U.S. Department of Transportation
Office of the Secretary of Transportation

Transportation Needs and Programs Summary

Sixth Edition

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January 1985

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Transportation Needs and Programs Summary

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Sixth Edition
January 1985

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Prepared for
Technology Sharing Program
Office of the Secretary of Transportation
Washington, D.C. 20590

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Contents

Introduction

For a number of years, the U.S. Department of Transportation has had an ongoing program of technology sharing, the process by which research, information, and experience on solutions to problems faced by State and local governments are made available to these jurisdictions. This broadly defined activity includes consulting with State and local governments on their transportation needs and problems, involving them in formulating and conducting research, and developing mechanisms to communicate research products in a useful form.

This *Transportation Needs and Programs Summary* represents an important element of this process, specifically, the identification of transportation needs as seen by major urban areas throughout the country. It is the sixth report on local government transportation needs and solutions to be prepared as part of the ongoing process to respond to major urban area concerns. Its purpose is to—

- Describe the process for evaluating needs and solutions for major urban areas
- Set forth the criteria for evaluating the higher priority needs and solutions
- Provide a concise summary of the needs and solutions
- Provide an information exchange on the needs and solutions, including solution types, contact information, and references
- Provide an organizing framework for classifying transportation information related to urban areas

This document provides a range of potential solutions, as well as issues that should be considered in implementing solutions. It also presents information on solution considerations, examples of related programs, information on persons familiar with the issues and potential solutions, and selected references. It also considers a broader range of communities than was included in earlier editions, to be of greater value than earlier versions to medium- and small-sized jurisdictions.

The material is intended for use in a number of ways. It provides information to the Federal level on needs as seen by the major urban areas, which can be used in guiding research decisions and from which further activity or development of more detailed solution considerations by the Federal level may result. It also provides information that is immediately useful to the major urban areas by identifying potential solutions and contacts who can provide information and advice on specific problem areas. Although developed from the perspective of major urban areas, the material is useful to jurisdictions of any size that may be concerned with the same problems or needs.

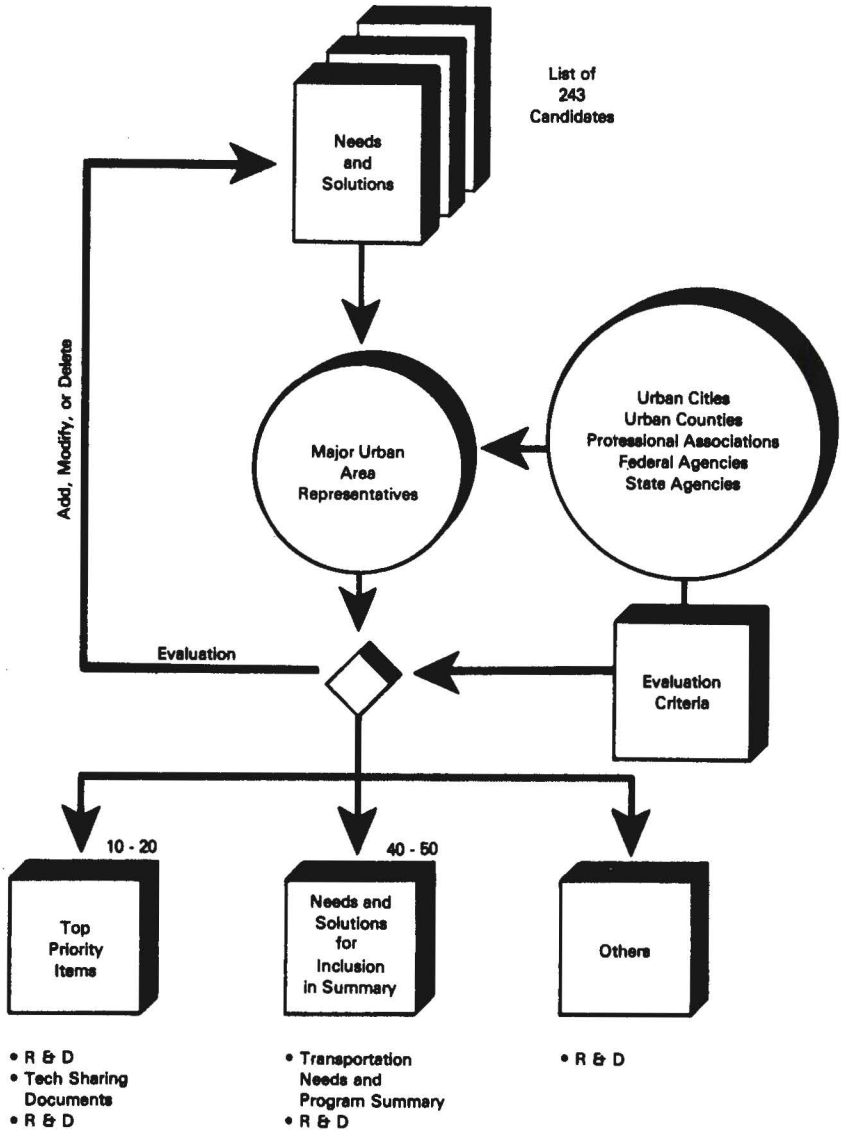
The report is organized in two parts. Part 1 presents the process used to identify and evaluate candidate needs topics, lists the 45 needs topics selected by this process, describes the format of the needs statements, and presents recommendations for further action. Part 2 presents the needs and solutions statements themselves.

Working with major urban area representatives, the U.S. Department of Transportation will update this document periodically. Questions or comments regarding this edition or suggestions for programs to be included in future editions should be directed to Al Linhares, Technology Sharing Program (I-30), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590.

Part 1
The Program

The Process

The figure below presents an overview of the process used in preparing and evaluating the needs and solutions and in determining those which are identified as priority items.



The basic list of candidate needs topics was selected from the most recent—1980 and 1982—Transportation Needs and Programs Summary documents. This list was then augmented by additional candidate topics identified by a review of current literature and state-of-the-art reports relevant to urban area transportation problems. Major urban area representatives and professional associations were contacted for additional topics.

A preliminary list of 243 candidate topics was subsequently developed, and each topic was placed in one of six categories:

- Transportation program management (100)*
- Transportation systems management (200)
- Streets and highways (300)
- Transit (400)
- Airports (500)
- Ports (600)

*Category series number

Appendix A lists these 243 candidate topics by category.

These categories, which form the classification scheme for this project, conform to similar classification schemes in the literature for urban transportation. This classification scheme is used instead of sequential page numbers for reference, order, and ease of updating the needs statements.

The next step was to reduce the list of topics to a manageable level and to ascertain the topic areas with the highest priority. To establish these, the 243 candidate topics were given a preliminary ranking according to the following criteria:

- Commonality — the extent to which a need exists in many jurisdictions
- Magnitude — the importance, scope, and urgency of the need
- Community Impact — the extent to which solutions to the need will affect the citizens and community as a whole
- Financial Impact — the monetary effect (costs, savings, and revenues) that a solution to the need will have on a city or county

A ranking matrix was employed, using a scale of 1-5 (with 5 being the highest), equally weighted for each criterion. All the items were ranked in this manner on an iterative basis. The 90 highest ranked items were then arrayed within each classification category. These interim results were also reviewed with the contributors, and a final list of 45 priority topics was developed. Although this list should by no means be considered a complete identification of research and development needs and solutions, it is hoped that an appropriate selection of local concerns appears.

Needs and solutions statements were then developed for each of the 45 highest priority topics. The statements present a problem statement, possible solutions, and solution considerations for each need. The problem statement provides a specific definition of the need; the possible solutions and solution considerations reflect suggestions from contributors or the literature.

Needs Statement Format

Needs and Solution Statement	
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Problem Statement	A brief statement of the need, supported by additional explanation of the issues, where appropriate.
Possible Solutions	A listing or brief description of relevant solutions that have been implemented or researched, or that are needed for further understanding of the problem.
Solution Considerations	A brief discussion of relevant issues, such as political, social, and economic constraints on implementation; specific requirements; and benefits to be gained.
Federal Programs	A listing of relevant programs or research sponsored by Federal governmental agencies with appropriate contacts, including address and telephone number.
State and Local Programs	Brief descriptions of actual solutions or ongoing research that have been implemented in the field by State, local, or private agencies, with appropriate contacts.
Applicable References	Selected current references.

The needs and solutions statements in Part 2 of this document follow the format shown above. They are designed to present a concise overview of the subject and are intentionally brief to highlight the key points and introduce the broad range of concepts. Neither the selected topics nor the examples are intended to be exhaustive or to demonstrate the entire state of the art. The examples have been selected to illustrate the potential solutions noted, and provide guidance and relevant information to the user.

Recommendations

Several of the topics were found to stimulate strong interest among the contributors or to exhibit a high priority for information dissemination. These should be considered to receive further study.

First among them is *Construction Work Zone Safety*. The Department of Transportation is currently sponsoring further detailed work on the topic.

Listed below are other topics recommended for further study:

- 100 Transportation Program Management
  - 110.2 Coordination of Parking with Transit and Ridesharing
  - 110.3 Transportation Program Marketing
  - 140 Project Prioritization and Integration
- 200 Transportation Systems Management
  - 220 Urban Revitalization
  - 231.3 Parking Enforcement
  - 241.4 Neighborhood Traffic Control
- 300 Streets and Highways
  - 310.1 Budget Development for Streets and Traffic Control
  - 310.2 Human Resource Allocation and Personnel Development
  - 320.1 Flexible Highway Design Standards for Urban Situations
  - 320.1 Improved Railroad Crossings
  - 330 Pavement Management Systems
  - 350.1 Monitoring Traffic Flow Characteristics
  - 360 Construction Work Zone Safety
- 400 Transit
  - 410.1 Financing Transit Operating Costs
  - 410.4 Transit System Productivity
  - 430.1 Bus Rehabilitation
  - 430.4 Ridesharing Programs for Commuters
- 600 Ports
  - 630 Landside Access to Port Facilities

Contributors

This report was prepared by Bellomo-McGee, Inc. (BMI), in association with Marcom Associates, Inc. (Marcom). A number of U.S. Department of Transportation agencies contributed, including the Office of the Secretary of Transportation, the Federal Highway Administration, the Urban Mass Transportation Administration, the Federal Aviation Administration, and the Maritime Administration. Other contributors included the U.S. Department of Housing and Urban Development, the American Public Works Association, the American Society of Civil Engineers, the Institute of Transportation Engineers, and the major urban area representatives. In particular, the assistance received from agencies in numerous State and local governments has been very helpful, and many local and State government staff members are listed in the contact information.

The following is a list of the major urban area representatives and others who provided review, comment, and ideas during preparation of this document:

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*Major urban area
representatives

Part 2
Needs and Solutions

Transportation Program Management

100

*Priority topics

Successful Use of Minority Business

Problem Statement

Useful information is typically not available on minority businesses in different technical and services areas.

Many government contracts require the involvement of minority-owned businesses. Some local goverment officials are concerned that there are not enough qualified minority businesses to provide the spectrum of services needed in their areas.

Possible Solutions

Identify local jurisdictions that have been successful in working with minority businesses and pattern programs after the successes.

Encourage qualified minority businesses to progress into new enterprise areas.

Solution Considerations

Jurisdictions that have succeeded in working with minority businesses should be examined along with the methods they have employed. Ways should be identified for Federal, state, or local governments to utilize existing resources to identify minority business firms more effectively.

Federal Programs

The Surface Transportation Assistance Act of 1982 provides that not less than 10 percent of the amounts authorized to be appropriated under the Act shall be expended with small business concerns owned and controlled by socially and economically disadvantaged individuals. The full regulation can be found in *Federal Register*, Vol. 48, No. 141, July 21, 1983.

The U.S. Department of Transportation sponsors Program Management Centers (PMCs) that serve as representatives of the Office of Small and Disadvantaged Business Utilization at the regional and local levels to enable minority and women-owned businesses to participate in DOT-funded financial assistance and grant programs. The PMCs identify minority and women-owned businesses interested in performing transportation-related projects, provide ***information*** on potential sources for obtaining procurement opportunities, PMCs provide ***technical assistance*** when such services are not available, and assist in developing business executive summaries for submittal to DOT-funded Minority Enterprise Small Business Investment companies. PMCs are located in Boston, New York, Philadelphia, Washington, D.C., Miami, Atlanta, Dallas, Kansas City, Denver, Arizona, Los Angeles, and Seattle.

Contact: Armando Mena, Director, Office of Small and Disadvantaged Business Utilization, OST (S-40), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-1930.

State Programs

The **Maryland Department of Transportation** developed the first model minority business program in the country with a grant from the Federal government in 1976. Since 1976, the State has been a national leader in utilizing minority business enterprises.

Contact: James A. Hester, Chief, Equal Employment Opportunity Section, State Highway Administration, Room 409, 704 N. Calvert Street, Baltimore, MD, 21202, (301) 659-1505.

Local Programs

The Southeastern Michigan Transportation Authority has recently updated their Disadvantaged and Women's Business Enterprise Plans to bring them into compliance with the Surface Transportation Act of 1982. The major plan changes revolve around better identification methods. As a continuing effort to assure minority business participation, SEMTA requires a 20 percent minority involvement and a 2 percent involvement of women on all contracts unless a specific waiver is granted. Contractors are required to provide evidence with their bid submission of MBE and WBE involvement and identifying who is participating, their field of endeavor, and the cost amount of the effort. The successful prime bidder and the MBE subcontractor both sign documents attesting to the MBE participation in the contract effort. SEMTA then monitors the effort over the life of the contract. SEMTA maintains a register of MBE and WBE businesses.

