposed solutions.

The introduction discusses the DOT Urban Goods Movement Task Force Report and the DOT studies on "Freight Loss and Damage" and "Nature of Future Cargo Liability Systems."

A bibliography is furnished.

TITLE: FINANCING OPERATING SUBSIDIES FOR URBAN MASS TRANSIT SYSTEMS:
AN ANALYSIS OF STATE AND LOCAL TAX OPTIONS

AUTHOR: Consortium of Universities
(Anne Maurer DeBeer, George Washington University)

DATE: June 1974 PROJECT NO.: DC-11-0003

KEYWORDS:

1. Financing Mass Transportation, sources
2. Government, state
3. Government, taxation
4. Government, federal
5. Government, urban

The purpose of this report is to analyze the various taxing alternatives open to state and local governments when faced with the problem of covering the deficits of their urban mass transit systems.

The format of the study is to: first, outline the financial condition of the urban mass transit industry; secondly, present the issue of operating subsidies; thirdly, present data on the state and local governments response; fourthly, analyze state and local taxes used and not used for financing subsidies; and fifthly, provide a brief outline of the Federal role in the issue.

According to the author, the financial condition of the urban transit industry guarantees that operating deficits will continue and increase at progressive rates. The author finds that state governments rely mainly on retail sales taxes and specific excise taxes to meet operating deficits of the transit industry, while local governments rely mainly on the property taxes. By definition these taxes tend to fall primarily upon a class of persons that are supposed to benefit from an urban transit subsidy program. Alternates to the present taxing mechanisms are presented.

Conclusions and recommendations are furnished. A bibliography is included.

TITLE: LAND ACQUISITION AND CONVEYANCING BY URBAN TRANSPORTATION
AUTHORITIES: A CASE STUDY OF METRO

AUTHOR: Consortium of Universities
(Thomas Timothy Ryan, Jr., American University Law School)

DATE: May 1973

PROJECT NO.: DC-11-0003

KEYWORDS: 1. Underground Structures
2. Land, acquisition
3. Rail, systems planning and design

In recognition of the need to relieve traffic congestion and improve the physical character, economic growth and well-being of the National Capitol region, the Washington Metropolitan Area Transit Authority (WMATA) was created in 1967. On December 9, 1969, a bill authorizing Federal participation in the 98 mile regional system (METRO) was signed by the President authorizing \$1.1 billion in Federal funds to be expended over a 10 year period.

Metro will be a modern rapid rail transit system, utilizing its own exclusive right-of-way with 47 of the 98 miles and 53 of the 86 stations underground. Some 42 miles will be on the surface and 30 miles will be along existing railroad rights-of-way or in medians of highways. The remaining 8 miles will be on aerial structure, mainly grade separations and bridges.

As of September 25, 1972, a total of \$18.2 million had been committed to real estate and rights-of-way acquisition. The primary objective of this study has been to investigate the plans, programs and operations of WMATA with regard to real estate acquisitions with special emphasis placed on the preparation and conveyancing of title to WMATA. In order to accurately investigate the preparation and conveyancing practices it was necessary to work closely with the Land Title Insurance Company and attorneys with whom WMATA had contracted to do this work.

As a direct result of the investigation and analysis, guidelines which should be of assistance to other urban transportation authorities involved in the acquisition of real estate are presented.

METRO made available its contracts with land title companies and attorneys were contacted and agreed to take part in the study. Employees of these organizations kept accurate time records of all activities involving selected parcels--time study data were submitted by the participants from October '72 to March '73. Accompanying this data were comments and recommendations from the land title companies and attorneys regarding the future real estate acquisition activities of METRO.

A bibliography is included.

TITLE: SAFETY IN MASS TRANSIT: A CASE STUDY OF BUS ACCIDENTS
IN WASHINGTON, D.C.

AUTHOR: Consortium of Universities
(John W. Shanley-Catholic University)

DATE: October 1974

PROJECT NO.: DC-11-0003

KEYWORDS: 1. Safety
2. Bus

The purpose of this report was to gain a better understanding of the variables involved in transit bus accidents. It is a case study of bus accidents in Washington, D.C. The methodology entails an analysis of 1971 District of Columbia police accident reports with a bus coded as one of the vehicles involved in the accident.

To give the research perspective and facilitate the development of a research design, the future role of transit buses in urban transportation and traffic safety was analyzed and a review of relevant traffic safety research and programs was conducted.

Factors in the operating environment such as traffic congestion, intersection width, differences in vehicle maneuverability and route design were found to have an important role in the frequency and severity of transit bus accidents. Because vehicle design is significantly circumscribed by the requirements of intracity bus service, improved transit bus safety requires a reduction of safety hazards in the operating environment in addition to vehicle design innovation.

Recommendations for reducing safety hazards in the operating environment are made and an inexpensive safety program for implementing these recommendations in different metropolitan areas is proposed.

TITLE: SOME CONSIDERATIONS FOR DETERMINING DIAL-A-RIDE FEASIBILITY IN THE WASHINGTON L'ENFANT AREA

AUTHOR: Consortium of Universities
(James E. Gale, George Washington University)

DATE June 1974

PROJECT NO.: DC-11-0003

KEYWORDS: 1. Demand-Responsive Systems, dial-a-ride
2. Elderly
3. Handicapped
4. Bus, feeder

Dial-A-Ride (DAR), according to the author, is a viable transportation system for the Washington, D.C., L'Enfant area. The relatively high DAR demand density of the area (average of 50 demands per square mile per hour) suggests that DAR may be more desirable than the present taxi system and should complement existing public transportation by providing feeder service to the fixed route facilities. The completion of the first phase of the METRO subway system will reinforce the DAR feeder system concept.

The L'Enfant DAR system size can be estimated from the simulation results reported in this document. This strongly depends on what type of travel characteristics are assumed. It is believed that the travel characteristics in L'Enfant are more closely described by the many-to-several variety of DAR.

The fare in L'Enfant can be estimated between 79¢ and 87¢ using a "value of time" model at the present estimated DAR demand density. From this a rough estimate of economic feasibility is possible based on the number of vehicles and cost per trip.

Conclusions have been based primarily on cost considerations. However, the utility of a public transportation system should also consider harder-to-quantify aspects such as service to the community (relief of traffic congestion) and improvement of urban environment.

This report attempted to identify some of the needs of the L'Enfant transportation disadvantaged which could be aided by DAR implementation. It was concluded from the high demand density of the elderly and handicapped in the area that DAR is a necessary system and might be initiated to support their needs. Even assuming a low modal split for low income people, enough demand would be generated to make DAR a suitable system for mobilizing this group to suburban job opportunities.

In summary, according to the author, indications encourage the implementation of DAR in the Washington, D.C. L'Enfant area for use either as a feeder system or as a service to the disadvantaged.

TITLE: SUBSIDIZATION OF TRANSIT OPERATING COSTS: A CASE STUDY OF METRO

AUTHOR: Consortium of Universities
(Michel Marcel Sherman, Georgetown University)

DATE: May 1973

PROJECT NO..

DC-11-0003

KEYWORDS.

1. Financing Mass Transportation
 2. Budgets & Budget Planning
 3. Rail, cost
 4. Social Benefits and Costs
-

Attempts by transit properties to financially survive have usually resulted in increasing fare levels followed by a decline in patronage. This report discusses the reasons why public assistance to urban transit properties is often very necessary.

A financial analysis is made of the Washington Metropolitan Area Transit Authority's (WMATA or METRO) rail system presently under construction. By defining rail net revenue as gross rail revenue minus total rail costs (including depreciation allowances and debt retirement), it is calculated that a rail system operating deficit of over \$5 million is likely to occur in 1990. Ways to relieve deficits are identified as deficit subsidies, input (cost) subsidies, output subsidies and fare subsidies.

A formula is devised to see how the financing of such a deficit might be allocated among the three major political jurisdictions in the area: the District of Columbia, Virginia and Maryland. The proposed formula is based on service, ridership and population characteristics of each of these areas. The analysis is theoretical in nature and designed only to offer local transportation planners food for thought and tools in the case that operating deficits arise. Political problems and jurisdictional conflicts are alluded to but not discussed in detail.

In the general discussion of transit financing and pricing, the allocation of public transit costs among non-users as well as users of the service is debated. The author sees a strong argument in favor of eliciting relatively more support from non-users than is presently the norm. Justification for this is that the external economy is stimulated by mass transit to the extent that there is increased business in the central city and more employment opportunity created for those who have access to no other means of transportation.

References are furnished.

TITLE: TRANSPORTATION POLICY ALTERNATIVES AND THE SOCIOECONOMIC REACTIONS: A CASE STUDY OF THE WASHINGTON METROPOLITAN AREA
AUTHOR: Consortium of Universities (James E. Gale, The George Washington University)

DATE: August 1973

PROJECT NO.

DC-11-0003

KEYWORDS:

1. Urban Development and Planning
2. Computer Applications
3. Socio-Economic Analysis

The primary purpose of this study is to examine the effects of transportation policy alternatives on socioeconomic variables in the Washington metropolitan area. The computer simulations tool used in this report is the "EMPIRIC" Activity Allocation Model. Socioeconomic variables as defined here refer to population, employment and income quantities.

The secondary purpose of this study is to evaluate the efficiency of the EMPIRIC model in urban transportation planning. The conclusions of the sensitivity study, although specific to the Washington metropolitan area, may be applicable to other urban areas as well.

The conclusions touch upon the relative impact of transit and freeway systems on the socioeconomic variables and the feedback effect of these quantities on transportation system usage. The transit approach is found to be a better alternative than the freeway approach. In addition, the EMPIRIC model is judged on its ability to reproduce the proper mechanisms and sensitivity of urban growth with respect to transportation policy inputs.

A list of references is included.

TITLE: URBAN TRANSPORTATION ASPECTS OF THE CLEAN AIR ACT: A CASE
STUDY OF THE WASHINGTON AREA

AUTHOR: The Consortium of Universities
(Robert C. Adams, The George Washington University and Marc S.
Herlands, Georgetown University)

DATE May 1973

PROJECT NO.: DC-11-0003

KEYWORDS:

1. Air Pollution
 2. Government, intergovernmental relations
 3. Government, Federal
 4. Environment & Environmental Control
-

This report summarizes a theoretical analysis of the implementation of urban transportation controls in compliance with the Clean Air Act of 1970. It begins with a discussion of air pollution in Washington, D.C. with an analysis of the amounts and sources of such noxious elements as nitrogen oxide, photochemical oxidants, and carbon monoxide. The legal methods of alleviating this situation are discussed and include state authority, private rights of action, and possible local legislation with particular application to the District of Columbia, Virginia and Maryland. Subsequently, the interjurisdictional nature of the problem is presented with previous attempts to regulate air pollution.

Although the Clean Air Act of 1970 places primary responsibility for reducing pollution on the states, it reserves enough Federal power to intercede if a state does not comply sufficiently. Federal justifications are included in the report as are certain cases which have been tried before the courts. Possible constitutional problems are also discussed.

The second part of the study is a case study of the District of Columbia and its metropolitan area. It includes a mandate for transportation planning, history and recommendations of the Air Quality Act of 1967, and an implementation plan for transportation proposals with general considerations for a parking surcharge in the District, Virginia and Maryland, and resultant constitutional objections.

A complete list of references is included.

TITLE: FOSTERING URBAN TRANSPORTATION ACTIVITIES IN UNIVERSITIES:
RECOMMENDATIONS TO THE URBAN MASS TRANSPORTATION ADMINISTRATION

AUTHOR: George Washington University, Program of Policy Studies
in Science and Technology

DATE February 1974

PROJECT NO.:

DC-11-0004

KEYWORDS:

1. Universities
2. Research Operations
3. Government, Federal

Section II of the Urban Mass Transportation Act of 1964, as amended, provides grants to universities and colleges for the conduct of research, student fellowships, curriculum development and other activities. UMTA has been exploring the feasibility of concentrating the available support at a smaller number of institutions which would permit more extensive programs at the selected institutions. It also is searching for ways to stimulate research, training, and other activities more directly applicable to urban transportation and operations, both for UMTA's programs and for the concerns of state, regional, and local agencies involved in urban transportation.

As part of that exploration, UMTA commissioned a study team at the George Washington University (GWU) to investigate how university-based centers for urban transportation might be started or more effectively continued through UMTA support. This report is the outcome of the GWU study.

After a discussion of the scope and method of approach, findings and recommendations are put forth. Among the findings is that the UMTA grants to universities have significantly increased the amount of research produced and students trained in the field of urban transportation. It was further found that whether a university is a public or private institution has little relevance to its ability to serve as resource for a region larger than a single state, although other institutional characteristics may affect this ability.

Key recommendations are: (1) UMTA should initiate a limited number of "programs" in universities, with a higher level and greater continuity of funding than has been typical of the past; (2) a portion of the funds should be reserved for less extensive "project" type support; (3) one or more "centers" should be evolved, on an experimental basis, from the "programs"; (4) a steering committee should be created with representatives from universities, urban transportation operating and planning organizations, professional consultants, and UMTA staff, for development and assessment of the proposed new approach; and, (5) a phased transition should be made to the proposed new approach.

Appendices include "Persons and Organizations Consulted," "Characteristics of Projects, Programs, and Centers," and "Activities of Projects, Programs, and Centers." References are furnished.

TITLE: COORDINATION OF URBAN GROWTH POLICY AND FISCAL POLICY WITH
TRANSPORTATION POLICY AT THE STATE AND SUB-STATE LEVEL

AUTHOR: Florida State University
Department of Urban and Regional Planning
(James E. Frank)

DATE December 1973

PROJECT NO.