Contact: Gail Ross, Manager, Contract Compliance Office of Minority Development, SEMTA, 660 Woodward Avenue, Detroit, MI 48226, (313) 256-8722.

The **Metropolitan Transportation Authority of New York** has recently increased their current goals to 15 percent for participation of disadvantaged business enterprises and to 9 percent for participation of women business enterprises. Compliance Program paticipants meet periodically to discuss the total program and ramifications of any changes.

Contact: Gwendolyn Colbert-Kushner, Director, Contract Compliance Programs, Metropolitan Transportation Authority, 347 Madison Avenue, New York, NY 10017, (212) 878-7000.

Applicable References

The following are available from Office of Small and Disadvantaged Business Utilization (S-40), Office of the Secretary, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590:

Contracting with the United States Department of Transportation (Revised 1-84).

A Guide to Highway and Transit Contract Opportunities for Minority and Other Disadvantaged Business Enterprises (1984).

Traffic Incident Management

Problem Statement

Plans are needed to deal effectively with traffic emergencies.

In many metropolitan areas, when a major emergency occurs, there is no preconceived plan to unblock traffic and divert it to alternate facilities. As a result, time and energy are wasted, public officials are criticized, and additional incidents can occur. Such incidents are occurring more frequently in some areas, requiring more attention to preventing traffic disruption.

Possible Solutions

Develop preplanning concepts, including route diversion schemes, that are tailored to each metropolitan area.

Encourage cooperation between affected agencies, such as police, fire, and public works, in planning and executing the traffic diversion schemes.

Establish alternate routes for major facilities.

Solution Considerations

Traffic movement can be affected by incidents that occur on the highways, as well as by other emergency events such as fires, major storms, and water main breaks. It is important to recognize the need to maintain traffic movement while handling the incident. In many instances, authorities are reluctant to remove disabled vehicles because of potential liability issues.

Federal Programs

The **Federal Highway Administration** is actively encouraging preplanning for traffic disruption and is preparing a film entitled, "Traffic Management for Freeway Incidents." The film may also be used in a future FHWA training course on traffic incident management.

Contact: Samuel C. Tignor, Chief, Traffic Control and Operations Division, (HSR-30) Federal Highway Administration, Room T-210, Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, VA 22101, (703) 285-2031.

The 16mm film (15.5 minutes in length) may be obtained without charge, on a loan basis for 15 working days, from Knox Adams, Federal Highway Administration (HRD-11), Room 300A, 6300 Georgetown Pike, McLean, VA 22101, (703) 285-2144.

Incident management is also included in the FHWA training course on *Freeway Traffic Management* (No. 13327). The course is available to State or local governments on a request basis.

Contact: James Robinson, Office of Traffic Operations, Traffic Engineering Programs (HTO-34), Federal Highway Administration, 400 7th Street, S.W., Washington, DC 20590, (202)426-0323.

State Programs

The **California Department of Transportation (CALTRANS)** established a preplanning incident route diversion concept in response to citizen complaints about traffic disruptions on the extensive Los Angeles freeway system. A freeway incident management team consisting of several agencies was formed. When freeway traffic becomes blocked, alternate preplanned routes are designated by signs upstream of the incident to divert traffic onto local streets. Traffic is managed from a command post at the incident site.

Contact: David H. Roper, Deputy District Director, or Robert F. Zimowski, Senior Engineer, California Department of Transportation, 120 South Spring Street, Los Angeles, CA 90012, (213) 620-3654.

Local Programs

The Transportation Research Board held a Freeway Incident Management Workshop on January 13, 1985, in Washington, DC.

Contact: David K. Witheford, Transportation Research Board, 2101 Constitution Avenue, N.W., Washington, DC 20418, (202) 334-2963.

Coordination of Parking with Transit and Ridesharing

Problem Statement

Parking policies in urban areas frequently are at odds with transit and ridesharing policies when they should be complementary.

The coordination of parking and transit can enhance transit utilization and reduce congestion on city streets, thus improving the overall transportation system. In many areas, however, this is not viewed as a systemwide program, and a better understanding of the potential benefits is needed. In addition to public policy and Transportation Systems Management (TSM) actions, incentives should be offered to the private sector to encourage transit and ridesharing.

Possible Solutions

Provide public fringe park-and-ride lots with bus stops; designate use of private parking lots (shared use); encourage carpool staging areas; provide preferential spaces for carpools and vanpools; substitute remote (off-site) parking facilities for CBD spaces; provide bicycle parking facilities; eliminate or reduce parking subsidies; establish a model parking code; and establish pricing policies, such as peak-hour surcharges, to make downtown parking more available to short-term parkers.

Solution Considerations

Other indirect methods may also be used, such as transit subsidies or transit passes. Of course, all of the solutions must be directly coordinated with transit and carpool/vanpool opportunities. Express or shuttle buses are most effective at remote lots, but local bus service can also be used effectively. The coordination concept may cause some inconvenience to users because of increased distances traveled, increased travel time, change of mode in inclement weather, and possible vandalism to automobiles. The TSM and parking solutions are complex and must be tailored to the needs of each community. TSM and parking policies should be consistent to provide the same goal of reduced auto usage.

Federal Programs

The **Federal Highway Administration** and the **Urban Mass Transportation Administration** provide funds for fringe and corridor parking facilities outside the CBD. In addition, the U.S. Department of Transportation sponsors research and demonstration programs.

Contact: Wayne Berman, Office of Highway Planning, Federal Highway Administration (HHP-24), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0210.

Bert Arrillaga, Urban Mass Transportation Administration (URT-31), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4984.

State Programs

The **Connecticut Department of Transportation** established a commuter lot program in 1970, and presently operates 201 lots ranging in size from 15 to 102 spaces. They are located at appropriate interchanges along expressways and state highways. New commuter lots are included in projects to realign or increase the capacity of highways. The lots are used for carpool/vanpool staging and for express bus pick-up in certain locations. ConnDot has also established extensive carpool and vanpool programs, including a ridesharing brokerage system.

Contact: Raymond Mascetti or Charles Barone, Connecticut Department of Transportation, 24 Wolcott Hill Road, Wethersfield, CT 06109, (203) 566-2414.

Local Programs

The **Dallas, Texas, Transit System** operates a shuttle from a peripheral park-and-ride lot at the Reunion Arena to the central business district (CBD). The program has been in operation several years and has shown a steady increase in patronage. The project is an attempt to ease traffic congestion in the CBD and increase the number of short-term parking spaces.

Contact: Janice Purpura, Public Relations Supervisor, Dallas Transit System, 101 North Peak Street, Dallas, TX 75226, (214) 827-3400.

The **City of Pittsburgh, Pennsylvania,** discourages all-day parking in the highly constrained downtown area through a variety of actions that promote the use of transit and ridesharing. Four fringe lots within the city accommodate nearly 7,000 vehicles; a direct shuttle bus serves the Three Rivers Stadium and the others are readily accessible to transit. Incentives, such as a 20 percent floor-area-ratio bonus, are offered to developers in the downtown area who tie into the fringe parking system. The city is studying a horizontal elevator concept to connect fringe lots to downtown development. Additional fringe lots are available to suburban users of the transit system. Preferential parking is also provided for carpools and vanpools in Pittsburgh Public Parking Authority garages.

Contact: Gary Erenrich, Principal Transportation Planner, Department of City Planning, Public Safety Building, Pittsburgh, PA 15219, (412) 255-2225.

Applicable References

JHK & Associates, *Model Parking Code Provisions to Encourage Ridesharing and Transit Use*, prepared for the U.S. Department of Transportation, Federal Highway Administration, September 1983.

JHK & Associates, Wagner-McGee & Associates, Traffic Institute, *High Occupancy Vehicle Facility Development, Operation and Enforcement*, Training Course, May 1981.

The *Coordination of Parking with Public Transportation and Ridesharing.* Urban Consortium Information Bulletin prepared by Public Technology, Inc., for U.S. Department of Transportation. DOT-I-82-29, June 1982.

Transportation Program Marketing

Problem Statement

Effective marketing and advertising programs are necessary to increase citizen support of transportation-related projects, as well as to increase citizen use of transportation facilities.

Possible Solutions

Update or develop new public education programs and advertising campaigns.

Solution Considerations

Techniques should address the specific needs of the local area and focus on developing close cooperation among media representatives, transportation agencies, and the public. This can play a major role in convincing the general public of a project's need or a program's benefits and encouraging the support and use of public transportation.

Federal Programs

The **Urban Mass Transportation Administration** is sponsoring a study in the District of Columbia to identify ways to ensure adequate and knowledgeable ***participation*** in the planning process by neighborhood residents.

Contact: Richard Steinmann, UMTA (UBP-30), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4004.

The **Urban Mass Transportation Administration** recently completed a program to assess the level of ***consumer awareness*** concerning the role and contributions of the transit industry. The primary goal of the project was to reinforce and broaden public support for transit by promoting a clear understanding of the role transit plays both as a public service and as a function of national policy.

Contact: Roger Tate, UMTA Service and Methods Demonstrations (URT-31), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590 (202) 426-4984.

The **Federal Highway Administration** publishes the *Ridesharing Newsletter* and the *Transportation System Management Brief*. Both are available from the FHWA Transportation System Management Programs Branch (HHP-24), 400 7th Street, S.W., Washington, DC 20590, (202) 426-0210.

A training course, Strategic Marketing for Ridesharing Professionals (No. 15252) has been prepared by the Federal Highway Administration. Information on this and related courses may be obtained from Robert Redmond, at the above address.

State Programs

The **Pennsylvania Department of Transportation** has prepared a handbook on ***marketing aids*** for specific use in mass transit project activities. Ideas are presented on garnering public support, promotion and advertising, and user information.

Contact: John Dockendorf, Mass Transit Assistance Division, Pennsylvania Department of Transportation, 1215 Transportation and Safety Building, Harrisburg, PA, (717) 787-7540.

The *Rideshare* program in Maryland offers extensive marketing support for carpool/vanpool programs. A multimedia slide presentation is available to demonstrate the benefits of ridesharing to employers, coupled with personalized plans to meet individual needs. On "Transportation Day" at a firm, carpool matching is available on site. In addition, Rideshare has initiated a seed van program to permit potential operators to test a vanpool, without purchase, for one month.

Contact: Joseph Seitz, Marketing Coordinator Mass Transit Administration Rideshare Office, Maryland Department of Transportation, 1515 Washington Boulevard, Baltimore, MD 21230, (301) 659-2993.

Local Programs

In **Palo Alto, California,** State Energy Commission funds were used to operate a ***Transit Information Van***. The van traveled to major employment centers to explain alternate travel modes. Now such marketing efforts come under the direction of the Santa Clara County Manufacturing Group Transportation Task Force, which meets monthly and includes representatives of local government, industry, business, etc.

Contact: Gayle Likens, Transportation Coordinator, City of Palo Alto, 250 Hamilton Avenue, Palo Alto, CA 94301, (415) 329-2136.

In Seattle, Washington, the Commuter Pool has a staff of 16 promotional and marketing personnel. A recent addition to the marketing effort is the employment of five outreach sales staff who are geographically distributed throughout the Metro region. They make "cold calls" on employers and follow up with more intensive programs. A staff of two is responsible for the preparation of public service announcements on a full-time basis. In addition, a computerized ride-match service is available.

Contact: John D. Shadoff, Supervisor of Commuter Sales and Information, Metro Commuter Pool, 821 Second Avenue, MS125, Seattle, WA 98104, (206) 447-6954.

Applicable References

Transit Marketing in Pennsylvania: A Handbook of Effective Transit Marketing Aids (Pennsylvania Department of Transportation, Harrisburg. Revised, December 1984).

Transit Reliability Information Program: Reliability Verification Demonstration Plan for Rapid Rail Vehicles (useful to operators in plans to market rapid rail usage) (NTIS, Springfield, VA 22161. PB 82-118464).

Public/Private Coordination and Transportation Financing

Problem Statement

Closer coordination is needed between the public and private sectors in the planning, programming, financing, design, construction, and operation of transportation improvements.

In recent years, there has been a trend toward the involvement of the private sector in becoming an active partner in the financing, construction, and operation of transportation facilities due to rapid growth and the inability of local governments to finance these facilities. This activity ranges from financing highway overpasses or additional lanes of highway, to operating small transit systems, and to participating in transportation management plans and projects. In most cases, the impetus for this cost sharing is the requirement for off-site infrastructure improvement to support new development.

Possible Solutions

Obtain private sector involvement through policy actions, enabling legislation, or mandated requirements; require developers to provide transportation improvements in order to receive requested zoning changes or building permits; encourage joint development projects; make direct financial contributions to transit and commitments to carpooling/vanpooling; and form special assessment taxing or tax increment districts to finance improvements.

Solution Considerations

Closer coordination between public and private sectors can result in lower levels of public transportation funding, better access and management along roadways, realistic design standards for access points and roadways/interchanges, better traffic operations, coordination of parking with public transportation and ridesharing, reduced travel demands and vehicular congestion levels, and coordinated pedestrian access from private property to public systems.

Federal Programs

The **Federal Highway Administration** recently sponsored an extensive analysis of the existing uses of private funds for highway improvements, alternative methods of obtaining private financing, and ways of increasing public/private cooperation. Seven detailed case studies are included in the references.

Contact: Community and Environmental Planning Branch, Federal Highway Administration (HHP-23), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0150.