FL-11-0003

KEYWORDS:

1. Land Use
 2. Government, state
 3. Government, urban
 4. Financing Mass Transportation
 5. Urban Development and Planning
-

The central concerns of this report are: (1) the examination of two groups of policy options which recently have been suggested as mechanisms for rationalizing the control of urban development; and (2) the investigation of the possibilities for relating these policies in coordinative fashion to development-sensitive transportation policies within urban areas. The two groups of policies examined are: (1) state involvement in urban growth policy and land use controls; and (2) development-related fiscal policy. It is intended that the research explore the current status of emerging policy options in these two areas as well as examine the possibilities and implications which they embody for coordination with development-sensitive transportation policies.

In the first section of the report, the interrelationship between transportation and land use is discussed and three approaches to modeling the land use/transportation interface and the theoretical-behavioral approach are presented. The topic of State involvement in the growth policy and land use control includes discussion of the historical development of land use controls and the recent entry of states into the area of development control policy, the trend toward comprehensive revision of enabling statutes for local development control and the implications for transportation policy. Two major land use distortions resulting from local revenue systems and the trends in fiscal policy which directly and indirectly affect land use are subsumed under the topic of the trend toward development-related fiscal policy. Finally, the potential for coordination and reinforcement among transportation, land use and fiscal policies is presented.

TITLE: THE EFFECT OF INFLATION AND REAL INCOME GAINS ON CHOICE OF MODE
FOR URBAN RAPID TRANSIT INVESTMENT

AUTHOR: Florida State University, Department of Urban and Regional Planning
The Transportation Center
(Daniel R. Fredland and Alan Visintainer)

DATE: August 1973

PROJECT NO.: FL-11-0003

KEYWORDS:

1. Rail, commuter
 2. Bus, rapid transit
 3. Financing Mass Transportation
 4. Logistics
-

This report considers the differential financial effect that inflation and income can have on capital intensive and labor intensive approaches to mass transit such as rail and express bus service. It is the opinion of the authors that the effect of these factors has not been studied sufficiently.

The study employs a sixteen mile hypothetical transit corridor, servicing 30 million passengers a year, for which cost is figured for both rail and bus express service. Cost and revenue factors are inflated using a range of assumptions. Ridership and trend assumptions are also varied. Net present values of revenues minus costs (including amortization) for thirty years of operation are then estimated in cash terms and compared.

It was found, by this means, that bus operation is more sensitive to real wage increases and less sensitive to inflation and ridership levels. The financial variant for buses was considerably less than for rail which, added to the shorter time needed to institute bus service and the greater flexibility of buses, would, according to the authors, place in question the wisdom of the current trend toward rail rapid transit.

Various illustrative tables and figures are included.

TITLE: ANALYSIS OF THE PLANNING ENVIRONMENT FOR THE INTRODUCTION OF MASS TRANSPORTATION IN AN URBANIZED CORRIDOR

AUTHOR: Florida State University, Department of Urban and Regional Planning, The Transportation Center (Kozmas Balkus)

DATE: July 1972

PROJECT NO.: FL-11-0052

KEYWORDS:

1. Urban Development and Planning
 2. Land Use
 3. Environment and Environmental Control
 4. Research Operations
 5. Planning, tools
-

An analysis of the planning environment for the innovation of mass transportation services in an urbanized corridor has been performed. On the basis of information obtained by DELPHI ("The DELPHI Method: An Experimental Study of Group Opinion" The Rand Corporation, 1969) techniques, cross-impact analysis and uncertainty minimizing-cost controlled communications strategies were employed for detecting which combinations of factors would lead to the acceptance by the decision-makers of a proposed mass transportation facility. The final result of the analysis enabled the formulation of advocacy strategies for the issue, and provided the planner with information for plan preparation. From this information the planner can see how the plan is to be prepared and which aspects of the issue are to be stressed. A criterion for budgeting the advocacy of the issue has also been developed.

The author concluded from the study that the analysis of the planning environment for innovation planning proved to be fruitful. It leads to rationalized and quantified advocacy strategies with sound foundations for the institutionalization of planning and plan preparation. This analysis demonstrates the possibility for bridging the gap between comprehensive planning and the environment for which the planning is done. Although the value of the analysis of the planning environment is beyond doubt, this work is still the beginning of this type of analysis, which should be expanded as techniques are improved.

TITLE: PROMOTING OFF-PEAK HOUR BUS RIDERSHIP

AUTHOR: University of Iowa, Center for Urban Transportation Studies
(J.F. Hultquist, et al.)

DATE June 1974

PROJECT NO.: IA-11-0002

KEYWORDS: 1. Advertising and Promotion 6. Fares, reduction
2. Off-Peak Traffic
3. Bus
4. Surveys
5. Ridership, attraction

This report builds on previous promotional efforts by experimenting with a new inducement of off-peak bus ridership--- a coupon redeemable for cash. The underlying assumption was that, by tempting people who ordinarily use autos for off-peak hour trips into seeking information on the bus system and then using the bus, it could be demonstrated that the bus is a viable alternative to the auto for many off-peak hour trips.

The study took place in Cedar Rapids, Iowa, in two relatively homogeneous, middle-class neighborhoods.

Methodology included ridership counts, an on-board survey of ticket users, and recording of the questions asked by ticket users over a special telephone. A follow-up telephone survey determined the reasons why people did not utilize the tickets.

It was decided that two distinct levels of inducement, one dollar and three dollars, would be used to help detect any different effects that the level of inducement may have on utilization of the coupons. Coupons were employed in the following manner: (1) each coupon had the names of the adult members of the household on it; (2) the person must ride and have the coupon validated from 10 AM to 4 PM during a specific week; (3) the rider must pay the regular fare; and (4) the second time the coupon was presented the ticket was collected and the user received the appropriate amount of money.

Results of the study showed that no new ridership was generated and overall less than one household in eight used the coupons. The authors question whether the value of the incentive coupons was sufficient or whether non-transit users have ruled out the bus as a means of meeting their transportation needs.

Tables complement the text and a bibliography is presented.

NTIS ORDER NO.: PB 239-013/AS

\$3.75

TITLE: A PROMOTIONAL STUDY FOR PUBLIC BUS TRANSPORTATION TO IMPROVE KNOWLEDGE AND RIDERSHIP BY NON-CAPTIVE, MIDDLE-INCOME HOUSEHOLDS

AUTHOR: University of Iowa
Center for Urban Transportation Studies
(E.M. Wilson, et al.)

DATE: January 1973

PROJECT NO.: IA-11-0002

KEYWORDS: 1. Marketing 6. Ridership, attraction
2. Small Cities
3. Bus
4. Advertising and Promotion
5. Information Aids

This study involves an investigation of the information currently available and of the means and effects of supplying transportation information to middle-income households. The main objectives of the study were: (1) to determine the level of knowledge the public presently has about the city's transit systems; (2) to determine what effect a change in the level of knowledge would have on daily ridership; (3) to induce people to ride the city bus system through different promotional materials; and (4) to measure the effectiveness of the promotional materials used in this study. Cedar Rapids, Iowa, an urban region with approximately 125,000 inhabitants, is the study area.

The captive mass transportation user initiates the retrieval of public transportation information out of necessity. An assumption that can be made is that the small percentage of "choice" riders indicates that few non-captive riders make similar efforts. The purpose of this study is to determine how the limited resources of smaller cities or towns might be effectively applied to transit promotion.

The rationale of the study is that automobile oriented young families neither consider transit as a viable transportation alternative, nor are fully aware of its potential for meeting their needs. The study was initiated to investigate this general conceptualization through a design fashioned to determine the informational impact of several experimental treatments, each of which would encourage a transit trip in a differing manner. Pre- and post-treatment levels of transit related knowledge, combined with monitoring of patronage to and from the sampling area, were measured. General characteristics of the two respondent groups as obtained from home interviews are presented.

Among the conclusions are that the majority of trips from the middle-income areas are made without regard to the potentialities of the existing transit system and that information levels regarding existing public transit systems can be improved through relatively inexpensive promotional materials.

References are furnished. The appendix contains the questionnaire used in the study.

TITLE: TRANSPORTATION PLANNING: "SURVEY AND SYNTHESIS"

AUTHOR: University of Iowa, Center for Urban Transportation Studies
(Henri L. Beenhakker)

DATE: August 1972

PROJECT NO.: IA-11-0032

KEYWORDS:

1. Planning
 2. Quantitative Analysis
 3. Benefit-Cost Analysis
 4. Models and Modeling
-

This report establishes a conceptual framework for transportation planning by relating several existing bodies of knowledge and focusing on the establishment of optimal implementation times of transport facilities. The following deficiencies of some of the present bodies are discussed: neglect of important outside considerations in models which convert benefits and disbenefits of transport facilities in monetary values; introduction of bias in the transportation planning process by distinguishing between the various recipients of benefits; lack of understanding in the difference between investment planning and financial planning; and neglect of the dynamic aspect of implementing future facilities.

Suggestions are presented for the quantification of monetary impacts of transportation facilities on factors such as noise, pollution and safety. Disadvantages and advantages of subjective models as compared to casuistic models (those dealing with ethical considerations) are examined. An approach which calls for the employment of casuistic models in combination with subjective models is recommended for transportation investments requiring large capital outlays.

Dynamic programming models are discussed in reference to optimal times. New approaches are presented which consider the classification of normal, diverted and generated traffic, together with the age of a facility. Models for optimizing stage construction are also presented.

A bibliography is included.

TITLE: AN ANALYSIS OF TWO FEDERALLY-ASSISTED DEMONSTRATION PROJECTS

AUTHOR: Northwestern University, The Transportation Center
(Joseph R. Adams)

DATE August 1974

PROJECT NO.: IL-11-0005

KEYWORDS:

1. Rail, commuter
 2. Government, Federal
 3. Ridership
 4. Fares
-

This report is an analysis of two demonstration projects. Demonstration projects resulted from the passage of the Housing Act of 1961 which marked the beginning of the Federal government's role in providing funds to aid urban areas in solving their transportation problems.

One of the demonstration projects examined was undertaken by the Southeastern Pennsylvania Transportation Compact (SEPACT) from October 1962 to October 1965, and the other by the Mass Transportation Commission of the Commonwealth of Massachusetts (MTC) from December 1962 to March 1964. Both projects provided data for the purpose of predicting the effects on ridership levels of various changes in fares and frequencies.

Both projects were analyzed from regional and national viewpoints. It was determined what could be learned from these projects and what could have been done to obtain more information that might have increased their worth to both the Federal government and the local area.

It should be recognized that while other modes were included in the demonstrations, only commuter rail experiments (which comprised the largest group) were considered for the purpose of analysis in order to limit the size of the study.

Appendices contain the letter to B&M's passengers and an excerpt from the Housing Act of 1961. A selected bibliography is furnished and there is a list of those contacted for the structured interviews and telephone conversations.

TITLE: PER PASSENGER-MILE ENERGY CONSUMPTION AND COSTS FOR
SUBURBAN COMMUTER SERVICE DIESEL TRAINS

AUTHOR: University of Illinois at Chicago Circle, College of Engineering
(Edward W. Walbridge)

DATE August 1974

PROJECT NO.: IL-11-0006

KEYWORDS 1. Energy Conservation
2. Environment and Environmental Control
3. Rail, commuter
4. Propulsion Systems, diesel
5. Suburbs, business district
6. Rail, cost

The results presented in this report are based on data obtained from Chicago, Illinois's three diesel commuter railroads. Operations and equipment are described, particularly in terms of energy consumption and pollutant production.

Service characteristics, such as average occupancy, average trip distance, and energy consumption results are presented and discussed.

With energy efficiency measured in passenger-miles per Btu, it was found that trips by diesel commuter train are 3.5 times more energy efficient than Chicago Central Area auto trips. The total trip from home to suburban station, then by train to a downtown terminal, is found to be 2.2 times more energy efficient than such auto trips.

Pollutant production rates are presented for five pollutants: carbon monoxide, hydrocarbons, nitrogen oxides (NO_x as NO₂), particulates, and sulfur oxides. For every pollutant except sulfur oxides, trains were found to be less polluting per passenger-mile than autos. According to the author, per passenger-mile pollutant emissions from trains are, overall, less damaging by a factor of 5.5 than the per passenger-mile emissions from autos.

The author feels that travel on these diesel commuter trains is less costly to society than auto travel (1972 suburban-based autos), whether one compares the train trip alone to an auto trip or the home-to-suburban-station-then-by-train-to-a-downtown-terminal trip to an auto trip.

A summary is presented. The appendix describes the details, assumptions, and approximations involved in developing certain tables included in the report. References are cited.

TITLE: POLICING INTER-COMMUNITY MASS TRANSIT SYSTEMS: PROPOSED
LEGISLATION FOR CHICAGO WITH A CONSIDERATION OF OTHER CITIES

AUTHOR: University of Chicago, Dept. of Criminal Justice
(P.S. Wallace and R. M. Buren)

DATE March 1974

PROJECT NO.

IL-11-0024

KEYWORDS

1. Safety
 2. Crime & Crime Prevention
-

The purpose of this report was to present model legislation that would require inter-community mass transit systems to be responsible for the safety of their passengers while using transit facilities.

An effort was made to show why legislation is necessary and how it is a solution to the present problem of high crime and low passenger safety on selected mass transit systems. With metropolitan Chicago, Illinois as the selected example, a recent history was given (1967-1972) of the rise in transit crime there and, according to the authors, the inadequate police response.

Some explanation for the present situation in Chicago was provided through a consideration of the conflicting perspectives and pressures upon the parties involved: the passenger, the suburban police department, the Chicago Police Department, the Chicago Transit Authority. Then, the effects of the present multi-community policing were stated and explained.

Before stating the proposed legislation (with a commentary), the authors took a brief look at the policing of three other inter-community mass transit systems: Boston, Cleveland, and Toronto.

The "Proposed Act Creating A Metropolitan Transit Authority Police Department for the Metropolitan Chicago Area" has five parts: definition of terms; duties of board; police department, powers and personnel qualifications; civil service commission; and, retirement, disciplinary actions and funding.

Some of the concluding remarks include the definition of the problem as the need for effective passenger safety throughout inter-community mass transit systems. Just as every municipality is responsible for providing protection of person and property for its citizens, so also is every mass transit system - a separate municipal corporation. The authors feel that it makes no sense for the transit system to have the option of whether it will care for the safety of its citizens-passengers or not. The legislation proposed as the solution would help to create the sense among passengers of personal safety and security that could maintain and even enhance ridership.

TITLE: AN EVALUATION OF A COMPLIMENTARY PASS PACKAGE AS AN ACCEPTABLE
MARKETING TECHNIQUE FOR ATTRACTING NEW PASSENGERS TO URBAN BUS
TRANSIT LINES

AUTHOR: Purdue University, School of Civil Engineering
(James D. Brogan and Kenneth W. Heathington)

DATE May 1973

PROJECT NO.: IN-11-0001

KEYWORDS:

1. Market Research
 2. Fares, passes
 3. Ridership, attraction
 4. Advertising and Promotion
-

This study examines a complimentary pass package distribution as a marketing tool designed to attract new passengers to urban bus transit lines. It is pointed out by the authors that bus patronage has declined drastically since the end of World War Two, resulting in part from transit management's lack of marketing awareness. A complete marketing program can therefore aid the industry in determining and providing various services which would meet the diverse needs of the community.

The first part of the report examines past uses of complimentary pass packages in ridership promotion campaigns through a survey of transit operators. The second part deals with the actual complimentary pass package distribution to a random sample in a selected city. Subsequent pass utilization is determined by various market subgroups. Also conducted is an attitudinal survey of pass recipients' opinions toward various transportation issues.

It was found that complimentary passes had little effect on increasing bus ridership. The authors recommend that market research be directed toward latent demand ridership rather than being directed indiscriminately, making no attempt to insure that non-bus users receive the package.

The secondary study, concerned with subgroup attitudes toward mass transit, discovered, among other things, that while the elderly are most concerned with getting a seat, wage earners are primarily concerned with more frequent service.

It is also recommended that future complimentary pass distribution studies might be more effective if they are made in connection with new route openings or the introduction of new service.

Included in the appendices are sample questionnaires and a discussion of the psychological scaling techniques. A bibliography is also provided.

TITLE: PROCEEDINGS OF THE WORKSHOP ON MOVING WAY TRANSPORTATION SYSTEMS

AUTHOR: Northeastern University and
Transportation Systems Center

DATE: July 1974

PROJECT NO.: MA-11-0006

KEYWORDS:

1. Pedestrians
 2. Traffic Congestion
 3. People Movers
-

This report emanates from a workshop conducted by the Center for Continuing Education of Northeastern University in cooperation with UMTA and the Transportation Systems Center at the Parker House in Boston, Massachusetts on November 5-7, 1973.

Moving way transportation systems are described as constituting means for massive movement of people in cities and in such places as airports, sprawling university campuses, shopping centers, rapid transit stations and the like, where traffic congestion or considerable walking distances occur.

Principal issues affecting the development and implementation of moving way transportation systems within the United States and abroad are discussed with a view to exchanging related socio-economic and technical concepts among the workshop participants, while within the bounds set by proprietary considerations.

Engineering and economic data are presented not only to report prior state-of-the-art which goes back to the 1880's, but also to stimulate aggressive research and development activities in the private and public sectors.

Questions of need, safety, financing, public acceptance and implementation of moving way transportation systems are discussed with the development of a regard for the difficult problems that remain to be solved. Optimistic attitudes are discernable, however, in the sense that vigorous action is already underway, contemplated and projected. The need for new movement in cities, made possible by moving transportation systems, alone and through their coupling with existing rapid transit and other forms of public conveyance, is critical but promising.

TITLE: URBAN TRANSPORTATION POLICY: AN ANNOTATED BIBLIOGRAPHY

AUTHOR: University of Michigan, Transportation Institute
(Peter A. L. Stroh)

DATE November 1973

PROJECT NO.: MI-11-0001

KEYWORDS.

1. Bibliographies
 2. Planning
 3. Government. urban
-

The purpose of this bibliography is to provide a collection of material dealing exclusively with urban transportation policy. It is designed to enable policy analysts, planners, and government officials to understand how urban transportation policy is formed and how current arrangements may be altered to influence the future outcomes.

The bibliography is organized to emphasize the demands that shape policy, the institutional framework that constrains policy alternatives and how these factors shape supply strategies.

Section 100 presents overviews of urban transportation problems and prospects. Section 200 highlights literature on the demand or input side of transportation and gives the policy-maker an idea of how and why people travel in cities.

The next three sections form the major part of the bibliography and concentrate on the urban transportation decision-making process. Section 300 is essentially normative material on the art of urban transportation decision-making and management. Section 400 offers empirical studies of policy-making arrangement in the United States, focuses on the various actors involved in the policy-making process and analyzes their actions and interactions. Section 500 is a compilation of prescriptive works on the design of institutional arrangements for urban transportation.

The supply of urban transportation is emphasized in the following two sections. Section 600 considers the consequences of transportation for urban life. The nature of the service supplied is seen to have a great effect on urban form, environment and welfare. Section 700 delineates alternatives currently being introduced in urban areas to improve transportation facilities.

Section 800 presents international and comparative perspectives on urban transportation policy. Section 900 presents reference sources. A final section suggests several works dealing with topics closely related to urban transportation policy: metropolitan political fragmentation, the politics of planning, and the quality of urban life.

Each annotation in the bibliography includes the following information about the item: its purpose; contents (noting the inclusion of a bibliography where applicable); data (case studies, modeling techniques, statistical information; and legislative documentation); and conclusions.

NTIS ORDER NO.: PB 232-264/AS

TITLE: DEMAND ACTIVATED TRANSIT

AUTHOR: University of Minnesota, Center for Urban and Regional Affairs
(Francis P.D. Navin)

DATE June 1974

PROJECT NO.: MN-11-0003

KEYWORDS:

1. Ridership
 2. Demand Responsive Systems, Dial-A-Ride
 3. Modal Split
 4. Models & Modeling
-

This report focuses on the problem of estimating the ridership increase experienced when regular fixed-route and fixed-scheduled bus systems adopt a Dial-A-Bus policy. The mathematical model used to accomplish such estimation is a modal split model.

Dial-A-Bus is a bus operation which has many characteristics of a shared taxi. The patron telephones for a bus which comes to his door at a mutually accepted time and delivers the patron through to a destination while doing the same for others. At the time this study was initiated (January 1971) there were three distinct Dial-A-Bus operations: Columbia, Maryland, Bay Ridges, a suburb of Toronto, Ontario, Canada; and, Mansfield, Ohio. All three communities had conventional fixed-route and fixed-schedule bus systems prior to the introduction of Dial-A-Bus.

A combination of published data, data specific to Dial-A-Bus operations, and data collected from three surveys were used to develop a modal choice model which explained the transit ridership increases. The model development depended on an understanding of transit operations and the interaction of patrons with the system. The technique used to develop the model was a process of fitting empirical data, from diverse sources, into a relationship which was reasonable from transit operation experience and easy for a transit planner to use. The model was then tested using a stochastic demand process and the Bay Ridges study area. The test showed the applicability of the model for small area transit analysis.

The study also established relationships between attitudes held by people toward the potential service of Dial-A-Bus. Many of the Dial-A-Bus attributes were ranked relative to each other thus providing insight for the transit operation into Dial-A-Bus.

TITLE: LOW SENSITIVITY DESIGN OF OPTIMAL FEEDBACK SYSTEMS FOR
LONGITUDINAL CONTROL OF AUTOMATED TRANSIT VEHICLES

AUTHOR: University of Minnesota, Center for Urban and Regional Affairs
(Sen-Chi Yang)

DATE: July 1973

PROJECT NO.: MN-11-0003

KEYWORDS

1. Dual Mode Systems
2. Personal Rapid Transit
3. Models & Modeling
4. Quality Control
5. Rail, automatic control

Many new urban transportation systems involve the use of automatically controlled vehicles. Some new systems, such as Personal Rapid Transit (PRT) and Dual Mode, are characterized by small automated transit vehicles traveling on exclusive guideways. The number of passengers per vehicle is small and short headways are necessary for high capacity. This requires a versatile, efficient and safe control system which maintains proper spacing between vehicles on guideways without causing passenger discomfort.

The longitudinal control system is an essential part of the overall control system for automated transit vehicles. It must be capable of closely following the acceleration-deceleration profiles as commanded by wayside computers during merging, maneuvering to avoid conflicts at intersections, pushing a failing vehicle, or stopping for an emergency. This report was devoted to the design of such a longitudinal control system by using modern control technology.

A detailed mathematical model of the longitudinal motion of automated transit vehicles in an external-reference system is presented. The model is non-dimensionalized so that results are applicable to a variety of systems. Appropriate choice of state variables is discussed and the performance index is selected so as to give tight vehicle control as well as comfortable ride. Formulations of optimal design and the low sensitivity design problems are presented.

The theory of the low sensitivity state feedback design of a class of linear time-variant systems is discussed. Study of results of the longitudinal control problem in the presence of the disturbance environment and sensor errors is presented. A specific example contains details of the design of a high-capacity PRT system.

Conclusions and suggestions for future research are offered. From the results of the study, it appears to the author that optimal control theory can be usefully applied to the design of a longitudinal control system for automated transit vehicles.

TITLE: A METHODOLOGY FOR THE LOCATION OF PERSONAL RAPID TRANSIT FACILITIES

AUTHOR: University of Minnesota, Program in Urban Transportation (Gerald Olafson)

DATE: August 1973

PROJECT NO.: MN-11-0003

KEYWORDS:

1. Personal Rapid Transit
 2. Routes and Routing
 3. Models and Modeling
-

The purpose of this study is to develop a methodology which would assist planners in the design of first-cut Personal Rapid Transit networks which, given pragmatic considerations, could generate a network of lines and stations which would be worthy of a more comprehensive systems analysis.

The report points out that most previous network generation models have not demonstrated their usefulness for Personal Rapid Transit systems, which consist of small, automatically controlled vehicles utilizing their own guideway and off-line stations.

An opportunity index is defined by which the network is evaluated and compared to the present auto-street system. It consists of a modification of the standard accessibility index. The network is first developed in a general way and the rationale for the opportunity index is presented. The method is then demonstrated by designing a PRT system network for a section of Minneapolis. The study concludes with a discussion of the results and conclusions.

A bibliography is included.

TITLE: PLATOON-OPERATED STATIONS FOR QUASI-SYNCHRONOUS PERSONAL RAPID TRANSIT NETWORKS

AUTHOR: University of Minnesota, Institute of Technology (Jack L. Dais and Harold L. York)

DATE September 1973

PROJECT NO.: MN-11-0003

KEYWORDS:

1. Personal Rapid Transit
2. Dual Mode Systems
3. Rail, stations & terminals
4. Computer Applications
5. Routes and Routing

In recent years there has been an increasing amount of research and development on personal rapid transit (PRT) and dual-mode transit (DMT) systems. This report focuses on the management and simulation of captive vehicles in a PRT or DMT system.

The simulation of a station for a quasi-synchronous network is presented. Quasi-synchronous systems allow slot slipping or advancing at interchanges to avoid merge conflicts. Vehicles are dispatched from stations with the first slot that can converge without conflict at the immediate merge point. This report, then, is a computer simulation of vehicle operations in an off-line, single ramp personal rapid transit station. Previous to entering the station, the vehicles form platoons in a queue area. The vehicles are assumed to leave the station in platoons and enter another queue area to await open slots for merging onto the main line.

The primary objective of this report is to obtain numerical relationships between the abort rate, station throughput, main line loading, number of vehicle berths in the station, and number of berths in the front and rear queue areas. The independent variables of the simulation, then, are the station throughput, flow rate on the main line, number of vehicle berths in the queue areas, and number of berths in the station. The dependent variables are the abort rate and time delays in the queue area.

The major results of interest to station designers are curves relating throughput to the total number of berths in the station and queue areas. Curves corresponding to .5% and 1% abort rates are exhibited.

Tables and figures are numerous and references are furnished.

TITLE: VEHICLES SCHEDULING AND CONTROL IN PERSONAL RAPID TRANSIT SYSTEMS

AUTHOR: University of Minnesota, Program in Urban Transportation
(Harold L. York, W.L. Garrard, A.L. Kornhauser)

DATE September 1973 PROJECT NO.: MN-11-0003

KEYWORDS:

1. Personal Rapid Transit
2. Guideways
3. Computer Applications
4. Rail, automatic control
5. Schedules and Scheduling

This report consists of three separate studies which cover the various aspects of the scheduling and control of Personal Rapid Transit Vehicles.