FHWA and UMTA are sponsoring the Joint Center for Urban Mobility at Rice University. The program is exploring innovative solutions to development and financing of urban transportation systems with particular focus on private sector development.

Contact: Gary Brosch, Director, Joint Center for Urban Mobility, Rice Center, 9 Greenway Plaza, Suite 1900, Houston, TX 77046, (713) 965-0100.

Local Programs

A large multiuse redevelopment plan in **Bridgewater Township, New Jersey**, involved complicated access schemes to I-287 and adjacent State routes. The development consisted of retail, office, a 300-room hotel and

conference center, and a community facility. Through negotiation and joint input by the State Department of Transportation, a disposition agreement was adopted in which the developer would provide a 100-percent contribution for all off-site improvements, amounting to more than $20 million in capital improvements and agreed to provide a subsidy for transit and ridesharing.

Contact: Salvatore J. Bellomo, Bellomo-McGee, Inc., 901 Follin Lane, Suite 220, Vienna, VA 22180, (703) 255-3312.

In **Newport Beach, California,** if a proposed development exceeds a certain threshold size and contributes more than 1 percent of the peak traffic to an intersection, the developer is responsible for improving the intersection (to level of service D) prior to receiving a building permit. In one case, five developers, with eight developments, contributed to improving 14 intersections. Improvements included design and construction of turn lanes, restriping, and signal modifications. The total cost of about $1.8 million was split among the developers, based on the amount of traffic added by their development.

Contact: Richard Edmonston, Traffic Engineer, City of Newport Beach, P.O. Box 1768, Newport Beach, CA 92663, (714) 640-2181.

Through State enabling legislation in Virginia, developers may "proffer" to implement certain transportation or other off-site improvements. In **Fairfax County, Virginia,** for example, one project will result in the construction of a $3 million, 4-lane overpass by the developer to serve a major office development and lessen congestion on existing facilities. In another, developers adjacent to a congested roadway interchange profferred jointly to provide highway improvements, including a grade-separated access.

Contact: Carlos Montenegro, Staff Coordinator, Office of Comprehensive Planning, 4100 Chain Bridge Road, 5th Floor, Fairfax, VA 22030, (703) 691-3555.

Applicable References

Kimley-Horn and Associates, Inc., *Use of Private Funds for Highway Improvements,* prepared for the Federal Highway Administration, U.S. Department of Transportation, FHWA/PL/83/017, January 1984.

Rice Center, *A Guide to Innovative Financing Mechanisms for Mass Transportation,* Report No. DOT-I-82-53, prepared for the Urban Mass Transportation Administration, December 1982 and *Alternative Financing for Urban Transportation*, Report No. DOT-I-83-54, prepared for Federal Highway Administration and Urban Mass Transportation Administration, October 1983.

Growth Management Investment

Problem Statement

Rapid growth in many urban areas has resulted in a reexamination of development goals, with consequent tradeoffs between investment goals for infrastructure.

Efforts to reallocate funds to serve new growth are limited by existing enabling legislation or commitment to preexisting programs. Many areas seek financial contributions from developers in the form of fees that may or may not relate to the actual costs of the improvements.

Possible Solutions

Establish a standard cost sharing model based on development and other impact costs in various jurisdictions.

Establish a government-sponsored group to educate citizens and developers on the consequences of development.

Solution Considerations

A comprehensive review and compilation of the existing policies used by various jurisdictions would be useful in assessing and charging fees to developers where development is taking place. These results could then be made available to the various jurisdictions so they might initiate or update requirements in meeting their particular local needs.

Federal Programs

The **Federal Highway Administration, Office of Highway Planning** sponsored a contract to examine the use of ***private funds*** for highway improvements and the public-private cooperation in achieving the goals of communities and developers. The results of the study, which examines seven case studies, are contained in the FHWA report *Financing Urban Transportation Improvements, Report 2: Use of Private Funds for Highway Improvements*, January 1984.

Contact: Community and Environmental Planning Branch, FHWA (HHP-23), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0150.

Local Programs

Thousand Oaks, California uses a ***fees arrangement*** to collect money for traffic signals and road improvements necessitated by new development. See the report *Traffic Impact Mitigation Fees*.

Contact: J. P. Clement, Traffic Engineer, City of Thousand Oaks, P.O. Box 1496,Thousand Oaks, CA 91360, (805) 497-8611.

Snohomish County, Washington, has an ***ordinance*** that ensures roads are improved adequately to serve the increased demands generated by new development. A revision to this ordinance allows charging a "late comer fee" to subsequent developers using the original road improvements or other improvements made by the original developer.

Contact: Harold Urich or Hans Kurz, Department of Public Works, 5th Floor, Snohomish County Administration Building, Everett, WA 982-01, (206) 259-9488.

Downtown **Bellevue, Washington** has grown rapidly from a small suburban shopping center to a major multiuse activity center with a strong employment core. Several actions were taken to reduce automobile usage, improve pedestrian access, and shape downtown land use. One measure was the imposition of maximum parking level lower than current demand, coupled with a minimum parking requirement. Developers thus are required to develop "aggressive" transportation management programs to divert travel to transit and carpools. Performance standards for diversions are built into permits and the developer has two years to comply. One employer has achieved 55 percent ridesharing and 15 percent transit use. These programs are supplemented by a downtown transit center and a transit incentive program with Seattle Metro.

Contact: Tom Noguchi, City of Bellevue Planning Department, P.O. Box 90012, Bellevue, WA 98009, (206) 455-6880.

Applicable References

Growth Management and Transportation, An Urban Consortium Information Bulletin, Office of the Secretary, U.S. Department of Transportation, June 1982.

Programming and Prioritization

Problem Statement

There is a need to share information on systematic program methods to establish priorities for all modes and on techniques for integrating policy elements into transportation programs.

Priorities for transportation projects in high activity centers are often separated by mode and then linked to available funding sources. Such modal separation and lack of integration can cause inefficiencies in design, construction, and operation of transportation facilities.

Possible Solutions

Develop a management information system to assist decisionmakers in establishing priorities and provide input to the transportation improvement program.

Encourage input from political and community concerns before final programs are established.

Solution Considerations

Modal prioritization techniques include programs for Interstates, resurfacing of Interstates, safety, bridge replacement, pavement rehabilitation, traffic operations, transit operations, metro stations, improvements for the elderly and handicapped, pedestrian accommodations, etc. The prioritization techniques range from rigorous, computer-based technical cost-benefit studies to sufficiency ratings and more qualitative mapping techniques using panels.

Federal Programs

The **Federal Highway Administration's Program and Management Division** maintains various software packages to prioritize highway corridor improvements. The Highway Investment Analysis Package (HIAP) considers capital, operating and maintenance, and user costs in rank ordering highway projects.

Contact: Philip I. Hazen, Office of Highway Planning, Planning and Programming Branch, Federal Highway Administration (HHP-15), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-1046.

In addition, this office has prepared a training course using State priority programming in four States as case studies.

Contact: James Walls, (202) 426-1045.

The **Federal Highway Administration, Office of Highway Safety,** has a Highway Safety Improvement Program (HSIP) that provides guidelines and standards for safety.

Contact: Paul Scott, Office of Highway Safety, Program Evaluation Division, Federal Highway Administration (HHS-20), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-2171.

State Programs

In **Pennsylvania,** the framework for program development in recent years has shifted from an emphasis on construction to maintenance and improvements to the existing system. High-leveraged and other Federal-aid completion projects have also become a priority. Priorities are selected by a computerized evaluation system. A top-level program manager handles each priority area in the overall program management office. There is cooperation among State, county, and local officials in prioritizing and developing programs and projects.

Contact: Roy W. Taylor, Director for Program Development and Management, Pennsylvania Department of Transportation, Transportation and Safety Building, Harrisburg, PA 17120, (717) 787-2862.

The **Washington State Department of Transportation** has used a priority program system since 1963, when it was mandated by the State legislature. A priority array ranks existing highway system deficiencies in three categories: bridge life expectancy (structural), pavement condition, and hazardous accident locations. Each group is defined by a specific set of parameters. Highway congestion levels and geometric conditions are also evaluated. A modeling effort is used to establish the appropriate level of funding for each program.

Contact: Thomas L. McLain, Program Development Engineer, Washington State Department of Transportation, Olympia, WA 98504, (206) 753-7365.

Local Programs

In the **Pinellas Area Transportation Study (PATS) Priority Project Procedure**, priorities are developed locally and adopted by the MPO. The Florida Department of Transportation then uses the priorities as input to its construction work program. Subjective and objective evaluation procedures and formulas are used by a technical subcommittee to evaluate urgency, criticality, cost/benefit, and technical merit of each project with respect to the long-range transportation plan. In addition, an intersection prioritization procedure uses quantitative measures to analyze candidate projects submitted by the county or municipalities. Criteria for evaluation of intersections include urgency, volume/capacity, cost/benefit, and criticality.

Contact: Joseph Kubicki, Transportation Planning Program Administrator, Pinellas County Planning Department, 440 Court Street, Clearwater, FL 33516, (813) 462-4751.

Applicable References

Transportation Research Board, *Highway Programming Issues and Practices: Proceedings of Two Conferences,* prepared for the U.S. Department of Transportation, Federal Highway Administration, May 1983.

Special Event Transportation and Parking Requirements

Problem Statement

Heavy, short-term traffic created by sporting or cultural events and conventions often create severe strains on local transportation facilities.

Possible Solutions

Increase public awareness, via media sources, of available special transportation and parking facilities provided for special events.

Consider tactics to spread the peak and offer inducements, such as reduced fares, for using public or mass transit facilities when attending special events.

Solution Considerations

Efforts made by various jurisdictions to handle traffic and parking in these circumstances should be examined. Considerations should include available mode of transportation, arrival and departure patterns, parking, and access to and from the specific events.

Local Programs

The **Denver, Colorado**, sports complexes are carefully designed to accommodate projected parking demand and to minimize traffic impact. Transit buses provide service from park-and-ride lots.

Contact: James L. Brown, Director of Traffic Engineering, 5440 Rosslyn, Denver, CO 80216 (303) 575-5781.

The **Kansas City, Missouri**, ***facility design*** of a sports complex has been designed to minimize traffic to the adjacent areas. Park-and-ride service to sporting events is provided from shopping center parking lots.

Contact: Richard F. Davis, General Manager, Kansas City Area Transportation Authority, 1350 East 17th Street, Kansas City, MO 64106, (816) 346-0200.

The **Washington Metropolitan Area Transit Authority's *Special Events Task Force*** meets on an ad-hoc basis to develop plans for moving spectators and participants at events such as Presidential inaugurations, and Fourth of July celebration. Task Force members include the General Manager, Assistant General Manager, Directors of Bus and Transit Operations, Marketing Director, and the head of the Metropolitan Police.

Contact: Beverly Silverberg, Director, Public Affairs, Washington Metropolitan Area Transit Authority, 600 Fifth Street, N.W., Washington, DC 20001, (202) 637-1051.

Columbus, Ohio in cooperation with other local agencies, provided traffic control of the Ohio State Fair (average Saturday or Sunday attendance 220,000) and the Ohio State University football games (six Saturdays, average 87,000 attendance). The key element is cooperation between enforcement, engineering, transit, and events officials at all affected levels.

Contact: James A. Davis, Operations Engineer, City of Columbus, 50 W. Gay Street, Columbus, OH, (614) 222-7790.

Applicable References

The evaluation of the 1982 World's Fair Transportation System provides applicable experience to planning similar special events transportation schemes. The two-volume evaluation study examined many aspects, including organization; planning; access; roadways and traffic, parking; transit, tour and shuttle buses; regulations and agreements.

The Knoxville-Knox County Metropolitan Planning Commission, et al., Phase I Report, 1982 *World's Fair Transportation System Evaluation*, DOT-I-83-4, December 1982 and Phase II Report, *A Closer Look: The 1982 World's Fair Transportation System*, DOT-I-83-29, July 1983, prepared for Office of Planning Assistance, Urban Mass Transportation Administration.

Transportation Systems Management (TSM)

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*Priority topics

Parking and Zoning Requirements for Downtown

Problem Statement

Many zoning parking requirements are outdated, inflexible, and counter-productive to parking management programs, particularly for downtown areas.

In many cities, the downtown is being revitalized with both public and private development. Zoning ordinances, which in many cities, have not been updated, still specify the amount of parking that must be provided for specific types of land use. The financial interests who underwrite these redevelopment projects insist upon ample parking, which may be inconsistent with a city's program of parking management to control traffic congestion and promote transit use. Parking management programs and zoning ordinances must be compatible and be sufficiently flexible to meet competing needs.

Possible Solutions

Flexible zoning ordinances
Parking management programs
Parking restrictions
Parking requirement elimination

Solution Considerations

In any revision to zoning ordinances, it must first be determined what is the actual parking demand generated by a variety of land uses and particularly new multi-use developments. Parking management policy should be established to guide the revised zoning ordinances.

Federal Programs

The **Federal Highway Administration** has recently published a report entitled *Model Parking Code Provisions to Encourage Ridesharing and Transit Use*, which gives guidance on how municipalities could alter their parking codes to enhance ridesharing and transit opportunities. It provides examples of various elements that could be incorporated into a code.

Contact: Wayne Berman, Transportation System Programs Management Branch, Office of Highway Planning (HHP-24), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0210.

Local Programs

Seattle, Washington, has developed ***flexible parking requirements*** which are being used now in the permit process and will be included in the zoning code. Elements include tradeoffs of parking space requirements for transit passes, car and vanpool usage, and payments into a parking trust fund.

Contact: Jim Parsons, Chief Transportation Planner, Office of Policy and Evaluation, City of Seattle, 300 Municipal Building, Seattle, WA 98104, (206) 625-4591.

Alexandria, Virginia, has prepared a new parking requirement ordinance (not yet approved by city) which allows for reduction in spaces for proximity to transit, space allocation for car and vanpools, multi-use developments, and contributions to the transportation improvement fund.

Contact: Dayton Cook, Director, Transportation and Environmental Services, City Hall, Alexandria, VA 22313, (703) 838-4966.

Chicago, Illinois, has a zoning ordinance that creates a Central Area Parking District within which parking is permitted only as an accessory use (i.e., required parking for a structure). Non-accessory parking (i.e., public parking for a fee) is permitted only on special exemption. Also, floor area bonuses are provided for buildings that include hook-ups to pedestrian facilities and mass transit.

Contact: Elizabeth L. Hollander, Commissioner of Planning, Room 100, City Hall, Chicago, IL 60602, (312) 744-4471.

San Francisco, California, no longer has a minimum parking requirement for the high-density, auto-controlled downtown zones. City Planning Commissioner approval is required for any structure where parking is proposed for more than 7 percent of the gross floor area.

Contact: Chi-Hsin Shao, Transportation Section, City Planning Department, 450 McAllister St., San Francisco, CA 94102, (415) 558-5423.

Applicable References

The Coordination of Parking with Public Transportation and Ridesharing, An Urban Consortium Information Bulletin, DOT-I-82-29. Office of the Secretary of Transportation, U.S. Department of Transportation, June 1982.

Smith, Thomas P. *Flexible Parking Requirements*, American Planning Association, Chicago, IL, 1983.

Urban Revitalization

Problem Statement

As older cities pursue urban revitalization goals, such as housing rehabilitation, and commercial improvement schemes, there are often conflicts with other urban goals, such as neighborhood preservation.

In some cases, narrow streets, heavy through traffic, and lack of parking and access have affected the decline in commercial activity, which has resulted in physical decline. To attain the desired types of development, integrated and mutually acceptable access, traffic, and parking plans are needed.

Possible Solutions

Include local residents and business owners in the planning and development process.

Divert traffic from sensitive areas to designated streets.

Encourage shifts in travel mode, such as from autos to transit.

Adjust target growth areas to generate traffic at acceptable levels of service.

Define a coordinated street system to include autos, parking, transit, pedestrians, and bicycles.

Develop improved parking plans.

Solution Considerations

As desirable as it seems, urban revitalization can actually injure or destroy other important assets, such as a sense of community and established travel patterns. The effort in revitalization schemes should be to integrate all elements of the community and carefully weigh them in the planning and implementation process to minimize conflicting goals and maximize urban development and economic return to the community. The transportation elements are key to effective projects.

Federal Programs

The **U.S. Department of Housing and Urban Development (HUD)** is administering a new program, the Housing Development Action Grant Program (HODAG). The program is designed for urban areas that have neighborhood preservation programs or special needs.

Contact: Jessica Franklin, Grants Officer, U.S. Department of Housing and Urban Development, Room 6110, 451 7th Street, S.W., Washington, DC 20410, (202) 755-6142.

The ongoing **HUD** Urban Development Action Grant Program (UDAG) funds some revitalization projects.

Contact: Hugh Allen, Development Officer, U.S. Department of Housing and Urban Development, Room 7266, 451 7th Street, S.W., Washington, DC 20410, (202) 755-6234.

The **National Trust for Historic Preservation,** through the National Main Street Center, prepares publications and slide shows and sponsors training programs and demonstrations on downtown revitalization. While much of the focus is on smaller cities, the principles are relevant for subareas of larger cities.

Contact: Scott Gerloff, Executive Director, National Main Street Center, National Trust for Historic Preservation, 1785 Massachusetts Avenue, N.W., Washington, DC 20036, (202) 673-4219.

Local Programs

In **Salem, Oregon,** lack of accessibility was discouraging residents from shopping downtown. In response, the downtown core area was designated as a free parking area for shoppers. A tax was levied on businesses to pay for operation and maintenance of parking areas; with these and other funds, two 1,000-car parking structures were built. A major arterial was reconstructed as a bypass to divert non-core-bound traffic from that area. Pedestrian amenities were provided, such as awnings to protect them from inclement weather. In addition, alleys were upgraded to provide safe, attractive access for pedestrians on colored walkways, while allowing trucks to deliver goods easily. A downtown transit terminal was also included in the project.

Contact: Jim Walker, Renewal Supervisor, Community Development Department, City Hall, 555 Liberty Street, S.E., Salem, OR 97301, (503) 588-6011.

A preventive approach to urban decline is being initiated in **Fairfax County, Virginia,** a large urban county outside Washington, D.C. The objective of a current study is to identify older commercial areas where the potential for deterioration exists, with the expectation that urban revitalization techniques can be implemented to improve declining areas.

Contact: Richard Hecht, Fairfax County Office of Comprehensive Planning, 4100 Chain Bridge Road, Fairfax, VA 22030, (703) 691-4247.

In the 1960s, the East Liberty Shopping District in **Pittsburgh, Pennsylvania,** was created as an outdoor bus/pedestrian mall by closing three city streets. However, by the late 1970s, the area was deteriorating, and sales had declined. An ongoing revitalization plan was adopted that includes reopening the closed streets to traffic and short-term shopper parking. In addition, the location of the district on the exclusive busway is encouraging lower rent office development with easy access to downtown.

Contact: Karen LaFrance, Associate Director, East Liberty Development Corporation, 5907 Penn Avenue, Pittsburgh, PA 15206, (412) 361-8061.

Reducing Peak Period Travel

Problem Statement

There is a need to identify the most effective Transportation Systems Management (TSM) measures for each urban area and tailor a total program to meet these needs. TSM programs should be continually evaluated and modified to meet changing needs and conditions.

TSM measures can have a positive effect on reducing air pollution and energy consumption, as well as on moving traffic efficiently. Implementation, however, requires considerable research to justify projects, and cooperation and coordination with employers is necessary.

Possible Solutions

Implement TSM improvements, such as preferential treatment for high-occupancy vehicles (HOVs) (buses, carpools, and vanpools, exclusive lanes on city streets and highways, preferential treatment at signals, contraflow lanes, fringe parking for transit and HOVs, alternative work schedules (flextime), auto-restricted zones, coordinated transit and para-transit services, express bus and other transit promotions, carpools/vanpools, and parking management.

Solution Considerations

Planning and implementing TSM programs has been in effect in many urban areas with varying degrees of acceptance and effectiveness. Solutions must be packaged in a cost-effective manner to meet local needs. There is extensive literature and experience on the subject that could be used for effective technology sharing.

Federal Programs

The **Federal Highway Administration** and the **Urban Mass Transportation Administration** sponsor research, demonstration projects, and training programs in this area.

Contact: Transportation System Management Programs Branch (HHP-24), Federal Highway Administration, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0210.

Chester Phillips, Traffic Engineering Programs Branch, Federal Highway Administration, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0323.

Office of Planning Assistance (UGM-20), Urban Mass Transportation Administration, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590 (202) 426-2360.

Local Programs

There are numerous examples of TSM applications. A few are listed below; these and others are more fully described in the references.

Los Angeles, CA—San Bernardino Busway, two-way lanes for buses and 3+ carpools.

Washington, DC—I-66, two exclusive peak direction lanes for buses and 3+ carpools.

Pittsburgh, PA—South PATWAY, exclusive HOV facility for buses.

Denver, CO—Concurrent flow on two one-way pair streets reserved for HOV treatments.

Boston, MA—Auto-restricted zone in core retail area.

Washington, DC—Parking enforcement plan to encourage short-term, on-street parking.

Bellevue, WA—Central business district parking management program to encourage transit and limit parking supply.

Seattle, WA—SR 520, right shoulder designated for buses and 3+ carpools.

New York, NY—Long Island Expressway, inside lane designated as contraflow lane.

Applicable References

D. Baugh and Associates, *Evaluation of Freeway High Occupancy Vehicle Lanes and Ramp Metering,* Executive Summary DOT-P-30-80-30, Final Report DOT-P-30-80-28, prepared for the U.S. Department of Transportation, August 1980.

Transportation Research Board, *Experiences in Transportation System Management*, NCHRP Synthesis Report 81, November 1981.

Wagner, Frederick A., *Traffic Control System Improvements: Impacts and Costs*, Wagner-McGee Associates, Inc., FHWA-PL-80-005, March 1980.

JHK & Associates, *Evaluation of Priority Treatments for High Occupancy Vehicles*, FHWA/RD-80/062, January 1981.

Transportation Research Board, *Simplified Procedures for Evaluating Low-Cost TSM Projects,* NCHRP Report 263, October 1983.

Ridesharing Programs for Commuters

Problem Statement

Techniques for encouraging ridesharing to employers, building tenants, local government officials, and the general public need to be developed.

Widespread adoption of ridesharing programs by both private and public sectors highlights an increased interest in low-cost alternatives to fixed-route bus service. Information on the range of available alternatives is needed as local decisionmakers face critical choices on the future of local transportation services.

Possible Solutions

Disseminate information on successful ridesharing programs.

Update or develop new public education and advertising programs.

Develop ways to overcome reluctance by employers and tenants to participate in ridesharing programs.

Solution Considerations

Effective marketing programs are necessary to increase awareness and use of ridesharing. Programs should focus on the specific needs of the various audiences. Separate programs may need to be developed to respond to the varying interests of government officials, employers, tenants, and the general public.

Federal Programs

The **Federal Highway Administration** provides Federal-aid primary, secondary, and urban system funds that can be used to encourage and promote carpooling and vanpooling. Federal-aid funds can participate in the project cost for activities such as systems for locating and informing participants of potential carpools, vanpools, or buspools; designation of existing highway lanes as preferential high occupancy vehicle (HOV) lanes; the acquisition of vanpool vehicles for a vanpool program; and signing to designate carpool parking.

Contact: Robert Redmond, Federal Highway Administration (HHP-24), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0210.

The **Urban Mass Transportation Administration's Service and Methods Demonstration program** is supporting a number of public transportation demonstration projects that encourage active participation by the private sector. Employers have initiated ridesharing programs for their employees to reduce commuting costs, alleviate parking shortages and costs, and provide a reliable supplement to auto travel. The program uses private sector experience from past and ongoing demonstrations to study comprehensive approaches to private sector involvement.

Contact: Stewart N. McKeown, Urban Mass Transportation Administration (URT-31), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4984.

Local Programs

A demonstration of ridesharing brokerage in the **Newport News-Hampton, Virginia,** area involved working with local employers to stimulate interest in ridesharing. The project analyzed employee work trip data and developed ridesharing strategies to best suit the employment site. These included carpools, vanpools, subscription bus, and changes in scheduled transit service.

Contact: Viktoria Fox, PENTRAN, 3400 Victoria Boulevard, Hampton, VA 23661, (804) 838-7433.

The **Greater Bridgeport, Connecticut, Transit District (GBTD)** demonstrated a systemwide brokerage approach to planning, implementing, and operating a variety of transit and paratransit services such as ridesharing, coordination of social agency transportation, taxi/transit integration, suburban and inner-city community transit service, and economic development. Examples of new services include the Fairfield Minimover, which provides both peak-hour commuter and daytime circulation routes to one community, and the Human Services Transportation Consortium.

Contact: Peggy Brennan, Greater Bridgeport Transit District, 525 Water Street, Bridgeport, CT 06604, (203) 366-7070.

The **Delaware Valley Regional Planning Commission** developed an extensive promotion campaign that provided the required match for Federal Aid Highway Urban Systems funds for ridesharing. Two programs—Staggered Work Hours and Ridesharing—resulted in State deregulation of corporate-based vanpooling, significant financial benefits to participating carpool/vanpool participants, and benefits to the community in air quality and energy conservation. The structure for developing the program was based on the use of private contractors who would take responsibility for vehicle procurement, fleet maintenance, insurance, and billing services.

Contact: Roger Moog, Delaware Valley Regional Planning Commission, Bourse Building, 21 South 5th Street, Philadelphia, PA 19106, (215) 592-1800.

The **Golden Gate Bridge Highway and Transportation District** operates a third-party vanpool/sedanpool leasing program. Vanpools and sedanpools are formed using District-owned vehicles. After a 6-month trial period, poolers are diverted into privately owned and operated vanpools and sedanpools.

Contact: William Gant, Director of Ridesharing, Golden Gate Bridge Highway and Transportation District, Box 9000, Presidio Station, San Francisco, CA 94129, (415) 921-5858.

Applicable References

Multisystems, Inc., *Paratransit for the Work Trip: Commuter Ridesharing*, prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, Office of Policy Research, December 1982. Available from NTIS, PB 83-127589.

Parking Enforcement

Problem Statement

In many urban areas, parking regulations are not strictly enforced. Illegal parking, especially during peak hours, is a major obstacle to improved traffic flow and better management of the transportation system.

The greatest deterrents to an adequate enforcement program are (1) a lack of resources to deploy the needed personnel to detect, record, and adjudicate infractions and (2) a perception that any increase in police resources should be used to combat street crime.