The first study, "The Simulation of a PRT System Operating under Quasi-synchronous Control", discusses the operational strategy of such a PRT system and demonstrates the feasibility and limitations of this strategy in a very high-demand situation using a computer simulation. The purpose of the computer simulation is to model the detailed operation of a small vehicle transit network and to determine the effects of random passenger demands on system performance. It was found that by managing average line flows in the system, conflicts at interchanges could be reduced to very low values and that the significant variance in waiting time could be reduced by closed loop shuttling policies.

The second paper, "Design of Optimal Feedback Systems for Longitudinal Control of Automated Transit Vehicles", applies an optimization theory to the design of feedback control systems for high-capacity automated transit systems. Resulting controllers minimize headway and velocity errors without causing passenger discomfort. Significant dynamic response is achieved during normal mainline operation, merging and demerging, maneuvering and emergency stopping. Illustrative design charts are presented and the effects of the propulsion system dynamics are discussed. The authors conclude that optimization theory is a useful tool in the design of longitudinal control systems for automated transit systems.

The third paper, "Use of State Observers in the Optimal Feedback Control of Automated Transit Vehicles", discusses the theory of optimal control and the theory of observers as applied to the design of feedback systems for longitudinal control of vehicles in automated, high-capacity transit systems. The only measurements required by the resulting controllers concern position and velocity errors. The authors find that significant dynamic response is achieved for mainline operation, for merging and demerging from stations, for maneuvering and for emergency stopping.

Each section has a list of references.

NTIS ORDER NO.: PB 224-573

259

\$5.75

TITLE: CRASHWORTHINESS FOR HIGH-CAPACITY PERSONAL RAPID TRANSIT VEHICLES

AUTHOR: University of Minnesota, School of Mechanical and Aerospace
Engineering
(W.L. Garrard, R.J. Caudill, T.R. Rushfeldt)

DATE: October 1974 PROJECT NO.: MN-11-0037

KEYWORDS: 1. Personal Rapid Transit 6. Headways
2. Safety
3. Vehicle Design
4. Qualitative Analysis
5. Quantitative Analysis

This report is concerned with the design of crashworthy vehicles for high-capacity personal rapid transit (PRT) systems. PRT systems offer on-demand, non-stop service from origin to destination over an extensive network of exclusive guideways. Proposed high-capacity PRT systems operate at fractional second headways. The necessity for such short headway operation has resulted in concern for passenger safety in high-capacity PRT.

The primary objective of this study is the development of guidelines for the design of PRT vehicles in which the possibility of serious injury to occupants is minimized in case of a collision. Since the purpose of the study is to examine the basic trade-offs between alternative seating arrangements, passenger restraints, and shock absorbers, various design alternatives are proposed and evaluated. The evaluation is both qualitative and quantitative.

The authors conclude that even in the case of a collision with a fixed unyielding barrier, adequate passenger protection can be obtained using existing technology, provided impact velocities do not exceed 30 to 40 m.p.h.

Chapters include a qualitative discussion of crash survivability, analysis of the dynamics and kinematics of collisions, computer simulation, results and analysis of vehicular collisions and conclusions and recommendations.

References are furnished. Appendices contain a simple analysis of hydraulic shock absorbers, and description and documentation of the computer program simulating vehicle/vehicle and vehicle/fixed barrier collisions.

TITLE: DOWNTOWN CIRCULATOR SERVICE IN KANSAS CITY:
AN EVALUATION OF DIME-A-TIME

AUTHOR: University of Missouri - St. Louis , Urban Transportation Study
Group
(James F. Veatch)

DATE: February 1974

PROJECT NO.: MO-11-0001

KEYWORDS:

1. Center City
 2. Bus, minibus
 3. Fares, reduction
-

Since a number of cities have adopted or are considering adopting some kind of downtown circulator service, it is deemed useful by the author to describe and analyze a specific bus circulator service known as Dime-A-Time in Kansas City, Missouri.

Dime-A-Time, in service since July 30, 1972, serves the major retail area, the Civic center office complex and a hotel area of Kansas City. Service is every seven minutes during most of the day and the fare is 10¢. No transfers are provided in either direction between the Dime-A-Time buses and the regular bus system serving the city. Buses are distinctly painted and not usually interchanged with equipment used on regular routes.

This report describes Dime-A-Time and its history and then goes on to analyze the system by comparing operations and characteristics with similar circular services in Cleveland and Denver.

A multiple regression model is used to test several hypotheses and estimate the value of the relationships between ridership, fare policy and external conditions. The estimates obtained from the regression model make it possible to evaluate the impact of fare changes. It is shown, for example, that a somewhat higher fare would increase total revenue, although not substantially.

One of the findings of this report is that by eliminating rush hour service, as in Denver, Dime-A-Time could reduce its operating deficit. Other cities may wish to adopt alternative systems, such as the shorter hours in Denver, or provide circulator service with regular route buses. The benefits and costs of the various alternatives are discussed.

The author feels that the downtown circulator service may in fact be the most visible improvement which can be made anywhere in a transit system. Most operations engender new support by instituting new lines, lengthening old ones or reducing headways. Such changes are apt to be recognized as gains, according to the author, only by the limited number of people who actually ride the lines. In contrast, new circulator service may be perceived as an improvement by most people who work and shop downtown.

Maps, tables and notes support the text.

TITLE: SOCIAL SERVICE AGENCY TRANSPORTATION STUDY

AUTHOR: North Carolina A&T State University, The Transportation Institute
(Raphael L. Brown, Judi Lund, and Alice E. Kidder)

DATE: December 1973

PROJECT NO.: NC-11-0002

KEYWORDS: 1. Community Response
2. Elderly
3. Transportation Disadvantaged
4. Surveys
5. Handicapped

Previous studies of transportation needs of the North Carolina Piedmont Triad area indicate that low income, carless residents of the urban centers and hinterland are very dependent upon other auto drivers for mobility. Bus service accounts for no more than 30% of the trips taken by the carless residents despite a wide network of routes inside city limits. Taxis or "catching a ride" are the alternate modes upon which carless individuals have come to depend. Studies have shown that these people without access to cars have difficulties in getting to medical facilities, manpower training programs and getting children to recreational programs.

Social service agencies in Greensboro, North Carolina have identified the needs of low income residents and each agency has its own program which has attempted to solve the problem of mobility among its clients. With the cooperation of 24 agencies, surveys were conducted to answer questions related to the transportation resources currently at the disposal of these agencies. Recommendations regarding service to transportation disadvantaged clients were put forth. Hypotheses were tested. Models for alternative consolidated systems for improving transportation services of social service agencies are presented.

It was found that social service agencies in Greensboro, taken in toto, have sufficient transportation resources to meet the round-the-clock emergency needs of the low income and transportation disadvantaged. The reason that transportation needs remain unmet is that resources are scattered among the various agencies, with no one agency in a position to develop a total transportation program which would have to include telephone dispatch, vehicles, and drivers. Deficiencies mentioned are: there is no pooling of information on transportation calls made by clients; some agencies use volunteers while others use the time of paid professionals to handle driving chores; and, agencies are not aware of sources of transportation modes through commercial channels, for example, staff cannot cite bus routes and schedules or taxi fare structure to clients.

Most agencies recognize that they could reach more clientele if a better system were available. However, on the priority list of any given agency, transportation ranks fairly low.

TITLE: CRITERIA FOR PLANNING A HOME-TO-WORK PUBLIC TRANSPORTATION DEMONSTRATION PROJECT FOR LOW INCOME WORKERS: A CASE STUDY

AUTHOR: Polytechnic Institute of Brooklyn, Department of Transportation Planning and Engineering
(John C. Falcocchio, Louis J. Pagnataro, and William R. McShane)

DATE June 1972

PROJECT NO.: NY-11-0009

KEYWORDS:

- | | |
|--------------------------------------|---------------------------------|
| 1. Benefit-Cost Analysis | 5. Access, planning and control |
| 2. Transportation Disadvantaged | 6. Employment |
| 3. Inner City | |
| 4. Management, planning and analysis | |
-

This report discusses some basic criteria which should be considered when planning a home-to-work transportation demonstration project for low income areas. Particular attention is given to the concept of relating the level of investment which is required if the objectives of a demonstration project are to have at least a 0.5 probability of being detected. The results of a case study in a large urban area are discussed in detail.

This study demonstrates that transportation improvements in an area, in order to reduce unemployment, should be carefully evaluated. It was discovered that minimal improvements are not likely to succeed since they are usually associated with a high probability of no detection. According to the authors, substantial public subsidies are required in order to reduce unemployment among low-skilled workers since improvements cannot be financed through the fare box. However, these improvements appear to be economically justified because they tend to reduce the total costs of public subsidy to the unskilled worker.

Improved transportation accessibility can reduce the unemployment rate in the case study area from 19.6% to 14.7%, which still does not bring unemployment down to average levels. The worth of the unemployment accessibility model for planning purposes rests primarily on its ability to estimate a more realistic expected level of improvement, avoiding pitfalls encountered in recent demonstrations. It serves as a guide to the planner so that he might select an improvement plan which most nearly meets his objectives and will help him to eliminate proposals which would not reduce unemployment to a level which would at least cover the costs of improvement.

A list of references is included.

TITLE: MEASURING THE EFFECT OF TRANSPORTATION ACCESSIBILITY ON INNER-CITY EMPLOYMENT

AUTHOR: Polytechnic Institute of Brooklyn, Department of Transportation Planning and Engineering
(John C. Falcocchio, Louis J. Pignataro, and William R. McShane)

DATE: June 1972

PROJECT NO.: NY-11-0009

KEYWORDS:

1. Transportation Disadvantaged
 2. Inner City
 3. Employment
 4. Benefit-Cost Analysis
 5. Access, planning and control
-

This study presents some empirical evidence on the manner in which transportation service to job sites influences the employment potential of low-income workers living in the inner city. In addition, it describes an employment-accessibility model which considers the direct relationship of transportation service to employment characteristics and permits quantification of the expected benefits in unemployment reduction through a proposed improvement in transportation accessibility.

This report, according to the authors, has demonstrated the feasibility of obtaining estimates of unemployment reduction attributed to proposed accessibility improvements prior to the implementation of a demonstration program.

The implications of these findings may be of significant importance in evaluating the worth of a capital or operating expenditure for improving transportation accessibility, because they may lead to more efficient utilization of resources in the quest for "optimum" transportation improvements.

The report was originally presented at the Highway Research Board 52nd Annual Meeting, January 1973.

A list of references is included.

TITLE: THE ECONOMIC FEASIBILITY AND SOCIAL DESIRABILITY OF AN URBAN
GOODS CONSOLIDATION TERMINAL

Part 1

AUTHOR: Ohio State University, College of Administrative Sciences

(James F. Robeson and Dennis R. McDermott)

DATE: July 1974

PROJECT NO.: OH-11-0001

KEYWORDS:

1. Freight Movement
 2. Bus, stations and shelters
 3. Center city
 4. Rail, stations and terminals
-

The scope of this report includes an examination of general freight pick-up and delivery shipments ranging from one to 5000 pounds flowing into and out of the Columbus, Ohio CBD as performed by private and for-hire carriers stationed outside the CBD. Organizations that specialize in small shipment distribution were excluded from the study.

The following vehicle characteristics were examined to determine current conditions on a given business day in the Columbus CBD: (1) number and types of vehicles involved; (2) vehicle capacity utilization; (3) distance traveled and the air pollutants emitted within the CBD; (4) aggregated daily transit time, unloading and loading time, queueing time prior to loading or unloading within the CBD; and (5) the economic pick-up and delivery costs, as measured by applying hourly cost to the total vehicle time within the CBD.

The report looked at the impact that routing the measured daily demand through a consolidated terminal would have on the above vehicle characteristics. The experimental technique of simulation was used to make this determination.

The authors conclude, among other things, that the societal benefits to be derived from a consolidated urban terminal would include a significant reduction in commercial vehicle traffic within the CBD as well as significant savings in fuel consumption.

Illustrations, tables, a glossary of terms and a bibliography are furnished. A related report is "An Analysis of the Economic Costs of Constructing and Operating an Urban Goods Consolidation Terminal" (PB 239-854).

TITLE: AN ANALYSIS OF THE ECONOMIC COSTS OF CONSTRUCTING AND OPERATING
AN URBAN GOODS CONSOLIDATION TERMINAL Part II

AUTHOR: Ohio State University, College of Administrative Sciences

(James F. Robeson and Ernest R. Cadotte)

DATE: August 1974

PROJECT NO.

OH-11-0001

KEYWORDS:

1. Freight Movement
2. Center City
3. Bus, stations and shelters
4. Rail, stations and terminals

The primary purpose of this report was to estimate the cost of an urban goods small shipment consolidation terminal for Columbus, Ohio. These costs are compared against the potential economic and social benefits which could be realized by the adoption of the consolidated terminal concept for the pick-up and delivery of shipments in the Columbus CBD.

More specifically, the study deals with: (1) investment requirements for the initial structure of a consolidated urban goods terminal and its materials handling system; (2) timing and size of future investments in the terminal's structure and/or its materials handling system; and (3) the operating expenses throughout the terminal's planning horizon.

The answer to each of the above questions is dependent upon the design of the terminal. Depending upon the level of automation, alternate terminal designs require different investments in construction, materials handling equipment and manpower. Therefore, the above questions are investigated in terms of four alternate terminal designs. In order of decreasing materials handling automation, the four facility designs studied are: a tilt-slat or sorting conveyor, a towveyor with non-powered bump-off spurs, a towveyor without spurs, and a manual four wheel cart system.

Illustrations, tables and a bibliography are furnished. A related report is "The Economic Feasibility and Social Desirability of an Urban Goods Consolidation Terminal" (PB 239-853).

TITLE: DISAGGREGATE ACCESS MODE AND STATION SELECTION MODELS FOR
RAIL TRIPS

AUTHOR: University of Oklahoma, School of Civil Engineering
(Antti P. Talvitie, Peter S. Liou)

DATE September 1973

PROJECT NO.: OK-11-0016

KEYWORDS:

1. Logistics
2. Access, planning and control
3. Rail, stations and terminals
4. Modal Split
5. Models and Modeling

This study is concerned with disaggregate selection choice models developed for the access mode and for access station selections. In each of these models there are at least two alternatives from which an individual traveler is allowed to make a choice.

The mathematical model used in this study is the multi-nominal logit model based on the axiom of the "independence of irrelevant alternatives". It basically assumes that the odds of choosing one alternative over the other in a system containing both are independent of the presence of a third alternative in the system.

Two methods of approach concerning the traveler's decision making processes are used in constructing the mode and station choice models. The first is the simultaneous approach which assumes that the access mode and station choices are made at the same time. The second is the sequential approach which assumes that the individual traveler may make the access mode and station choice decisions in one of two sequences. Where the sequential assumption is adopted, the choices of the access mode and the access station are modeled separately.

The results of this study suggest that the mode choice is preceded by the station choice. Walking and bus modes are preferred to the auto, and accessibility has the greatest influence over the traveler's train station selection decision.

A bibliography is included.

TITLE: A ROUTE COST MODEL FOR BUS

AUTHOR: University of Oklahoma, School of Civil Engineering &
Environmental Sciences
(Antti Talvitie and Austin Neal)

DATE: November 1974

PROJECT NO.:

OK-11-0016

KEYWORDS:

1. Models & Modeling
2. Bus, cost
3. Routes & Routing
4. Fares, cost determination

The function of the model developed in this report is to provide transit managers and transportation planners with a more rational framework for comparison of costs of alternative plans or operating policies than is being used at present. Also, the model provides for the calculation of marginal cost fares, by route. This type of pricing, according to the authors, will insure that the transit company covers its costs at any particular level of service.

The cost model was developed to calculate total variable cost, by route, for a bus system. The model was designed to predict the total variable cost, by route, as a function of three variables: (1) vehicles; (2) vehicle-miles; and (3) operator days. The financial statements of the system under study were analyzed and the various costs allocated to the variable with which they vary.

Chapters address the background of the report, the route cost model, and the cost function. An example is given.

Given the state of supply-ride analysis in the transit industry, the authors feel that this study can be termed very successful. If for any reason the use of marginal cost pricing is unacceptable, the model still enables transit managers and transportation planners to evaluate and compare the real economic costs of alternative plans on a more rational basis than methods currently in use.

Tables, illustrations and references are provided.

TITLE: DETECTION OF TRACK GUIDED GROUND VEHICLES USING THE TRACK AS AN ELECTROMAGNETIC SURFACE WAVEGUIDE

AUTHOR: Carnegie-Mellon University
(Alastair D. McAulay)

DATE: December 1973

PROJECT NO.: PA-11-0007

KEYWORDS:

1. Communications
 2. Vehicle, monitoring
 3. Tracks & Trackage
 4. Rail
-

The importance of vehicle detection and communication in mass transportation systems is discussed in this report, together with the advantages of track guided systems and the use of automation.

Present and proposed methods of tracked vehicle detection are reviewed: fixed and moving block systems, use of crossover wires, choice of signalling frequencies and the advantages of using high frequencies and electromagnetic surface waves.

An innovative method is proposed for detecting or communicating with tracked vehicles in which the track is used as an open waveguide. The characteristics of a rail as a communication channel are determined and suggestions for analyzing other parts of the system are discussed.

A method of analyzing wavelengths of arbitrary shape and consisting of lossy materials was required. The problem of distinguishing the desired modes from non-physical spurious and other modes is discussed and the complete set of programs is listed and described.

The history, definitions and applications of electromagnetic surface waves are reviewed and the behavior of two types of surface waves are discussed in order that the results may be more easily understood.

In order to verify the above procedure, determine the limitations and gain further insight into the behavior of surface waves along structure similar to that of interest in the rail problem, relatively simple structures are considered for which some analytical results are available.

The numerical procedure was applied to a steel rail augmented by a strip of dielectric material, resting directly on the ground. The results indicate that the proposed method is technically feasible for vehicle detection. Suggestions are made for further study.

References are furnished. Tables and figures are numerous. Appendices include program listings.

TITLE: DEVELOPMENT AND APPLICATION OF RELATIVE OPPORTUNITY INDICES FOR
TRANSIT MOBILITY EVALUATION

AUTHOR: Carnegie Mellon University, Transportation Research Institute
(Robert Jay Popper)

DATE: October 1973

PROJECT NO..

PA-11-0007

KEYWORDS:

1. Benefit-Cost Analysis
 2. Computer Applications
 3. Access, planning and control
 4. Models and Modeling
-

Much confusion and controversy have been generated over the notion of "provision of mobility" through transportation policy. An analysis and classification of previous studies of transport mobility lead to the formulation of relative opportunity indices to measure transit mobility impacts. The indices are used in a comparison of relative zonal access to a set of opportunities by existing and modified transit service. As mobility indicators, they capture both the level and zonal distribution of accessibility implications for a proposed transit project.

The development of a computer model to analyze the relative opportunity distributions is discussed. Application of the model to real data for the Pittsburgh East Corridor indicates, according to the author, that the level of mobility improvement realized through a typical transit corridor project is small. Furthermore, the accessibility impacts are generally limited to those uptown and suburban zones adjacent to the right-of-way. Therefore, this quantitative evaluation of the expected accessibility/mobility impacts indicates that only low levels of actual benefit seem attainable. Implications suggest that benefit-cost ratios should not be promoted on the basis of these expected, but usually unquantified, accessibility/mobility impacts. Use of the relative opportunity indices, through the computer program, is suggested as secondary criteria for transit line evaluation.

\$6.25

NTIS ORDER NO.: PB 227-043/AS

TITLE: SIMULATION OF A PASSENGER FLOW THROUGH A RAPID TRANSIT STATION

AUTHOR: Carnegie Mellon University, Transportation Research Institute
(Robert J. Popper, Robert B. Anderson, Lester A. Hoel)

DATE: May 1973

PROJECT NO.: PA-11-0007

KEYWORDS:

1. Computer Applications
 2. Rail, stations and terminals
 3. Interfaces
 4. Models and Modeling
-

This report presents the development of a mathematical model designed to describe the flow of passengers through a rapid transit station. The model is a key element in the development of a rational approach to the design of transportation interface facilities. The movement of pedestrians is depicted as sequential flows of people across individual station components. Stochastic elements of the model design include the magnitude and distribution of passenger demand, and the modal split of arrivals. The basic processing algorithm for passenger flow is deterministic. The model incorporates the use of empirically derived functions of pedestrian flow through specific station components.

The model is designed to serve as an aid to the station designer by simulating the movement of passengers on a digital computer. Examples are provided to demonstrate the program's flexibility and its application to access mode analysis, transit scheduling, and the testing of alternative station layouts.

A user's manual and a bibliography are both included.

TITLE: CHARACTERISTICS OF TRANSIT SUPPLY IN SMALL- AND MEDIUM-SIZED CITIES

AUTHOR: Pennsylvania State University, Pennsylvania Transportation
Institute (G. John Kurgan)

DATE: April 1974-

PROJECT NO.: PA-11-0010

KEYWORDS:

1. Small Cities
 2. Ridership
 3. Routes & Routing
 4. Planning, tools
 5. Qualitative Analysis
 6. Fares, cost determination
-

The ability of a bus system to provide satisfactory service to the community has often been thwarted by the fact that current service is commonly underutilized resulting in economic loss for the operator. This study proposes to demonstrate that with a small- or medium-sized community's given hardware system this need not always be the case. Instead, by assessing the present ridership rates and route characteristics, analyses can be performed which will suggest a system that is both acceptable to passengers and economically viable to the bus operator. To verify this approach, ridership rates and route characteristics were studied and analyzed to develop planning techniques that would yield an economically sound system.

Frequency of service was used as the indicator of the relative quality or level of service. An attempt was made, therefore, to demonstrate the use of a methodological technique to aid transit operators in adjusting bus service using the financial resources available.

The specific objectives of the study were: (1) to test the service specification concept as a means for determining the economic conditions of bus transit operators; and (2) to establish a correlation between economically viable ridership rates and route characteristics. Secondary objectives include the development of ridership profiles which may prove beneficial to operators and the development of an economic scheme for use by small communities in analyzing bus transit operating strategies. Conclusions are presented.

A bibliography is furnished. Appendices include an example of the questionnaire used to obtain data and summary statistics for linear regressions performed in the development of the study analysis.

TITLE: MANAGERIAL RESOURCES AND PERSONNEL PRACTICES IN URBAN MASS
TRANSPORTATION

AUTHOR: Pennsylvania State University. Pennsylvania Transportation
and Traffic Safety Center
(Ray A. Mundy and John C. Spsychalski)

DATE: November 1973

PROJECT NO.: PA-11-0010

KEYWORDS:

1. Management, training techniques
 2. Management, operations & techniques
 3. Manpower & Personnel
-

The primary purpose of this project was to identify and evaluate policies, practices and other conditions relating to the supply of managerial personnel in the urban mass transit industry. The study, conducted during 1972-73, sought to provide information concerning each of the following: (1) an inventory of management, technical, and supervisory personnel in the industry; (2) a current profile of management and technical personnel; (3) a summary of personnel practices and training methods now being used in the industry; (4) an assessment of manpower demand and supply in the industry by administrative levels; and (5) a review of the roles which UMTA, universities and the industry could play in improving the training of personnel in the transit industry with respect to such matters as training methods, course contents, and level of support for trainees.

Questionnaires supplemented by personal interviews with transit property officials were used to obtain data. Ten Canadian and thirty-one U.S. properties were polled. The survey was designed to permit statistical inferences to be drawn for the industry as a whole.

According to the author, relatively little formal organization and planning concerning the development and utilization of human managerial resources were found to exist within the U.S. urban transit industry. Most training and development of supervisory and managerial personnel has been abandoned. Another critical factor is that the vast majority of professionally trained industry leaders will retire within the next decade. The average age of middle and supervisory management is, in many transit systems, higher than that of top management.

According to the authors, urgent action is needed to prevent the deterioration of the industry's management structure. Major training and development programs rely on: (1) a large effort to upgrade executive skills of selected individuals; and, (2) transit systems' understanding of benefits and needs of formal procedures for personnel planning, particularly along the avenues of redefinition of job specifications and implementation of more systemized means for recruiting employees.

Data are presented throughout the report. Appendixes are Transit Interview Format, Marketing Practices in Transit Industry, Transit Employee Questionnaires, Confidential Manpower Report, Study Participants, and Selected Job Descriptions within Urban Mass Transit. References are furnished.

TITLE: MARKETING URBAN MASS TRANSIT - 1973

AUTHOR: Pennsylvania State University, College of Business Administration
 (Ray A. Mundy)

DATE: January 1974

PROJECT NO.:

PA-11-0010

KEYWORDS:

1. Market Research
 2. Advertising & Promotion
-

In 1962, Dr. Lewis M. Schneider collected data on the marketing practices of 12 U.S. transit systems (Marketing Urban Mass Transit, Harvard University Press, Boston, 1965). This 1974 report is an update of the marketing progress that has been made in the 10 years since Dr. Schneider's study. Forty-one transit systems are examined in this study.

Eighteen of the 41 systems polled now have formal departments of marketing and the vast majority of marketing officers are considered members of the top management team. The decision to create or expand the marketing role in urban mass transportation has occurred more frequently in medium and a few small transit systems. Marketing expenditures are difficult to assess since transit systems can usually ascertain how much is spent for advertising but not for the other elements of a marketing strategy. It was found, however, that the average expenditure by a transit system was not different from that determined by Schneider. Most programs concentrate on only one aspect of marketing, that of promotion. Smaller transit systems appear to lead the shift from a product to a market-oriented transit industry. In terms of marketing personnel it was found that while the average age of the marketing officers was 46, there is a preponderance of youth in the medium and smaller companies.

The internal problems of urban transit marketers are: (1) problems in gaining acceptance of the marketing role and function by others; (2) line versus staff conflicts; (3) necessity of considering the urban environment; and (4) lack of a complete marketing strategy.

Transit marketers need aid in applying effective marketing strategies, which first requires changes in the image of mass transit. This necessitates a change in our present auto-oriented life style. A new "urban mobility market" will emerge along with a strategy geared toward it.

Tables and figures support the text. Appendices are "Marketing Practices in Transit Industry" questionnaire and worksheet of results of the survey. References are included.

TITLE: U.S. AND CANADIAN URBAN MASS TRANSPORTATION SYSTEMS

AUTHOR: Pennsylvania Transportation and Traffic Safety Center,
Pennsylvania State University (Ray A. Mundy)

DATE: January 1974

PROJECT NO.: PA-11-0010

KEYWORDS:

1. Management, operation & techniques
 2. Manpower & Personnel
 3. Market Research
-

The purpose of this study was to investigate U.S. and Canadian transit systems on a comparative basis. It was proposed that this investigation be confined to the study of the three conceptual variables of organizational structure and personnel profiles, personnel processes, and marketing strategies.