Possible Solutions

Use civilian enforcement agents
Move to administrative adjudication
Adopt strict enforcement policies
Improve data systems
Implement systematic procedures to collect fines

Solution Considerations

Consideration should be given to coordination between agencies, such as police and parking authorities, to ensure the proper organizational framework required for a successful program. Legally mandated maximum parking fines may govern the cost effectiveness of programs. In addition, possible citizen resentment or public indignation may result from increased enforcement.

Local Programs

Washington, D.C., has an aggressive parking enforcement program. The District of Columbia uses 85 civilian parking control aides (PCAs), including supervisors, both on foot patrol and in vehicles. The PCAs enforce all parking regulations, including parking meters and time restrictions. The D.C. Department of Transportation (DCDOT) estimates that PCAs write 1 million tickets each year. Ticket revenue accounted for $11.6 million in FY 83. Towing is provided by City staff, which has proved more efficient than using outside contractors.

Contact: Paul H. Davis, Jr., Chief of Parking Enforcement, District of Columbia Department of Public Works, 65 Massachusetts Avenue, N.W., Washington, DC 20001, (202) 727-9196.

Boston, Massachusetts, currently employs about 50 parking control aides who write about 100 tickets each per day. The City collected $23 million in tickets in FY84, accounting for about 80 percent of all parking citations. Boston originally towed the cars of scofflaws (individuals with five or more outstanding parking citations), but now uses the Denver boot as a more cost-effective deterrent.

Contact: Phillip Caruso, City of Boston, Department of Traffic and Parking, City Hall Square, Boston, MA 02201, (617) 725-4675.

The **Portland, Oregon, Bureau of Traffic Management** employs 24 civilian parking control deputies. Sixteen deputies patrol the central business district (CBD), which is covered at least four times each day. The City budgets $0.4 million for the enforcement patrol, and collects

$1.0 million in fines each year. Certain rush-hour streets are designated as towing zones, and towing is provided by a contract service.

Contact: Nick Nozaki, Bureau of Traffic Management, City of Portland, 1120 Southwest 5th Street, Portland, OR 97204, (503) 796-5185.

Ann Arbor, Michigan, instituted a towing and booting program in August 1978. Ann Arbor uses those City employees on light duty or workman's compensation as spotters to patrol the streets with lists of autos whose owners have been identified as scofflaws (six or more outstanding parking citations).

In 1963, 2,631 scofflaws were identified and 1,736 were towed. The City had tried booting but abandoned it because police did not want to unlock them after city staff had gone off duty. The City is now developing a 24-hour, 7-day-a-week booting program.

Contact: John Robbins, Director, Department of Transportation, P.O. Box 8647, Ann Arbor, MI 48107, (313) 994-2818.

Applicable References

Basham, D. J., *Traffic Law Enforcement,* Springfield, Illinois: Charles C. Thomas, 1978.

Battram, D. C. (ed.), *Selective Law Enforcement,* Gaithersburg, Maryland: International Association of Chiefs of Police, 1976.

Cima, Bart, and Hildebrand, L., "Evaluation of the Washington, D.C., Parking Enforcement Program," Report No. UMTA-MA-06-0049-82-10, prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, September 1982.

DiRenzo, John F., et al., "Study of Parking Management Tactics, Volume 1, Overview, and Volume 2, Overview and Case Studies," Reports No. FHWA-PL-79-020 and 021, prepared for the U.S. Department of Transportation, Federal Highway Administration, December 1979.

Gardiner, John A., *Traffic and the Police: Variations in Law Enforcement Policy,* Cambridge, Massachusetts: Harvard University Press, 1969.

Gourley, G. Douglas, *Patrol Administration,* 2nd Ed., Springfield, Illinois: Charles G. Thomas, 1974.

Improved Parking and Traffic Enforcement in the District of Columbia, Washington, D.C.: Metropolitan Police Department, Office of Corporation Counsel, and D.C. Department of Transportation, April 1977.

Pedestrian Facilities Planning and Design

Problem Statement

Planning and design guidelines and criteria for pedestrian facilities in urban areas are needed.

Accommodations for pedestrians in urban areas tend to be done on a piecemeal and inconsistent basis, if at all. There is no consistency in the provision or design of pedestrian facilities including sidewalks, walkways, malls, signals, connectors to transit facilities, etc. The impacts of street improvements, such as turn storage lanes, increased curb radii, median, etc., on pedestrian movements are not adequately considered. These problems can be traced back to several deficiencies including the lack of a comprehensive planning process and design guideline.

Possible Solutions

Pedestrian planning and design manual

Performance standards

Encourage private sector to include pedestrian amenities in design

Solution Considerations

A manual should be a one-source document that would be usable at the planning and design level. It should include the process, procedures, and appropriate models for planning, warrants for the provision of various types of facilities, and standards, criteria, and specifications for the design of facilities.

Federal Programs

The **National Highway Traffic Safety Administration** (NHTSA) and the **Federal Highway Administration** (FHWA) share joint responsibility for administering Federal programs related to pedestrians. NHTSA's area involves education, enforcement, and pedestrian behavior, while FHWA is responsible for planning and engineering. Initial contacts for each agency are:

Contact: FHWA—John C. Fegan, Office of Research and Development (HSR-30), Federal Highway Administration, 6300 Georgetown Pike, McLean, VA 22101, (703) 285-2422.

Contact: NHTSA—Marvin M. Levy, Office of Driver and Pedestrian Research (NRD-42), National Highway Traffic Safety Administration, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-2977.

UMTA's Office of Services and Methods Demonstrations conducts studies and demonstrations on transit and pedestrian malls.

Contact: Joe Goodman, Office of Services and Methods Demonstration (URT-31), Urban Mass Transportation Administration, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC, (202) 426-4984.

Local Programs

Los Angeles, California, adopted a CBD pedestrianway plan as an element of the General Plan. The plan is intended to be used as a guide for new development in the CBD. The main points of this plan include preservation of rights-of-way for, and construction of, pedways.

Contact: Calvin S. Hamilton, City Planning Department, City Hall, Room 561C, Los Angeles, CA 90012, (213) 485-5073.

Applicable References

Proceedings, Fourth Annual Pedestrian Conference, prepared by Public Technology, Inc., and Transportation Division City of Boulder, prepared for Federal Highway Administration and National Highway Traffic Safety Administration, FHWA-TS-84-218, July 1984.

Fruin, J. J. *Pedestrian Planning and Design*, Metropolitan Association of Urban Designers and Environmental Planners, Inc., New York, NY, 1971.

Kagon, L. S., Scott, W. G., and U. P. Avin. *A Pedestrian Planning Procedures Manual*, Federal Highway Administration, U.S. Department of Transportation, 1978.

Orcutt, F. L. and Walker, H.A., Jr. "Traffic Engineering for Pedestrian Safety," *Transportation Engineering*, January 1978.

Public Technology, Inc. *Pedestrian Movement,* U.S. Department of Transportation, January 1980.

Public Technology, Inc. *Pedestrian Safety,* U.S. Department of Transportation, September 1980.

Neighborhood Traffic Control

Problem Statement

Excessive traffic levels and speeds on residential streets lower the quality of life and pose a safety hazard to pedestrians, especially children.

Many local governments have begun to respond to citizen pressure for reducing traffic volumes and speeds on local streets. More information should be disseminated about how neighborhood traffic controls can be implemented successfully.

Possible Solutions

Traffic diverters
Traffic circles
Truck restrictions
Turn restrictions
Street narrowing
4-way stop control
Speed and warning signs
Street closing
Speed bumps
Parking permits

Solution Considerations

There are a variety of effective techniques for reducing traffic volume and/or traffic speed. However, these controls will evoke strong protests even from local residents, if not properly planned and implemented with the support of the neighborhood. Access for emergency vehicles and transit vehicles as well as liability are among the many issues that need to be considered.

Federal Programs

Federal financial assistance in the installation of neighborhood traffic controls generally is not available unless the streets involved are included in the Federal Aid System. If so, the Federal share is 75 percent and the funding would be administered through the State highway agencies. More information on this can be obtained from the appropriate State agency or from FHWA:

Contact: James A. Carney, Programs Branch (HNG-12), Office of Engineering, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0450.

General information on residential traffic management strategies and access to technical assistance may be obtained from:

Contact: John C. Fegan, Traffic Control and Operations Division (HSR-30), Federal Highway Administration, Turner-Fairbank Research Center, 6300 Georgetown Pike, McLean, VA 22101, (202) 285-2419.

Contact: Phillip Russell, Traffic Control Standards and Applications Branch (HTO-21), Federal Highway Administration, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0411.

Local Programs

Seattle, Washington, has a very successful neighborhood traffic management program which focuses on the use of circles for speed control.

Contact: Bill Van Gelder or Ed Von Borstel, Neighborhood Traffic Control Program, Engineering Department, City of Seattle, 708 Municipal Building, 600 4th Avenue, Seattle, WA 98104, (206) 625-2347.

Thousand Oaks, California, has had recent experiences with use of speed bumps as a speed reduction measure.

Contact: J. P. Clement, Principal Engineer, Traffic Division, City of Thousand Oaks, CA 91360, (805) 497-8611.

Palo Alto, California, has a long-standing informal neighborhood traffic management program which attempts to limit traffic in residential areas.

Contact: Ted Nagouchi, Director of Transportation, City Hall, Palo Alto, CA 94301, (415) 329-2160.

Applicable References

Appleyard, D., et al. *Liveable Urban Streets: Managing Auto Traffic in Neighborhoods,* Report No. FHWA/SES-76-03, Federal Highway Administration, January 1976.

Public Technology, Inc. *The Impact of Traffic on Residential Areas*, An Urban Consortium Information Bulletin, U.S. Department of Transportation, DOT-1-82-30, June 1982.

Public Technology, Inc. *Neighborhood Traffic Controls*, an Urban Consortium Information Bulletin, U.S. Department of Transportation, Revised Edition, January 1980.

Smith, D. T., Jr., and Appleyard, D. *Improving the Residential Street Environment,* Report No. FHWA/RD-81/031, Federal Highway Administration, May 1981.

Smith, D. T., Jr., and Appleyard, D., et al. *State of the Art Report: Residential Traffic Management,* Report No. FHWA/RD-80/092, Federal Highway Administration, December 1980.

Large Trucks in Urban Areas

Problem Statement

Guidelines and criteria may be needed to establish routes and controls where longer and wider trucks can operate within urban areas.

With the passage of the Surface Transportation Assistance Act of 1982, urban areas can expect to experience wider trucks (from 96 to 102 inches) and longer trucks—either double trailer or longer single-trailer trucks. Although it is intended that these vehicles be restricted to the highway system as designated by the Federal government in concert with the States, some urban highways and streets are likely to be included. These wider and longer trucks can pose safety and operational problems for certain highways and streets. Consequently, guidelines and criteria are needed to determine where these trucks should be permitted/prohibited and what controls should be implemented if they are allowed.

Possible Solutions

Restrictions for certain streets
Time-of-day restrictions
Lane restrictions

Solution Considerations

Restrictions of any type must consider urban goods movement requirements, access of trucks to terminals and pick-up/drop-off points, and enforcement requirements. Cost implications include signing and other traffic control devices to implement restrictions. Criteria for restrictions should include issues of safety, capacity, and circulation. Of particular concern are trucks carrying hazardous material cargo.

Federal Programs

The **Federal Highway Administration's** Office of Research and Development has a research program that deals with large truck safety. One of the studies underway is an investigation of the operation of larger trucks on roads and streets with restrictive geometry.

Contact: Michael Freitas, Safety and Design Division, Office of Research and Development, Federal Highway Administration (HSR-20), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (703) 285-2421.

Local Programs

The **Port Authority of New York and New Jersey** encountered a problem relative to the legislation that provided that large trucks would automatically have access to tunnels and bridges on the interstate system. However, the Lincoln and Holland Tunnels under the Hudson River are not wide enough to safely accommodate 102-inch-wide vehicles. The solution was to ban both wide trucks and buses in the tunnels and to permit travel on the right lanes of the three Staten Island bridges and on both decks of the George Washington Bridge.

Contact: William D. Ankner, Supervisor, Public Policy and Legislative Analysis, Office of Strategic Planning, Port Authority of New York and New Jersey, 54 South, World Trade Center 1, New York City, NY 10048, (212) 513-2056.

Applicable References

Christiansen, D. L., *Urban Transportation Planning for Goods and Services, A Reference Guide*, Federal Highway Administration, Office of Highway Planning, June 1979.

Streets and Highways

300

*Priority topics

Budget Development for Streets and Traffic Control

Problem Statement

With budgetary cut-backs and shifting priorities, government agencies must reallocate resources among all needs and improve utilization of resources.

State and local governments are finding it increasingly difficult to finance needed roadway improvements. Inflated costs for capital improvements, as well as for operations and maintenance of facilities, have resulted in a need to reassess budgets. This is coupled with a reduction in funds resulting from legislative mandate and a diminishing tax base, especially in urban areas.

Possible Solutions

Revise budgeting procedures to be inflation-responsive, or responsive to rapidly changing conditions.

Develop better local prioritization processes for projects.

Encourage greater involvement by the private sector.

Provide more efficient management of existing resources, such as maintenance management and deferred maintenance.

Solution Considerations

The long lead time required for capital programs and projects, in particular, complicates the budget process and makes it difficult to predict factors such as the amount of inflation and shifts in revenue sources. More flexible methods should be implemented to finance projects, identify and prioritize them, and shift resources in a more cost-effective manner.

In addition, the source of Federal or State funding support often changes, causing a shift in local street and traffic programs to maximize available resources.

Local Programs

Montgomery County, Maryland, is a large, rapidly developing county consisting of older urbanized areas adjacent to Washington, D.C., and large rural areas that are attracting "high tech" development. In an effort to accommodate both maintenance and repair of older infrastructure, as well as new construction associated with development, the Capital Improvements Program (CIP) now contains a new element—operating budget impacts—for all new improvements. This impact represents life-cycle maintenance and staffing costs for the improvements. The impact analysis is carried over into the operating budget and, in some instances, results in an actual reduction in that budget, reflecting more efficient use of resources.

Contact: John J. Clark, Director, Office of Transportation Planning, Montgomery County, 101 Monroe Street, Rockville, MD 20850, (301) 251-2145.

Human Resource Allocation and Personnel Development

Problem Statement

A rational personnel allocation process is needed to provide improved productivity, a greater awareness of citizen concerns, reduced on-the-job stress, employee development, and a better managed transportation system.

Budgetary pressures for limited personnel can result in competition among functional areas for top personnel, certain types of skills, etc. Many governmental agencies must expend considerable time and effort to justify personnel requests and maintain existing performance levels. Scheduling of maintenance and construction crews is critical.

Possible Solutions

Implement computerized scheduling, such as scheduling of maintenance staff.

Apply personnel allocation models.

Redefine programs.

Improve employee training and development programs.

Develop efficient staff promotion and hiring schemes.

Provide on-the-job training and self-administered courses.

Encourage use of microcomputers and interactive software.

Develop special workshops and guidance materials sponsored by groups like the Federal Highway Administration, the American Association of State Highway and Transportation Officials, the American Society of Civil Engineers, or the Institute of Transportation Engineers.

Solution Considerations

When personnel reductions are required for budgetary reasons, personnel assignments can be adjusted and shifted to cover key posts and balance the workload. Occasionally, procedural or legal obstacles restrict the flexibility of managers to devise and implement new personnel programs. Tradeoffs between functions, such as planning and design vs. maintenance, must be weighed in the overall allocation and personnel development process.

Federal Programs

The **Federal Highway Administration** has developed the Preconstruction Engineering Management System (PCEMS) for use by State highway departments. It employs a critical path method for scheduling, monitoring, and forecasting manpower needs for construction projects. The program may be defined as a "resource leveling" process in which the program defines person-hour requirements, responsibilities, and skills needed, and can determine if there are sufficient manpower and skill levels for the duration of the project. The program runs on a mainframe computer, using the COBOL language.

Contact: Michael L. Halladay, Environmental Design and Surveys Branch, Federal Highway Administration (HNG-22), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0294.

State Programs

A computerized construction management program is applied in **Minnesota** for scheduling, funding, and human resource planning. The Project Management Schedule System (PMSS) is similar to the PCEMS.

Contact: Gary Dirlam, Minnesota Department of Transportation, Project Management Schedule System, Room 716B, Minnesota DOT Building, John Ireland Boulevard, St. Paul, MN 55155, (612) 296-3073.

Accident Information Systems

Problem Statement

Accident data is not always used efficiently or effectively, even though substantial amounts of manpower and time are expended on accident data collection and processing.

Traffic engineers, safety personnel, planners, police officers, insurance investigators, lawyers, and city/county elected officials are among the many users of accident data. An accident information system should respond to these users at the least public cost. The system should assist in the identification of high accident locations, the selection of appropriate countermeasures, and the evaluation of implemented countermeasures.

Possible Solutions

Implement information systems that integrate computerized accident records and with other computerized data files, including highway inventories, driver registration files, traffic volume data, and traffic control devices.

Solution Considerations

The needs of all potential users must be considered to ensure that the required data is collected, processed, and reported in a usable format. There is also a need to train system operators, streamline data collection and reduction, provide quick turnaround for requests, and provide an organizational framework for proper management. Because the cost of implementing new systems is often high, consideration should first be given to modifying or updating existing equipment.

Federal Programs

The **Federal Highway Administration** sponsored a study of existing accident record systems to evaluate highway safety programs. The study focused on State recordkeeping and the manner in which States maintain results of specific project evaluations and use the results in selecting and evaluating safety countermeasures.

Contact: C. Phillip Brinkman, Federal Highway Administration (HSR-30), U.S. Department of Transportation, Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, Washington, DC 22101, (703) 285-2031.

State Programs

A.F. Austin and Associates, Inc., in cooperation with the **Alabama Office of Highway Traffic Safety,** developed the Model Traffic Records System (MTRS), which links data on accidents, highway inventory, traffic volume, drivers, vehicles, emergency medical services, and school buses.

Contact: Cecil W. Colson, Office of Highway and Traffic Safety, Alabama Highway Department, Montgomery, AL 34130, (205) 261-6128.

The Department of Industrial Engineering at Auburn University developed the Records Analysis for Problem Identification and Definition (RAPID) system in direct response to the problem identification needs of

the Alabama Office of Highway and Traffic Safety. RAPID has been installed for **Alabama, South Carolina, Kentucky, Tennessee, Delaware,** and **Virginia**. The department also developed the City Accidents Rapid Evaluation (CARE), which is patterned after RAPID. However, unlike RAPID, which is accessible on an IBM 370/158, CARE is a microcomputer-based software system that enables officials of moderate-sized cities to retrieve accident information quickly.

Contact: Dr. David B. Brown, Department of Computer Science and Engineering, Dunstan Hall, Auburn University, AL 36849, (205) 826-4340.

The University of Florida Department of Civil Engineering developed the Seminole County Accident Records System (SCARS) for **Seminole County, Florida.** This is a CP/M-based microcomputer system.

Contact: Reginald Cotton, Seminole County Traffic Engineering Department, 4300 South Orlando Drive, Sanford, FL 32771, (305) 323-2500, Ext. 158.

The **Arizona Department of Transportation** operates an Accident Location and Surveillance System (ALISS). The system generates accident location reports, selective enforcement reports, standard summary reports, and intersection and midblock computer-drawn collision diagrams.

Contact: Roger Hatton, Traffic Design Services, Arizona Department of Transportation, Room 206E, 205 S. 17th Avenue, Phoenix, AZ 85007, (602) 255-8697.

Local Programs

National Con-Serv, Inc., (NCSI) developed a Microcomputer City/County Traffic Accident Records System (McTARS) for the **City of Hagerstown, Maryland.** The system manages accident and citation records and associates them with roadway information.

Contact: Cpl. Gary Spielman, Hagerstown Department of Police, 50 N. Burhans Boulevard, Hagerstown, MD 21740, (301) 790-3700, ext. 261.

Hennepin County, Minnesota, developed a computerized traffic accident system to identify hazardous locations, generate and evaluate alternative improvements, and evaluate the highway safety program.

Contact: Dennis L. Hansen, Hennepin County Department of Transportation, Hopkins, MN 55343, (612) 935-3381.

Applicable References

Zegeer, C. V., "Highway Accident Analysis Systems," NCHRP Synthesis 91, Transportation Research Board, November 1981.

"Management of Accident Data Systems," NCHRP Circular 233, Transportation Research Board, November 1981.

Flexible Highway Design Standards for Urban Situations

Problem Statement

Strict interpretation and adherence to the various design standards often makes it difficult and expensive to construct or reconstruct streets and highways in urban areas.

Because of the limited right-of-way and the high expense of construction, more flexibility and wider tolerances in the application of design standards are needed. Standards to be considered include lane widths, superelevation, pavement thickness, sight distance, access control, storm drainage.

Possible Solutions

Develop standards based on highway type (freeway, parkway, arterial, local, residential) and location (urban, rural).

Develop standards based on regional and geographical differences, such as climate, terrain, material resources, and population.

Develop standards for the design of new facilities and rehabilitation of existing facilities.

Allow for variance in standards, especially those related to safety, as long as operational controls are implemented (such as speed reduction and limitation of certain vehicles).

Solution Considerations

A primary consideration in the revision of standards, especially those related to safety, is any negative impact associated with reduced tolerances or specification levels. Cost benefit analyses may be required to support revisions.

Federal Programs

The **Federal Highway Administration** does not promulgate its own design standards but does adopt standards developed by others, notably the American Association of State Highway and Transportation Officials. FHWA has allowed for flexibility in standards related to 3R (resurfacing, restoration, and rehabilitation) projects by allowing States to develop their own standards.

Contact: E. Dean Carlson, Office of Engineering (HNG-1), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4853.

The **American Association of State Highway and Transportation Officials** recently developed a new policy on the design of streets and highways. Currently under publication, this policy incorporates the elements of the 1965 Blue Book, "A Policy on Geometric Design of Rural Highways," and the 1973 Red Book, "A Policy on Design on Urban Highways and Arterial Streets. In the policy, standards are presented for local, collector, and arterial roads, streets, and freeways.

Contact: David Hensing, American Association of State Highway and Transportation Officials, 444 N. Capitol Street, N.W., Suite 225, Washington, DC 20001, (202) 624-5800.

As required by the Surface Transportation Assistance Act of 1982, the **Transportation Research Board** is evaluating design standards for 3R projects. This involves contacts and interviews with numerous State and local jurisdictions to determine their policies.

Contact: Robert Skinner, Transportation Research Board, National Academy of Sciences, 2101 Constitution Avenue, Washington, DC, (202) 334-3260.

Applicable References

Bellomo-McGee, Inc., *Highway Design and Operations Standards Affected by Driver Characteristics*, Vol. I, Final Technical Report, FHWA-RD-83-015, May 1983.

Bellomo-McGee, Inc., *Highway Design and Operations Standards Affected by Vehicle Characteristics*, Vol. I, Final Technical Report, July 1984.

Both reports available from Federal Highway Administration, Safety and Design Division (HSR-20), 6300 Georgetown Pike, McLean, VA 22104, (703) 285-2057.

Improved Railroad Crossings

Problem Statement

There are thousands of rough, substandard railroad-highway crossings which are in need of improvement using long-life, cost-effective materials.

A rough crossing creates a safety hazard in many ways. It can cause damage to the vehicle's tires and wheels, wheel alignment, shock absorbers, and steering mechanisms. Light vehicles, such as mopeds, bicycles, and even very light automobiles can go out of control if the crossing speed is high enough. Very rough crossings can cause a vehicle to slow down, undesirably exposing it to collision with a train. Maintenance of crossings is costly and difficult because of the repeated shock loads from train and truck traffic.

Possible Solutions

A variety of crossing surface types are available including:

- full depth timber
- sectional treated timber
- concrete slab or pavement
- steel sections
- rubber panels
- linear high density polyethylene modules
- epoxy-rubber mix cast-in-place

Solution Considerations

The selection of the crossing surface type should be based on a life cycle cost analysis which considers the installation and maintenance costs over the useful life. The crossing surface installation must be compatible with railroad operations and maintenance requirements.

Federal Programs

The **Federal Highway Administration** has published the *Railroad-Highway Grade Crossing Handbook* (Technology Sharing Report TS-78-214, Aug. 1978) which discusses and gives illustrations of various crossing surface types. This handbook is being revised and will include updated material on crossing surface. Also, FHWA performed a limited analysis of crossing surfaces in 1979. The results, which include cost data, were documented in FHWA Technical Advisory T6120.1, December 10, 1980.

Contact: James Overton, Federal Highway Administration, Office of Engineering (HNG-12), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0450.

State Programs

Florida Department of Transportation recently ***developed criteria*** to assist the State DOT and railroads in selecting and evaluating crossing surface materials.

The **Rhode Island State Department of Transportation** has developd a process for tripling the useful life of a grade crossing. Two and a half-inch thick rubber pads are placed between the rails, a ***new method*** of preparing the track's base cuts down frost heaves, the tracks are welded together to produce a continuous rail, and the crossing area is replaced and resurfaced. Average cost per crossing is $78,000.

Contact: Stan Chorney, Department of Transportation, Room 237, State Office Building, Providence, RI 02093, (401) 277-2086.

Applicable References

Public Technology, Inc., *Improved Railroad Grade Crossings*, an Urban Consortium Information Bulletin, DOT-I-82-54, June 1982.

Asphalt Repair, Removal, and Recycling

Problem Statement

Uncertain oil prices, budget constraints, and limitations posed by traditional methods of asphalt removal and repair have focused attention on recycling asphalt materials when streets require resurfacing. Recycling techniques, especially in urban areas, tend to be noise- and dust-producing as well as disruptive to traffic.

Possible Solutions

Seal Coat to restore volatiles at placement
Seal Coat to eliminate and inhibit cracking
Rubberized asphalt inner layer

Solution Considerations

Traditional overlay resurfacing methods are limited to curb heights, manholes, overhead clearances, and other fixed objects in the right-of-way. Needed are techniques for recycling and resurfacing that are economical, environmentally sound, and effective.

Development and research is underway on products to preserve and renew asphalt paving materials and materials to reduce reflective cracking in bituminous overlays.

Federal Programs

The Federal Highway Administration (FHWA) and the **National Highway Institute** (NHI) have available a revised version of a 30-hour training course on "Techniques for Pavement Rehabilitation," (13108). The course is directed to engineers of the Federal, state, and local levels who are involved in ***rehabilitation and recycling*** projects.

Contact: Harry H. Hersey, Federal Highway Administration (HHI-22), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-9141.

FHWA's demonstration projects have also included those related to ***asphalt recycling***. Although Demonstration Projects No. 39, Recycling Asphalt Pavement, and No. 37, Discarded Tires in Highway Construction, are no longer active, data and reports resulting from them are available.

Contact: James Dunne, Federal Highway Administration, Demonstration Projects Division (HHO-42), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-9224.