The basic objective of the study was to provide knowledge that would be of use in establishing and implementing policies concerning the basis or rationale for investment in the development of U.S. transit personnel and the marketing of transit services.

A major problem of those wishing to recommend investment in the development of human resources is the demonstration of tangible results. The management of Canadian public transit properties have demonstrated an ability to increase both service and patronage in the last decade. Thus, by examination of these transit systems, it may be possible to suggest what investments, if any, should be made in the human resources development of U.S. transit systems. Similar arguments could be made in managerial development and marketing strategies. If no significant differences were found, it could be suggested that public ownership per se as in Canada does not result in organizational, personnel or marketing policy differences from private transit operations, suggesting instead that operational performance differences were due largely to external environmental influences rather than internal influences.

It is the authors belief that internal development of U.S. transit personnel and their policies is the most expedient route to revitalizing public transit in U.S. cities. The quality of individuals who serve in transit's managerial, technical, and supervisory positions is a leading (if not the single-most important) determinant of the extent to which mass transit will be improved.

A bibliography is included. Among the appendices are the transit interview format, transit employee questionnaire, marketing practices in transit industry, and personnel process and marketing strategy worksheets.

\$6.25

NTIS ORDER NO.: PB 232 590

TITLE: COLLECTIVE BARGAINING AND MANPOWER IN URBAN MASS TRANSIT SYSTEMS

AUTHOR: University of Pennsylvania, Transportation Studies Center
(Darold Turner Barnum)

DATE: 1972

PROJECT NO.: PA-11-0011

KEYWORDS:

1. Industrial and Labor Relations
 2. Manpower and Personnel
 3. Management, operations and techniques
 4. Public Ownership
-

This report is an overall analysis of collective bargaining and manpower problems in the urban transit industry since the late 1930's. The effects of transfer from private to public ownership are discussed in the collective bargaining structure and productivity of the system. Also the effects and prospects of increased governmental support for the transit industry are analyzed.

Topics considered in this paper include: industrial background and research to date, relationships between industry and government, financial trends, technological changes, manpower trends and unionization, collective bargaining with emphasis on sources of organizational power, union goals, management goals and bargaining structure, a history of collective bargaining, public systems versus private systems, the impact on the collective bargaining process of the shift from private to public ownership, and the effect of public ownership on manpower including a study on productivity.

There is an extensive bibliography which includes books, court cases and laws, dissertations, government publications, magazines, newspapers, reports and speeches. There is also a glossary of terms with page references to the text.

Specific findings of the report include: out of over 1000 operating companies, the four largest systems account for almost half the total employment; public systems tend to employ more people than private systems and most of the largest systems are publicly owned including all of the rapid rail systems; most systems are monopolies in that they are limited to one metropolitan area and do not compete with other transit systems; and, fares have been rising and ridership has been declining.

Recommendations for further research are included.

TITLE: DESIGN OF OUTLYING RAPID TRANSIT STATIONS

AUTHOR: University of Pennsylvania, Transportation Studies Center
(Vukan R. Vuchic, Shinya Kakuchi)

DATE February 1973

PROJECT NO.: PA-11-0011

KEYWORDS:

1. Bus, stations and shelters
 2. Rail, stations and terminals
 3. Parking, park and ride
 4. Kiss and Ride
-

This study has three primary purposes: (1) to define a methodology for the design of outlying rapid transit stations so that designers can utilize it in actual planning and design procedures, (2) to collect and systematically present basic principles and standards of design for outlying stations; and (3) to present actual solutions for the design of the individual components of stations including the basic flow patterns, relationships of functional areas, geometric dimensions of roadways, surface transit stops, parking areas, and so on. A complete design of an outlying station is presented. The procedure of evaluation and finalization of the design is also discussed. The report presents an ideal station design and several examples of very successful designs which have been built in several cities.

Other relevant matters discussed include pedestrians, bicyclists, feeder transit, kiss-and-ride, taxis, and park-and-ride. There are numerous charts and tables and a bibliography.

\$4.25

NTIS ORDER NO.: PB 223-279

TITLE: LINEAR CITY-RAPID TRANSIT AS A DETERMINANT OF URBAN FORM

AUTHOR: University of Texas at Arlington, Department of Architecture

DATE: September 1973

PROJECT NO.: TX-11-0001

KEYWORDS:

1. Planning
 2. Land Use
 3. Urban Development and Planning
-

The purpose of this study was to forecast and describe some of the physical planning implications of implementing innovative types of public transportation in the Dallas-Fort Worth region. In this context, the authors have sought to document conclusions about some of the physical implications of the use of rapid transit to structure new forms of urban development and to depict, in words and images, impressions of the increased quality of life possible in these transit-structured communities.

The study approach consisted of developing generalized concepts for structuring new urban growth based upon transit and then particularizing these concepts by applying them to specific parts of the Dallas-Fort Worth region. The initiation of this process involved gathering an extensive inventory of physical, economic and demographic data on the geographic area chosen as the focus of the study. The spatial and temporal scopes of the project were established so that planning proposals refined data assessments of the variables of population, spatial needs and economic expectations for the area.

The organization of the report roughly parallels the phases of the investigative process. The introduction sets forth the scope of the study and describes the basic objectives and methodology. Background conditions of transportation problems in the region and an historical perspective on the interaction of physical urban and movement systems of all kinds are discussed. A summary of the goals and design objectives formulated for the linear city are presented. Strategy is delineated.

A bibliography is furnished and graphics support text material.

TITLE: AN INVESTIGATION OF THE USE OF ACCESSIBILITY IN DIRECT GENERATION MODELS

AUTHOR: Virginia Polytechnic Institute and State University
(Mark H. Kellogg and Walter J. Diewald)

DATE January 1974

PROJECT NO.: VA-11-0001

KEYWORDS:

1. Travel Demand
 2. Trip Generation
 3. Modal Split
 4. Qualitative Analysis
 5. Models & Modeling
-

Trip generation and modal split analyses use similar factors to explain and predict travel demand patterns. Therefore, it may be possible and beneficial to combine these two steps into one and determine travel demand by mode.

It was the first objective of this study, then, to determine the effect of characteristics of the transportation system on travel demand. Secondly, the feasibility of combining trip generation and modal split into one step was investigated.

Models which directly generate trips by mode were developed and calibrated using 1965 trip data for Roanoke, Virginia. Only the auto driver and bus passenger were used. The models developed were not intended to be used for prediction of future travel demand. In the models, number and mode of trips were related to socio-economic, land use, demographic, and modal accessibility measures. Accessibility measures were developed and analyzed for their importance in explaining variations in the number of trips by mode.

The direct generation models were developed using linear, least-squares multiple regression analysis, available trip data and explanatory variables, and simple measures of accessibility. These models were examined for validity, accuracy, and sensitivity to changes in accessibility. A description of the model development and a discussion of the usefulness of the models chosen are included.

The authors conclude that the significant t-values and the standardized regression coefficients indicate that measures of accessibility, in terms of service quality, are significant factors in explaining variations in trip rates stratified by mode. Trip rates using the automobile appear not only to be sensitive to the accessibility provided by the thoroughfare system, but also to be sensitive, though somewhat less, to the accessibility provided by the bus system.

References are furnished.

TITLE: ON DEVELOPING A MODEL FOR COORDINATING MULTI-MODAL
TRANSPORTATION PLANNING WITH LAND USE PLANNING

AUTHOR: Virginia Polytechnic Institute and State University (Robert A. Scholl
and John W. Dickey)

DATE: June 1973

PROJECT NO.:

VA-11-0001

KEYWORDS:

1. Computer Applications
 2. Land Use
 3. Modal Split
 4. Planning
-

This report addresses the issue of developing a model which would provide a methodological approach to multi-modal transportation planning in coordination with land-use planning. The research focuses on the task of integrating multi-modal considerations into a land-use allocation technique called TOPAZ (Technique for the Optimum Placement of Activities in Zones), a computer process originally developed for use in Melbourne, Australia to provide a workable tool to aid in sketch-plan generation and analysis.

The complications caused by the traditional focus on highway concerns have led to the following problems: (1) paving over congested urban areas with concrete; (2) diminishing the amount of taxable land; (3) diminishing the amount of open space; (4) polluting the cities in areas of high population; (5) displacing people who benefit little from highways; (6) reinforcing a favorable environment for automobiles to the detriment of public transportation systems; and (7) reducing the level of public transportation service to those with the greatest need.

In order to solve the above problems, the planning of an optimal locational arrangement of land-use involves consideration of: health and safety hazards, proximity of modes, compatibility of modes, economic feasibility concerning land values and costs, practicality from a cost-revenue point of view, and livability and general attractiveness.

The technical application of the TOPAZ program is discussed in detail. The technique is also modified and applied specifically to the city of Blacksburg, Virginia.

TITLE: QUADATT II: A TRANSPORTATION PLANNING TOOL

AUTHOR: Virginia Polytechnic Institute and State University
The Center for Urban and Regional Studies
(Mark L. Schlappi and John W. Dickey)

DATE: September 1973 PROJECT NO.: VA-11-0001

KEYWORDS:

1. Computer Applications
 2. Planning Tools
 3. Demography
 4. Models and Modeling
-

QUADATT II (Quick and Dirty Analysis Technique for Transportation - Second Version) is a computerized transportation planning model which attacks the problems stemming from the high cost of data collection and computer time and the difficulties in interpreting and translating model output by simplifying data collection and the outputs of the model.

QUADATT II requires comparably little input data which may be obtained from readily available sources such as the Census Bureau, planning agencies, and highway departments. No calibration costs are incurred since it is assumed that most of the unique characteristics of metropolitan areas have already been discovered in previous planning studies. Costs are also decreased by gauging the computer execution time in seconds rather than hours. The understanding of the user is facilitated by presenting the output in a highly documented, tabular form.

For forecasting purposes, relative indicators are provided which will be even more valuable when planners and decision-makers place more faith in computer models, and when the causal factors of the urban system are better understood.

The principal purposes of this computerized model are to restore credibility to computer-aided transportation planning models, to assist in metropolitan policy formulation, to increase understanding of the urban system, and to prepare an atmosphere for developing more sophisticated planning models.

The program content includes: path procedures; division of ridership by population, families, income, and employment; land use; trip production; and models for trip distribution and trip-interchange.

QUADATT II is applied to thirty transportation zones in the metropolitan area of Roanoke, Virginia. Five transit configurations were designed as input and the resultant impacts are evaluated. Based on the results of this application, it was determined that QUADATT II provides reasonable trends in activity distributions and transportation characteristics related to a given set of alternative transportation plans, and does so at a much reduced level of cost and time than that of typical large scale studies.

A bibliography is included.

TITLE: CRITERIA FOR BUS RAPID SYSTEMS IN URBAN CORRIDORS:
SOME EXPERIMENTS WITH AN INTERACTIVE GRAPHIC DESIGN SYSTEM

AUTHOR: University of Washington - Seattle, Urban Transportation Program
(Matthias H. Rapp and Claus D. Gehner)

DATE April 1973

PROJECT NO.: WA-11-0003

KEYWORDS:

1. Bus, design
 2. Bus, rapid transit
 3. Bus, commuter
 4. Corridors
-

The purpose of this report is to define some guidelines for the design of urban bus rapid transit systems which will serve commuter demands from a large urban corridor to a single major activity center.

An interactive graphic system, the Urban Regional Transportation Analysis System (UTRANS) is used in an experimental mode to discover general relationships between alternative sets of external conditions, bus rapid transit system designs, and their associated performance characteristics. Twenty-four cases are examined and 637 design solutions are evaluated. The data generated from these experiments are used to formulate several sets of guidelines which begin to point the way toward the formulation of a bus rapid transit system design.

Most notable of the findings, according to the authors, is the existence of an envelope curve which appears to define the limit of possible transit operations in terms of profit/deficit and patronage share within a given set of external circumstances. The shape of this curve indicates that bus rapid transit can be profitable only in cases where its share of the local demand for trip-making is quite low (less than 30%). For patronage shares in excess of this amount, deficits appear to rise sharply. Other guidelines relate to the size and location of park-ride lots, route structure, fare levels, and the general nature of the influence of typical environmental constraints on the design of a bus rapid transit system.

A list of references is included.

TITLE: LOCATING AND OPERATING BUS RAPID TRANSIT PARK-RIDE LOTS:
A SYNTHESIS OF EXPERIENCE AND SOME PRELIMINARY PLANNING GUIDELINES

AUTHOR: University of Washington - Seattle, Urban Transportation Program
(Daniel M. Gatens)

DATE August 1973

PROJECT NO.

WA-11-0003

KEYWORDS:

1. Parking, park-and-ride
 2. Bus, rapid transit
 3. Bus, commuter
-

In order to develop a strategy for estimating the demand for park-ride facilities, it may be helpful to understand the behavior and attitudes of the park-rider today. The purposes of this report are to review past experience with bus transit change-of-mode facilities and to add to the growing body of information concerning the locational aspects of these facilities while providing a foundation for general guidelines along which further detailed research might be conducted.

This report reviews and synthesizes previous experiences with locating and operating park-ride lots throughout the country. The data included represent the experience of several municipalities including: Seattle, Washington; Washington, D.C.; New Brunswick, New Jersey; Milwaukee, Wisconsin; and, the Northeast Corridor in general. Approximately 4500 park-ride spaces in 13 park-ride lots serving as change-of-mode facilities for bus transit were examined.