State Programs

The **Georgia Department of Transportation** is in the process of completing a multi-phase reconstruction project of a section of the Atlanta Freeway (I-85) extending northeastward from downtown Atlanta. The project involves asphalt pavement ***recycling***, equipment devising ***new uses*** for existing, and management of stage construction.

Contact: Archie C. Burham, Jr., State Traffic and Safety Engineer, Georgia Department of Transportation, 2 Capitol Square, Atlanta, GA 30334, (404) 656-5423.

Local Programs

The **Oregon Department of Transportation** with the cooperation of local Public Works Departments—for example, Portland—has demonstrated that ***in-place asphalt pavement recycling*** can be done for less money when compared with other methods calling for all-new material.

Contact: Fred D. Miller, Director, Oregon Department of Transportation, 135 Transportation Building, Salem, OR 97310, (503) 378-6516.

In **Greensboro, North Carolina**, existing pavement surface is prepared prior to resurfacing by distributing a film of asphaltic emulsion followed by 10 lb of #78M stone per square yard surface. This is rolled and then, at varying times depending on site conditions, opened to traffic. Then the residue is swept up and 3/4" (for most residential streets) or 1" (for heavier-trafficked streets) overlay is put down. The city is currently considering resurfacing with chip seal and bituminous surface treatment.

Contact: Donald E. Knibb, Assistant Director of Public Works, Drawer W-2, Greensboro, NC 274, (919) 373-2074.

Applicable References

"Sprinkle Treatment of Asphalt Surfaces (State-of-the-Art Review)," Demonstration Project No. 50 (FHWA Interim Report, FHWA-DP-50-13, Nov. 1982).

Concrete Repair, Removal, and Surface Treatments

Problem Statement

Uncertain petroleum prices require research, development, and testing of cost-effective, non-petroleum-based surface materials that will provide a comfortable riding surface and require little maintenance over a five-year period.

Possible Solutions

Bituminous surface treatments
Concrete resurfacing

Solution Considerations

Costs, load strength, setup time, environmental acceptability, ease of storage, and preparation requirements are among the factors requiring study. Experiments with high-penetration ***asphalts*** in the mix (up to 200-300 penetration) and varying pavement thicknesses should be made. Also needed are experiments with placement of a very thin leveling course preceding thin wearing course overlay and the use of tack coats to ensure bonding reliability. ***Concrete strength*** should be tested before concrete is dry and the measurement test should be usable in all types of weather.

Federal Programs

The **Federal Highway Administration's Demonstration Project Division**, within its Demonstration Project No. 51, continues to study materials and methods related to bridge deck repair and maintenance techniques. A variety of repair methods are involved.

Contact: Darrell Maret, FHWA, Demonstration Projects Division (HH0-42), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-9224.

FHWA's Demonstration Projects Division also has an Experimental Projects Section. For further information, contact James Daves at the FHWA address noted above; telephone (202) 426-9210.

The **Federal Highway Administration's** expanded research and development laboratories have the equipment resources to conduct concrete strength measurements. Special attention is being given to seismic and geometric design as they relate to bridges and other structures.

Contact: John O'Fallon, Federal Highway Administration (HNR-10), Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, VA 22101, (703) 285-2089.

State Programs

The **Kansas Department of Transportation** has instituted a program of ***bridge deck repair*** that focuses on cracks resulting from shear and developed a reinforcing bar method applicable to grider halves. The bridge decking itself is restored through various types of BST and asphalt.

Contact: Carl Crumpton or F. Wayne Stratton, Kansas Department of Transportation, 2300 Van Buren Street, Topeka, KS 66611, (913) 296-7410.

Local Programs

The **Virginia Region, National Parks Service**, conducted a demonstration of ***concrete pavement restoration*** (CPR) on a strip of the 50-year-old Mount Vernon Memorial Highway, near Alexandria, Virginia, in May 1983. One of the materials used was Dow-Corning 888 silicone highway sealant. This material eliminates a priming step, which reduces sealing time and labor expense.

Contact: John F. Byrne, Superintendent, George Washington Memorial Parkway, National Park Service, U.S. Department of the Interior, c/o Turkey Run Park, McLean, VA 22101, (703) 285-2600.

Applicable References

The Estimation of Concrete Flexural Strength from Other Types of Strength Tests (W.C. Greer, Jr. Law Engineering Testing Company Special Technical Publication M-5, (no date). Law Engineering Testing Company, Atlanta, GA.)

Resurfacing with Portland Cement Concrete (*NCHRP Synthesis of Highway Practice No. 99*, 1982. Transportation Research Board, Washington, DC 20418, cost $8.40).

Pothole Patching

Problem Statement

Improved materials and methods for repairing potholes are needed.

Potholes are and will likely be a continuing problem for local and State governments. Unless the effort is expended to repair the pothole using accepted procedures, the repair usually does not last very long. Unfortunately, time does not permit anything but a quick application of patching materials. Development of longer-lasting pothole patching material at a reasonable price and suitable for year-round application would benefit all governments.

Possible Solutions

Cold-patch materials with good adherence and service life
Truck-mounted hot-mix patching machine
Improved procedures

Solution Considerations

Any new material or procedure should be cost-effective, applicable for different surfaces, and quickly applied.

Federal Programs

The **Federal Highway Administration** is undertaking a research study which has the objective of developing and evaluating new cold-patch materials.

Contact: Dr. Stephen Forster, Office of Engineering and Highway Operations Research and Development (HNR-30), Turner-Fairbank Research Center, 6300 Georgetown Pike, McLean, VA 22101, (703) 285-2431.

FHWA also has ongoing technology sharing programs.

Contact: Ronald A. Dattilo, Office of Implementation (HRT-10), 6300 Georgetown Pike, McLean, VA 22101, (703) 285-2358.

State Programs

The **Colorado Department of Highways** has had good experience with a self-contained mechanized pavement patching machine.

Contact: Dennis E. Donnelly, Division of Transportation Planning, Colorado Department of Highways, 4201 E. Arkansas Avenue, Denver, CO 80222.

Applicable References

Eaton, R.A. *Pothole Primer*, Special Report 81-21, U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, September 1981.

Niessner, C. W. *Bituminous Patching*, Report No. FHWA-TS-78-220, Federal Highway Administration, May 1979.

Pavement Patching Guidelines, Report No. FHWA-TS-82-221, Office of Implementation, Federal Highway Administration, February 1983.

Upper Plains States Innovation Group, *Pothole Patching with Small-Scale Asphalt Recycling Equipment*, Report No. DOT-I-81-25, U.S. Department of Transportation, August 1981.

Pavement Management Systems

Problem Statement

The broad concept of pavement management includes such operations as research, planning, design, construction, maintenance, and rehabilitation of pavements. Rehabilitation needs should be monitored and related to available funds in order to prioritize projects at State, county, and local levels.

Interest in this area has been generated as a result of cutbacks in new construction and the additional funding in 3R (resurfacing, rehabilitation, and restoration) programs and 4R (reconstruction) programs. The Federal Highway Administration and the American Association of State Highway and Transportation Officials have given emphasis to pavement management programs in the last 5 years. Much has been synthesized into computer programs for monitoring and prioritizing pavement projects. The Federal Highway Administration and other agencies offer training courses on the subject.

Possible Solutions

Conduct systematic pavement condition surveys.
Develop data base management systems.
Conduct prioritization programs.
Conduct demonstration projects.

Solution Considerations

A commitment by top officials to establish a usable data base and maintain the system is essential, particularly in a climate of reduced budgets for highway applications. Actual utilization of highway surfaces is changing with the advent of heavier, wider trucks. An effective pavement management system can support project prioritization programs and is a flexible method for providing objective evaluation to State legislatures and the public.

Federal Programs

The **Federal Highway Administration** has included pavement management as a program emphasis for 5 years through demonstration projects, training courses, and triregional workshops.

Contact: Frank V. Botelho, Pavement Branch, Federal Highway Administration (HNG-23), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0327.

The **Federal Highway Administation, Office of Planning** has an ongoing program that includes road surface management training for local governmental units.

Contact: Philip I. Hazen, Planning and Programming Branch, Federal Highway Administration (HHP-15), 400 7th Street, S.W., Washington, DC 20590, (202) 426-1046.

State Programs

The **Washington State Department of Transportation** developed a pavement management system to provide administrative officials with more information for efficient pavement management. The process includes steps to address pavement performance, select cost-effective rehabilitation strategies, and assemble a systemwide rehabilitation program. The pavement management system contains a master file, an interpreting program, a project-level priority program, and a network-level optimizing program.

Contact: David House, Washington State Department of Transportation, 1655 South 2nd Avenue, Tumwater, WA 98504, (206) 753-4666.

The **Arizona Department of Transportation (ADOT)** developed decisionmaking models for pavement management. The optimization model was first applied in 1980 and has been used subsequently to benefit the State decisionmaking process. The models provide a rationale for ADOT management to select an optimum, initial structural design and maintenance strategy for new pavements and to optimize maintenance strategies for existing pavements.

Contact: George Way, Pavement Management Engineer, Arizona Department of Transportation, 206 South 17th Avenue, Phoenix, AZ 85007, (602) 255-7231.

Local Programs

A computerized pavement management system, PAVER, was developed by the U.S. Army Corps of Engineers. The **American Public Works Association (APWA)** has adapted the software for use by urban areas; over 35 cities and counties are using this system. APWA also conducts training courses on implementation.

Contact: James Ewing, Staff Engineer, American Public Works Association, 1313 East 60th Street, Chicago, IL 60637, (312) 667-2200.

Applicable References

Federal Highway Administration, *Pavement Management, Rehabilitation, Programming: Eight States' Experiences,* Report No. 8, Statewide Transportation Planning and Management Series, August 1983.

Federal Highway Administration, Office of Engineering, *Pavement Management Synopsis,* April 1983.

Alternatives to Present Paints

Problem Statement

Traffic paint markings have useful lives of 1 to 3 years. In high wear areas, useful lives are as short as 3 months.

Frequent repainting is costly, disrupts traffic flow, and exposes maintenance crews to hazardous working conditions.

Possible Solutions

Epoxy Thermoplastic
Thermoplastics
Polyesters
Two-Part Epoxy

Solution Considerations

The alternatives to traffic paint are more costly; their useful lives therefore should be proportionately longer than those of traffic paint. The alternative marking materials should be easily applied.

Federal Programs

The Federal Highway Administration is sponsoring the development of ***epoxy thermoplastic*** (***ETP***) pavement marking material; it is a blend of two epoxy resins pigment filler, and glass beads. Epoxy thermoplastic has a no-track time of less than 6 seconds, does not require a primer, is 100 percent solid and is virtually smokeless at application temperature. It can be applied with equal success on asphalt and portland cement concrete pavement and on bare pavement or previously painted stripes. ETP has been tested in California, Minnesota, Colorado, and Texas. In each case, the demonstrated service life far exceeded that of traffic paint, providing an average of 5 times the service life of conventional traffic paint.

Contact: Chuck Niessner, Federal Highway Administration, Office of Implementation (HRT-10), U.S. Department of Transportation, Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, VA 22101, (202) 285-2365.

State Programs

New York State is currently conducting an evaluation of long life pavement marking materials on both concrete and asphalt pavements. Sprayed and hot-extruded *thermoplastics*, sprayed epoxy, and preformed tape have been evaluated.

Contact: Mr. James E. Bryden, New York State Department of Transportation, Engineering Research and Development Bureau, 1220 Washington Avenue, Albany, NY, (518) 457-747.

The **Ohio Department of Transportation** has been using and evaluating *polyester* pavement marking materials since 1975. Night visibility of polyester has been found to be superior to traffic paint and provides adequate delineation four times as long as paint. It bonds well only on asphalt surfaces, though.

Contact: Robert Yankovich, Ohio Department of Transportation, Bureau of Traffic, 25 South Front Street, P.O. Box 899, Columbus, OH 43216, (614) 466-3601.

The **Minnesota Department of Transportation** has been engaged in the development of a sprayable, two-component epoxy resin striping compound that would adhere to both bituminous asphalt and PCC pavements and would be abrasion resistant with long-term durability. Tests conducted from 1973 to 1977 in several states have indicated that the two-part epoxy remains serviceable for up to two years on high volume roads which, in some cases, require repainting every three months. The epoxy is more durable because it forms a chemical bond that makes it resistant to wear from sand, salt, snowplows, and traffic. These materials have been installed in 16 states on various types of roadways since 1977.

Contact: Hank Gillis, Minnesota Department of Transportation, Division of Highways, John Ireland Boulevard, St. Paul, MN 55155, (612) 296-8500.

The **California Department of Transportation** recently completed an evaluation of pavement delineation alternative to solvent-based paints. Solvent-based paints, when drying, emit hydrocarbons which contribute to air pollution. The Air Resources Board's "model rule," which has been adopted within the major California air basins, restricts the use of these paints. Thermoplastics, cold preformed tape, epoxy thermoplastic, polyester, and two-component epoxies were among the materials evaluated.

Contact: Kenneth Gilbert, California Department of Transportation, Division of Traffic Engineering, 1120 North Street, Sacramento, CA 95814, (916) 445-4362.

Applicable References

Roadway Delineation Practices Handbook, Federal Highway Administration, (FHWA-IP-81-5).

Left-Turn-On-Red

Problem Statement

Improved guidelines are needed for permitting/prohibiting left-turn-on-red (LTOR) after stop onto one-way streets.