The characteristics of park-ride users were investigated. Data were analyzed to determine the characteristics of trip lengths and trip times as well as the trip purpose, type of employment, trip origin and mode to bus. Further considerations included mode of travel to work prior to the establishment of park-ride lots and environmental impact factors.

From the analysis of data gathered, some preliminary and general planning guidelines relevant to the location and sizing of a park-ride facilities in an urban transportation corridor were developed.

References are furnished.

TITLE: REDUCING THE TRAVEL REQUIREMENTS OF THE AMERICAN CITY: AN INVESTIGATION OF ALTERNATIVE URBAN SPATIAL STRUCTURES

AUTHOR: University of Washington - Seattle, Urban Transportation Program
(Jerry B. Schneider and Joseph R. Beck)

DATE: August 1973-5

PROJECT NO.: WA-11-0003

KEYWORDS:

1. Computer, Applications
 2. Algorithms
 3. Demography
 4. Urban Development and Planning
-

Little attention has been given to investigating the potential for gradually restructuring the city so as to reduce its built-in requirements for transportation.

This report investigates this potential by analyzing the transportation requirements of some alternative urban spatial structures. The effort here is to deal with what are perceived to be the basic causes of urban transportation problems, instead of examining only the symptoms of these problems.

A computer-directed search procedure was developed and tested using two simple urban structures. These experiments form the basis for an investigation of a larger urban structure based on the 1970 urban pattern of the western part of King County, Washington. This study has demonstrated that a simple search algorithm can be a useful tool for finding spatial structures that have desired characteristics.

The results for these investigation indicated that by moving about one-third to one-half of the people and about one-third of the jobs to other locations, very substantial reduction (50% or more) in travel requirements could be obtained while also improving overall access levels.

While structural changes of this magnitude are not feasible in the near future, many cities may be growing by this much in the next 20 to 30 years. The potential for non-transportation solutions (i.e., changes in urban spatial structure) to transportation problems appears to be a significant but neglected area for policy-oriented research investigations. What appears to be most needed at this time, according to the author, is a way of identifying those particular locations where it would be most beneficial to encourage new people and/or jobs to locate. If such locations could be identified, public programs and policies could then be oriented to encouraging growth to occur in locations where the associated transportation requirements would be minimal.

Figures and table complement the text. References are furnished.

TITLE: THE URBAN-REGION TRANSIT ANALYSIS SYSTEM (UTRANS)
Volume I: Documentation

AUTHOR: The University of Washington - Seattle, Urban Transportation
Program
(Claus Dieter Gehner and James Wilson Clark)

DATE: August 1973 PROJECT NO.: WA-11-0003

KEYWORDS:

1. Computer, programming
 2. Computer, applications
 3. Planning, tools
 4. Models and Modeling
-

The purpose of this study is to provide detailed documentation of the Urban-Region Transit Analysis System (UTRANS) and to make available to potential users of this tool a comprehensive set of guidelines and instructions for the operation of the computer model. The study is divided into two volumes aimed at two different audiences: Volume I addresses those who have a computer background and wish to adapt UTRANS to a specific application or to a different computer hardware environment; and Volume II (PB-226-237) contains a comprehensive set of instructions aimed at those with no previous experience in computer programming who still wish to have a description of the computer simulation.

Sections I through VI are in Volume I. Section I presents an overview of both reports. Section II is a brief overview of the structure, operation and capabilities of UTRANS. Section III presents a brief description of the computer hardware environment at the Urban System Research Center. General concepts of data structure and the specific features used for UTRANS are discussed in Section IV. The "Disk File Structure," introduced in Section IV, is more fully described in Section V. Section VI presents a short synopsis of the salient features of each program, an operational description and a listing of the FORTRAN code, including a flow chart of the program. Sections VII and VIII are included in Volume II.

A list of references is included.

\$9.50

NTIS ORDER NO.: PB 226-233

285

TITLE: THE URBAN-REGION TRANSIT ANALYSIS SYSTEM (UTRANS)
Volume II: User's Manual

AUTHOR: The University of Washington - Seattle, Urban Transportation
Program
(Claus Dieter Gehner)

DATE August 1973 PROJECT NO.: WA-11-0003

KEYWORDS:

1. Computer, applications
 2. Computer, programming
 3. Planning, tools
 4. Models and Modeling
-

The purpose of this study is to provide detailed documentation of the Urban-Region Transit Analysis System (UTRANS) and to make available to potential users of this tool a comprehensive set of guidelines and instructions on the operation of the computer models. The study is divided into two volumes aimed at two different audiences: Volume I (PB-226-233/AS) addresses those who have a computer background and may wish to adapt UTRANS to a specific application or to a different computer hardware environment; and Volume II presents a comprehensive set of instructions aimed at those with no previous experience in computer programming who still wish to have a description of the computer simulation.

Volume II consists of two sections; Section VII, the basic description of the computer simulation and Section VIII, which contains information on error handling. Sections I through VI are contained in Volume I.

A complete index and a list of references is contained in each Volume, but Volume I contains the complete synopsis for both volumes.

TITLE: A BENEFIT-COST ANALYSIS OF A FREEWAY SYSTEM WITH RESPECT TO AN AVERAGE REAL ESTATE PROPERTY TAXPAYER IN THE CITY OF MILWAUKEE

AUTHOR: Marquette University, Urban Transportation Program
(Thomas J. Batchelor, Kumares C. Sinha, Arun Chatterjee)

DATE October 1974

PROJECT NO.: WI-11-0002

KEYWORDS:

1. Benefit-Cost Analysis
2. Highway
3. Right-of-Way

The objective of this study was to analyze the effects of freeways with respect to property taxpayers within a municipal area. The city of Milwaukee, Wisconsin was examined.

It was found that right-of-way takings for the freeway system in Milwaukee resulted in the removal of real estate property of an assessed value of approximately \$33 million from the City's tax base. This was approximately 1.5% of the assessed valuation of all real estate property in the City in 1970.

Based on a hypothetical assumption that the burden of the lost tax dollars was passed on to other taxpayers, the increase in property tax for an average taxpayer was estimated to be \$107.56 for the period 1953 to 1970. However, a number of identifiable benefits to city residents were attributed to construction of the freeway, such as: increased traffic safety, resulting in a reduction in the number of accidents; and, savings in travel time and vehicle operating costs. Also, it was estimated that requirements for the City's capital improvement fund for the period of 1962 to 1970 were reduced by approximately \$3 million due to the construction of the freeway system as opposed to regular arterial streets. Thus, from the standpoint of the average property taxpayer the quantified benefits were nearly twice as great as the increased tax burden.

The scope of the analysis was limited to quantifiable items for which data were available. A conservative approach was taken to ensure that benefits were not overestimated.*

The authors concluded that the loss in property tax to the City of Milwaukee due to freeway right-of-way takings was amply compensated for by other benefits directly or indirectly attributable to the freeways.

*The environmental impact of the freeway on real estate development patterns and property values was not included in the analysis.

TITLE: MODE CHOICE ESTIMATION FOR SMALL AND MEDIUM SIZE URBAN AREAS
A CASE FOR BAYESIAN APPROACH

AUTHOR: Marquette University, Urban Transportation Program
(Arun Chatterjee and Kumares C. Sinha)

DATE: June 1974

PROJECT NO.: WI-11-0002

KEYWORDS:

1. Models & Modeling
 2. Mode Choice
 3. Small Cities
 4. Modal Split
-

The success of long range transit studies in small and medium sized urban areas is closely related to the quality and capability of the mode choice models that are used for predicting future transit usage. This report analyzes the traditional approach for model calibration, which relies entirely on existing data, and finds it inappropriate for developing mode choice models for the smaller cities, particularly those which are expected to change significantly in the future.

This report discusses three different approaches for the mode choice analysis for small and medium sized urban areas. The traditional approach is examined as one of the alternatives and it is concluded that it may be accepted as valid only if a significant change is not expected or desired by the community. The other extreme alternative is the radical approach that sets a desired level of transit usage and concentrates on the means of achieving the goal. The third alternative is the compromise approach, the objective of which is to evaluate the various possibilities about the future transit usage and develop a model that would reflect each possibility in proportion to its merit and/or likelihood.

Many of the recent transit studies reflect the use of the compromise approach and this report analyzes the techniques of mode choice analyses used in these studies. According to the authors, none of the existing techniques are fully satisfactory since they lack a rigorous, and yet flexible, analytical basis.

An approach based on the principles of Bayesian statistics is recommended for developing mode choice models for small and medium size urban areas. The Bayesian techniques, which explicitly recognize the uncertainty associated with an estimate, can be used to combine information from various sources and also provide the scope of continued surveillance as well as the revision of a model as new information becomes available. The application of the Bayesian approach in developing a mode choice model is demonstrated.

References are furnished.

TITLE: OPTIMAL SCHEDULING OF BUS MAINTENANCE

AUTHOR: Marquette University
(M.M. Bakr and S.L. Kretschner)

DATE: March 1974

PROJECT NO.: WI-11-0002

KEYWORDS:

1. Computer Applications
 2. Maintenance, costs
 3. Management, operation and techniques
-

Study of current practices in the management of bus maintenance reveals that preventive maintenance schedules and procedures are based initially upon previous experience, then reviewed and adjusted according to feedback regarding the cost of maintenance and the reliability of performance of a bus fleet. Maintenance management would normally institute changes in the maintenance periods and in the procedures followed in an attempt to shift the system toward a better balance between cost of maintenance and reliability of service.

The method proposed in this report takes a formal approach toward the determination of bus maintenance schedules. This approach is based upon the evolutionary process used by maintenance management. A cost function which takes into account the sum of maintenance and associated costs has been developed. The total costs consist of the cost of periodic preventive maintenance, and the cost of failures and unscheduled repairs. Costs are expressed in terms of various cost elements and probabilities of failure for different systems on the bus. A computer method is used to derive the least cost maintenance schedule.

Practical application of the proposed approach and further improvements in the computer method are suggested to develop the proposed method into a useful scheduling technique.

Appendices contain the detailed flow diagram and listings of the computer problem. References are furnished.

TITLE: AN OPTIMIZATION MODEL FOR DETERMINING HEADWAYS FOR TRANSIT ROUTES

AUTHOR: Marquette University, Urban Transportation Program
(B. P. Lingaraj, Arun Chatterjee, Kumares C. Sinha)

DATE: August 1974

PROJECT NO.: WI-11-0002

KEYWORDS:

1. Schedules and Scheduling
 2. Planning, tools
 3. Models and Modeling
 4. Headways
-

The area of transportation planning examined in this report involves the scheduling of transit service. Scheduling includes the determination of the frequency of service or headways and the assignment of vehicles and operators. This particular report concentrates on the problem of headway determination, the first step in the scheduling process.

The objective of this report is to develop a practical procedure for determining optimal headways, recognizing all of the relevant factors. Based on an optimization approach, a chance constrained programming model is developed. The scope of using vehicles of different sizes and operating costs is built into the model which attempts to minimize the total operating cost.

The uncertainty associated with demand forecasts is expressed as a chance constraint that specifies the desired level of reliability with respect to the satisfaction of demand. The model also includes a constraint related to the management policy regarding the minimum service to be provided on a transit route. The deterministic equivalent of the model is solved by linear programming. Its application is demonstrated by an example problem.

The authors conclude that the model is simple in concept, and practical, and that the procedure is applicable to both conventional bus and rapid transit systems. The input data are realistic and usually available or can be obtained without any difficulty. Although this model does not actually schedule vehicles, its results are used in developing headway tables and subsequently vehicle and operator assignments.

TITLE: THE PROBLEM OF PERSONAL SECURITY IN BUSES ALONG A TRANSIT ROUTE
IN MILWAUKEE AND ITS EFFECTS ON RIDERSHIP

AUTHOR: Marquette University, Urban Transportation Program
(Forrest P. Roemer and Kumares C. Sinha)

DATE: July 1973

PROJECT NO..

WI-11-0002

KEYWORDS:

1. Ridership, attraction
2. Community Response
3. Crime and Crime Prevention

This study investigates the relationship between the decrease in transit passengers and the effect of experiences and beliefs of riders and potential riders relative to incidents of on-bus crime and vandalism. An attempt is also made to identify a relationship between such beliefs and experiences on passenger usage as related to the socioeconomic background of the respondents.

The study procedure includes two questionnaire forms which were designed, pretested and revised prior to executing the final survey of the riders and the non-riders who lived adjacent to the route. Both questionnaires contained five questions pertaining to crime, vandalism, and personal security and eleven questions referring to transit service characteristics. Rider questionnaires were identified with their point of distribution by a number and the mail out questionnaires were identified by a number assigned to their address. Questionnaire responses were coded, data cards were punched and programs were written which tabulated answers to each question and to specific combinations of questions chosen to evaluate the impact of crime and vandalism on respondents by zones preselected on the basis of socioeconomic differences, experiences and beliefs, frequency of bus usage, age, and sex.

The investigation revealed that transit crime and vandalism have an adverse effect on passenger usage, and that the effect becomes more pronounced as the distance from the position on the route decreases relative to the central city. However, it was found that service factors such as frequency of service, fare level, convenience of route, and travel time proved to be more critical for transit usage than personal security.

A list of references and sample questionnaires are included.

\$4.25

NTIS ORDER NO.: PB 224-220

TITLE: RELIABILITY ANALYSIS OF ORIGIN-DESTINATION SURVEYS AND
DETERMINATION OF OPTIMAL SAMPLE SIZE

AUTHOR: Marquette University, Urban Transportation Program
(Arun Chatterjee, Gary G. Makowski, Kumares C. Sinha)

DATE: August 1974

PROJECT NO.: WI-11-0002

KEYWORDS:

1. Quantitative Analysis
 2. Trip Generation
 3. Travel Demand
-

This report investigated the sample size requirements for specific levels of reliability at both trip distribution and traffic assignment stages and also examined the concepts of individual and simultaneous reliability. The accuracy of the widely used travel forecasting procedure using the three steps of trip generation, trip distribution and traffic assignment is closely related to the reliability of origin-destination (O-D) data which is used to calibrate the simulation models. The reliability of O-D data, is dependent on sample size and is therefore important for transportation planning.

The sample size for O-D surveys in urban areas is usually based on guidelines recommended by the Federal Highway Administration (FHWA). According to the authors, the FHWA sample sizes, however, are not explicitly related to the reliability of either the trip interchange values, or the assigned link volumes that are the basic indices of travel demand.

The procedure for deriving an optimal sample size that was developed on the basis of the reliability at the traffic assignment stage was analyzed and found to be impractical from the standpoint of its data requirements and associated costs. Further investigations revealed that the reliability at the trip distribution stage is most appropriate for deriving an optimal sample size due to its simplicity and because the non-route specific desire lines, directly related to O-D data, are the fundamental basis of transportation planning. Alternative ways of expressing the accuracy of trip interchange values were examined and it was concluded that the error at the trip distribution stage should be expressed in terms of an absolute amount instead of on a percentage basis.

The recommended formula for optimal sample size based on the simultaneous reliability of all zone to zone trip interchange values is presented. A sensitivity analysis was performed to show the relationship of the areawide sample size with various independent variables. A comparison with the FHWA sample sizes was made. The recommended formula was considered conservative in estimating sample sizes. According to the authors, in most practical cases with a large number of traffic zones, the sample size derived with the formula would be more than adequate for the specified level of reliability.

TITLE: AN ANALYSIS OF SYSTEM TRADEOFFS TO IMPROVE ACCESS TO SPECIAL GENERATORS

AUTHOR: University of Wisconsin-Milwaukee, Department of Systems-Design
(Frederick J. Wegmann, John Ojo, Michael Kennedy)

DATE: August 1973

PROJECT NO.:

WI-11-0003

KEYWORDS:

- | | |
|---------------------------------|---------------------|
| 1. Access, planning and control | 4. Universities |
| 2. Bus, shuttle | 5. Medical Centers |
| 3. Parking, demand and capacity | 6. Airports, access |

Traffic congestion and extensive parking needs for the immediate area of special traffic generators (i.e., airports, universities, shopping centers, hospitals) create access and egress problems of major proportions. Difficulties are compounded by the fact that these generators are often located in established residential areas which preclude, by their very nature, the securing of additional land to handle increased spatial demands for parking. A review of the literature is offered to demonstrate the need for research in this area.

The objective of this study is to identify the role of alternative transportation systems in providing access to special generators. The alternatives under study include: (1) highway-oriented travel on freeways and arterial streets; (2) transit service operating within a transit service area; (3) provision of remote parking lots and express shuttle service directly to the special generator; and, (4) encouragement of car pooling.

A computerized model was developed to test alternative access systems. This model was applied to a sample special generator, an urban university, located within a hypothetical city. Traffic flows were simulated and quantitative analysis was used to determine the level of demand and service at which one alternative dominated over others. Topics discussed include alternative system configurations, preliminary tests of the alternatives, costs and benefits at peak hours, changes in value of time, off-peak hour concerns, variable generator size and institutional and operating considerations.

Results indicate that efficient, frequent and low cost service will encourage increased patronage by the model university community. To alleviate the expense of providing costly service additions to the entire regional transit system, specialized transit services might be instituted. An example of such specialized service would be the provision of express shuttle bus service directly to a generator from outlying parking lots.

Findings show that when shuttle buses operate from remote lots at a premium fare or at costs similar to base transit service, there is a decline in ridership. Furthermore, the study noted that parking demands at a generator can be controlled by the imposition of parking fees or the limitation of parking availability. Most of the economic tradeoff analysis depends on the amount of subsidy provided by the generator.

TITLE: INVESTIGATION OF TRANSPORTATION RIGHTS-OF-WAY AND THEIR DIRECTLY RELATED LAND USE

AUTHOR: University of Wisconsin - Milwaukee, School of Architecture
(Robert M. Beckley and Dale Swenson)

DATE: October 1972

PROJECT NO.

WI-11-0003

KEYWORDS:

1. Land Use
2. Right-of-Way
3. Urban Development and Planning

This study considers transportation to be a major influence in determining urban form. Although transportation has a great effect on adjacent land use, few studies have explored this relationship. Much of the growth of urban areas is reflected in changing land use patterns. To provide access and service to these urban land uses, approximately 25% to 30% of developed land is required for transportation right-of-way.

Given that little is known about the character and use of streets for anything but moving traffic, the authors are interested in developing a more comprehensive approach to analyzing public right-of-way. Their long-range objective is to pursue studies which relate to the alternative utilization of transportation right-of-ways for public transit. How can existing rights-of-way be incorporated into future mass transit planning? This report proposes a methodology for evaluating the relationship of existing rights-of-way and their adjacent land uses, so such considerations can be made.

The investigative procedure is outlined. Primary steps include attempts at classification of typical public rights-of-way by type, adjacent land uses, and special features of the urban landscape. The question initially confronted was: What makes one right-of-way different from another?

Shadow Determinance Charts (indicating the heights, in feet, of buildings, trees, poles, signs, billboards, etc., located in close proximity to where a profile is taken) are presented.

Right-of-way perspective is examined from the vista view, traffic flow, right-of-way pattern, boulevard development and speed limit aspects. Adjacent land uses in terms of parking status, lighting system, crosswalks, pedestrian traffic, curb way services, access to right-of-way, advertisement signs, curb cuts, road surface and traffic lane constraints are discussed. A land use map and a zoning map are included, as well as traffic flow constraints.

The authors conclude that a systematic method of collecting and comparing data can be useful in defining the type and character of a right-of-way. Furthermore, a great array of techniques will need to be developed to incorporate mass transit facilities into existing public rights-of-way. Therefore, the methodology proposed here is best used as a tool to develop guidelines for specific situations.

TITLE: QUANTIFICATION OF COMFORT AND CONVENIENCE FACTORS FOR BEHAVIORAL
MODE-CHOICE MODELS

AUTHOR: University of Wisconsin - Milwaukee, Department of Systems-Design
(Theron D. Aslaksen)

DATE: May 1973

PROJECT NO.: WI-11-0003

KEYWORDS:

1. Models & Modeling
2. Modal Split
3. Qualitative Analysis
4. Quantitative Analysis
5. Socio-Economic Analysis

One of the primary obstacles to the development of behavioral models of mode-choice is the definition of relevant parameters for the models. Recent research has identified reliability, comfort, convenience, time and cost as the most important factors in choice of transportation modes. Two problems have been encountered with the use of comfort and convenience factors: the definition of these qualitative variables in quantifiable terms; and whether to use real, measured values of the variables, or users' perceptions of the variables in the behavioral models.

In this study, the comfort and convenience factors were defined by sets of modal attributes based on previous research. A self-administered, mail-back questionnaire was developed to gather data necessary to test the factor definitions in a recently developed behavioral mode split model and to examine relationships between traveler's attitudes toward modes, their perceptions of modal attributes and actual travel behavior. A small, carefully defined sample was selected to develop a body of data from a homogeneous group of people making similar work-trips by two competing modes of transportation.

The comparison of socio-economic characteristics of the sample populations with those of the city population showed that the desired population had been sampled. Analysis of the relationships between attitudes, perceptions, and behavior showed that travelers with favorable attitudes toward a particular mode of transportation were more likely to have unrealistically favorable perceptions of the characteristics of that mode than were those who had unfavorable attitudes toward the mode; thus indicating a need to account for travelers' attitudes in models attempting to simulate actual mode-choice behavior. The use of the definitions in an experimental behavioral model indicated that the definitions were able to quantify comfort and convenience factors for such models.

The development of the measurement device to record the attitudes and perceptions of travelers provided a tool which would be valuable as a guide for transit marketing efforts. The ability to measure qualitative factors such as travelers' perceptions of modal convenience and the theory of the mode-choice decision process as a form of learning behavior could open the door to the development of potentially more powerful models of mode-choice which actually simulate individual decision behavior.

TITLE: A STUDY OF ALTERNATIVE MEANS OF FINANCING FUTURE TRANSPORT NEEDS
OF THE MILWAUKEE URBAN AREA

AUTHOR: University of Wisconsin at Milwaukee, Department of Economics
(Thomas Tucker and Eric Schenker)

DATE: November 1973

PROJECT NO.: WI-11-0003

KEYWORDS:

1. Financing Mass Transportation, sources
2. Modal Split
3. Governmental, intergovernmental relations

The fragmentation of jurisdiction over the transportation system among various political units has served to impede the development of an efficient transport network. Contributing to this situation has been the lack of any single revenue source or set of sources that could be utilized to achieve such efficiency. Complicating the situation further is the desire on the part of many public officials to utilize the pricing mechanism in transportation to effect income transfers to certain segments of the population. This report examines and evaluates alternative sources of revenue that will answer these needs for the Milwaukee urban area.

Revenue sources are considered on the basis of whether their origin is Federal, state or local. Revenue sources are evaluated on the basis of four criteria: how much revenue is provided by the source; how well the source encourages people to conserve transportation resources; how equitably the source allocates burdens; and, the extent to which the source provides demand signals for the adjustment of the scale of the transport system.

The study concludes that:

- 1) At the Federal level, the most effective source of revenue is the funding provision of the Urban Mass Transportation Act.
- 2) At the state level, the two most effective revenue sources are increases in the excise tax on gasoline, and increases in vehicle registration fees.
- 3) At the local level, the two most effective sources of revenue are a surcharge on all-day parking and an ad valorem tax on automobiles registered in the Milwaukee urban area.

\$4.25

TITLE: TRANSPORTATION SYSTEMS: NOISE GENERATION AND ABATEMENT

AUTHOR: University of Wisconsin - Milwaukee
(Frank B. Hartl)

DATE: February 1974

PROJECT NO.: WI-11-0003

KEYWORDS:

1. Noise & Noise Control
 2. Environment & Environmental Control
 3. Vibrations
-

This report deals with the amount and intensity of transportation systems noise generation along with efforts used to lessen the impact of noise. An introductory discussion of the physics of noise and noise measurement is given to help the reader in understanding how the noise impact is analyzed.

Transportation planners and designers must be aware of the noise assault any proposed system will have on the environment. The mandate for this stems from the National Environmental Policy Act of 1969 and the Federal-Aid Highway Act of 1970; the first requires an assessment of all Federally funded projects to determine any adverse impacts they may have on the environment and the second, aimed at highways that are Federally funded, requires noise assessment of any proposed road that has not received approval before July 1, 1972.

This report covers three major topics. The first section deals with a general overview of the physical phenomena associated with noise as sound energy, the physiological effects of noise. The second deals with the psychological effects of noise.

The third topic considers various major transportation systems (with a primary emphasis given to highway networks) and the noise they generate. Also considered are methods that can be used to abate transportation generated noise.

Among the various noise sources discussed are noise from rubber tire vehicles, traffic noise, noise and vibration in rail transportation, and aircraft noise and sonic boom.

Conclusions are presented and references are furnished. Appendices include: "Federal Highway Administration Policy and Procedures Memorandum 90-2"; "Federal Department of Housing & Urban Development Departmental Policy: Noise Abatement and Control"; and, "FHWA Computer Simulation."

NTIS ORDER NO.: PB 236-681/AS

\$5.75

TITLE: THE URBAN TAXICAB IN WISCONSIN: AN INVENTORY AND EXAMINATION OF REGULATORY POLICIES

AUTHOR: University of Wisconsin - Milwaukee Program in Urban Transportation
(John A. Zachar and Edward A. Beimborn)

DATE February 1974

PROJECT NO..

WI-11-0003

KEYWORDS:

1. Private Transportation, taxicabs
 2. Para-Transit
 3. Demand Responsive Systems
-

The purpose of this research report is to provide information on the taxicab as a form of urban public transportation in Wisconsin. The first objective of this study was to perform an inventory of the taxicab operations in Wisconsin. This inventory included an identification of all taxicab operations in cities over 7000 population and a survey of their mode of operation, fare structures, and regulatory conditions. The second objective was to examine questions of regulatory policy with an emphasis on market entry restrictions; and, the third objective was to examine subsidies and promotion as they might be used in the taxicab industry.

The results of the survey indicated that the taxicab is an important and economically viable means of urban transportation in the state. This is especially true in some of the smaller cities where the taxi provides the only form of public transportation. The study found that the average taxicab operation has been in business for over 25 years and operates at a profit. The most common fare system is a zone fare system with costs of licenses and fees varying widely.

The results of the examination of regulatory policies indicate a need for regulations on vehicle safety and reliability, driver ability, and owner's responsibility. Other regulations such as market entry and multiple pickup restrictions were felt to be generally unwarranted. Some suggestions for innovative regulations are given. The report further recommends inclusion of taxicabs in legislation relative to urban mass transit including granting waivers to fuel taxis. Finally a system of maintaining a statewide inventory of taxicab service is suggested.

References are included. Appendices are "Waukesha Taxicab Ordinance" and "Wisconsin Department of Transportation Bus Data."

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