Under the Uniform Vehicle Code, left-turn-on-red is permitted from a one-way street onto a one-way street. However, some states have variations to this general rule; some states permit it from a two-way street onto a one-way street, and some do not allow it under any situation.

Possible Solutions

Prohibit LTOR completely.

Prohibit LTOR in downtown areas where high concentration of pedestrians exists.

Limit LTOR on one-way streets.

Limit LTOR only where engineering study determines it to be a safety problem.

Solution Considerations

The *Manual on Uniform Traffic Control Devices* has guidelines for prohibiting turns on red. Primary considerations are sight distance, unexpected conflicts, pedestrian conflicts, and accident experience. Left-turn-on-red has unique considerations relative to limited visibility.

Federal Programs

The **Federal Highway Administration** sponsored a research study that evaluated specific ***countermeasures***, such as signs, markings, and signal variations for increasing pedestrian safety at right-turn-on-red intersections. The findings would have application to left-turn-on-red as well.

Contact: John Fegan, Federal Highway Administration, Office of Safety and Traffic Operations Research and Development (HSR-30), Turner-Fairbank Highway Research Center, McLean, VA 22101, (202) 285-2422.

State Programs

New York State conducted a LTOR study with particular interest towards the disabled pedestrian. They concluded that LTOR intersections should be investigated on an individual basis to determine whether sight restrictions or a high volume of disabled pedestrians exist. The report was published May 1981.

Contact: Albert E. Karoly, Safety Operations Unit, Traffic and Safety Division, New York State Department of Transportation, State Campus, Albany, NY 12232, (518) 457-6186.

Kentucky DOT conducted a survey of left-turn-on-red in 55 cities around the country. The experience and viewpoints of 43 cities (as of 1975) are reported in Research Report No. 446, May 1976.

Contact: Kenneth Agent, Kentucky Research Foundation, Kinhead Hall, University of Kentucky, Lexington, KY 40506.

Technical Committee 4A-17 of the Institute of Transportation Engineers recently prepared proposed recommended practice for qualitative guidelines to assist traffic engineers, law enforcement personnel, and other officials in properly determining where turns on red should be prohibited.

Contact: Mark R. Norman, Institute of Transportation Engineers, 525 School Street, S.W., Suite 410, Washington, DC, (202) 554-8050.

Monitoring Traffic Flow Characteristics

Problem Statement

Traffic management strategies are often implemented when certain traffic conditions occur. If these strategies are to be successful, real-time traffic conditions must be monitored to determine when these thresholds are exceeded.

Traffic management strategies include coordinated signal timing plans for linear and grid signal systems, ramp metering, ramp closure, route diversion techniques, and other traffic-responsive and control strategies. Traffic monitoring systems are also used to detect incidents on freeways.

Possible Solutions

Develop integrated electronic surveillance systems to gather, process, and provide real-time traffic data.

Solution Considerations

The types of detectors that have been used in surveillance systems include inductive loop detectors, magnetometers, and pulsed sonic detectors. These systems are subject to mechanical failures that are often too subtle to be detected even with central computer control. The detectors provide "point" measurements, which must be integrated to determine system performance. Cost, reliability, and maintenance must be considered before the selection and implementation of a traffic monitoring and control system.

Federal Programs

The **Federal Highway Administration's Office of Implementation** is sponsoring a project to develop and evaluate a self-powered vehicle detector (SPVD), which does not require any wiring to the roadside.

Contact: Charles Stockfisch, Federal Highway Administration (HRT-20), U.S. Department of Transportation, Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, VA 22101, (703) 285-2368.

FHWA is providing a Traffic Detector Handbook Workshop. It is a hands-on course for engineers and technicians designed to convey known techniques for the design, installation and maintenance of traffic detectors.

Contact: Al Miller, HHI-22, Federal Highway Administration, Washington, DC 20590, (202) 426-0411.

The **Federal Highway Administration's Office of Implementation** is currently preparing a traffic detector handbook.

Contact: David Gibson, Federal Highway Administration (HRT-20), U.S. Department of Transportation, Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, VA 22101, (703) 285-2378.

State Programs

The **New York State Department of Transportation,** in cooperation with the Federal Highway Administration, awarded contracts for the Integrated Motorist Information System (IMIS), to be deployed in the heavily traveled Northern Long Island corridor. Construction is scheduled for completion in 1986.

Contact: Joseph Contegni, New York State Department of Transportation, The State Office Building, Veteran's Memorial Highway, Hauppauge, NY 11788, (516) 360-6020.

The **Florida Department of Transportation** recently completed a surveillance and control system for the Howard Frankland Bridge across Tampa Bay.

Contact: Gary C. Price, Florida Department of Transportation, 605 Suwanee Street, Mail Station 36, Tallahassee, FL 32301, (904) 488-4284.

The **Virginia Department of Highways and Transportation** recently installed a ramp metering system on routes I-66 and I-395 in Northern Virginia. The system is being tested and is expected to be operational soon.

Contact: Tom Farley, Virginia Department of Highways and Transportation, 10777 Main Street, Fairfax, VA 22030, (703) 359-1160.

Local Programs

The **Port Authority of New York** has used electronic detection equipment in the Lincoln Tunnel since 1974. This allows the entire network to be monitored at a relatively low cost.

Contact: John Ashe, Facilities Services, Division of Tunnels, Bridges, and Terminals, Port Authority of New York and New Jersey, One World Trade Center, Room 71 South, New York, NY 10048, (212) 466-7406.

Applicable References

Dunn, W. M., and McDermott, J. M., "Status of Freeway Monitoring Systems in the United States," Compendium of Technical Papers, Institute of Transportation Engineers, 53rd Annual Meeting, 1983.

Review of Current and Proposed Low-Cost Freeway Incident Management Systems, U.S. Department of Transportation, May 1976 (available from NTIS, Springfield, VA, #PB 259077/AS).

Transportation Research Board, "Information Series #15, Group 3, Operation and Maintenance of Transportation Facilities," Committee on Freeway Operations, October 1982.

Naval Surface Weapons Center, *Development of a Self-Powered Vehicle Detector,* (FHWA-RD-79-89), October, 1978. Revised printing includes Appendix on Implementation Activities since the original report.

Traffic Signal Interconnection Alternatives

Problem Statement

A compendium or handbook is needed which provides hardware specifications and guidelines on the selection of alternate methods of interconnecting traffic signals.

Possible Solutions

There are basically three methods for interconnecting signals: wired; time-based; and airborne. The last is rarely used and has practical limitations. For the first two there are alternatives to achieving each method. Regardless of the interconnection method, a hardware specification with functional details of each alternative is not available to the local traffic engineer. A cost/benefit analysis of available alternatives should be done and guidelines should result which would aid in the selection of the best alternative for given conditions.

Solution Considerations

Of the three methods of traffic signal interconnection for coordination operation, the time-based system tends to be unreliable due to potential drift away from the base. The others have had more successful application.

Federal Programs

The **Federal Highway Administration, Headquarters,** initiated the design of a cableless, time-based, traffic signal controller coordination unit in May 1977. Field testing of 25 prototype units was completed during 1979-1980. Industry has accepted the FHWA functional guidelines for time-based coordination units, and by 1982 there were eight vendors offering versions of this wireless interconnect method. See reference listing below for reports on this project.

Contact: Robert Ellington, Federal Highway Administration (HRT-20), Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, VA 22101, (703) 285-2377.

Applicable References

Time-Based Coordination Unit Specifications, Report No. IP-820-20, Federal Highway Administration, August 1982.

Traffic Control Systems Handbook, 76-10, Federal Highway Administration, June 1976. (Note: This Document is being updated, contact: H. Milt Heywood, Office of Traffic Operations (HTO-22), Federal Highway Administration, Washington, DC 20590, (202) 526-0411.

Traffic Controller Synchronizer, Field Test and Evaluation, Report TS-82-220, Federal Highway Administration, August 1982.

Traffic Signal Maintenance

Problem Statement

Improved traffic signal maintenance procedures, practices, and management techniques need to be developed and implemented.

Improved maintenance of traffic signals and associated hardware is needed to minimize the occurrence of physical and electrical malfunctions and to detect and repair malfunctions quickly. Lack of maintenance reduces equipment service life, and malfunctions can cause a safety hazard and inefficient traffic operation.

Solution Considerations

Information should be provided concerning:

- The number of manhours allocated to traffic signal maintenance in major cities
- Exemplary local level maintenance programs
- Maintenance needs of computerized and other electronic traffic signal systems
- The cost-effectiveness of computerized signal systems in terms of improved traffic flow

Federal Programs

The **Federal Highway Administration's** Office of Research is currently sponsoring a study, "Traffic Control System Reliability." This study encompasses the development of a computerized maintenance records system which will enable the determination of maintenance costs for operational traffic control systems. Additionally, computer programs will be developed to provide computerized inventory systems, and to analyze failure rate data for control system hardware.

Contact: Pete K. Mills, Systems Technology Division (HSR-10), Office of Safety and Traffic Operations Research and Development, Federal Highway Administration, U.S. Department of Transportation, Washington, DC 20590, (703) 285-2027.

Applicable References

Management of Traffic Signal Maintenance: Synthesis of Highway Practice No.114, National Cooperative Highway Research Program, December 1984.

Contact: Herb Pennock, Transportation Research Board, (202) 334-3242.

Traffic Control Systems Handbook, Implementation Package 76-10, Federal Highway Administration, Implementation Division, Washington, DC 20590, June 1976.

Guidelines for the Maintenance of Traffic Signal Systems, prepared by Edwards and Kelcey, Inc., Commonwealth of Pennsylvania, Department of Transportation.

Contact: J. Robert Doughty, Chief, Division of Traffic Engineering and Operations, Department of Transportation, Transportation and Safety Building, Harrisburg, PA 17120, (717) 787-3620.

Traffic Signal Manual of Installation and Maintenance Procedures, 2nd Edition 1983— $40.00 plus postage and handling.

Contact: The Institute of Transportation Engineers, 525 School Street, S.W., Suite 410, Washington, DC 20024, (202) 554-8050.

Sign Vandalism Reduction

Problem Statement

More stringent and effective countermeasures need to be implemented to reduce sign vandalism.

Vandalism of signs costs taxpayers millions of dollars each year and has been reported as a contributing cause in a number of serious traffic accidents. It also results in tort liability costs to highway agencies and municipalities.

Possible Solutions

Modify sign construction and installation procedures.

Enlist law enforcement agencies in the prevention and reporting of sign vandalism.

Institute legislative measures to enhance enforcement and prosecution efforts.

Promote public information and education about the costs and potential dangers of sign vandalism.

Solution Considerations

One approach to reducing sign vandalism deals only with physical countermeasures (i.e., sign construction and installation). Another approach is a comprehensive program consisting of both physical and nonphysical countermeasures.

Federal Programs

The **Federal Highway Administration's Office of Implementation** has sponsored a report (in preparation for printing) entitled *Countermeasures for Sign Vandalism.* This guide describes available sign vandalism countermeasures and their effectiveness and also includes development guidelines for an antivandalism program for agencies and municipalities.

Contact: James Brooks, Office of Traffic Operations (HTO-21), Federal Highway Administration, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0411.

State Programs

The **Virginia State Department of Highways and Transportation (VDH&T)** recently initiated a program to apply sign decals containing information on sign ownership, pertinent laws, penalties, and telephone numbers for reporting sign vandalism and for land-use permits. In addition, the State seal is etched on the front and back. Since implementation, there has been a significant reduction in vandalism, and few signs have been stolen. The cost is 15 cents per sign.

Contact: R. B. Lee, Regional Sign Shop Coordinator, Maintenance Division, Virginia State Department of Highways and Transportation, 1221 E. Broad Street, Richmond, VA 23219, (804) 786-4024.

The **Wisconsin Department of Transportation** conducts a program consisting of a Statewide education effort and enactment of a new sign vandalism law. This campaign includes informational brochures, cartoons, and slogans depicting the costs and consequences of sign vandalism. Annual sign vandalism trends have shown significant improvement since the program began.

Contact: Dorothy Kapke, Deputy Director, Office of Information, Wisconsin Department of Transportation, P.O. Box 7910, Madison, WI 53707, (608) 266-2405.

El Monte, California, instituted an inspection and inventory of stop signs along 117 miles of roadway. Deficient signs were upgraded with high-intensity sheeting containing a graffiti-proof protective film.

Contact: R. J. Pinniger, Director of Public Works, 11333 Valley Boulevard, Room 11, El Monte, CA 91734, (818) 575-2228.

Applicable References

U.S. Department of Agriculture, Forest Service, Equipment Development Center, *Guide for Traffic Control Devices on Forest Development,* 7100 Engineering, 8371 2603, November 1983.

U.S. Department of Agriculture, Forest Service, Equipment Development Center, *Outdoor Testing of Reflective Sign Materials,* 7200 Engineering, 8372 2206, Revised January 1984.

Construction Work Zone Safety

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Problem Statement

Roadway construction and maintenance can create situations that are hazardous not only to the road crews but to motorists and pedestrians as well. Preparation of plans, design, and specifications is important to the reduction of tort liability cases for local and State government and private contractors.

Possible Solutions

Traffic management
Planning and scheduling work
Temporary traffic control devices
Channelizing devices and barriers
Detours
Highway advisory radio

Solution Considerations

To facilitate adequate advance project planning, the plans, specifications and estimates (P,S&E) for each project should include provisions for a specific traffic control plan for moving traffic through or around a construction zone in a manner that is conducive to safety to the motorists, workers, and pedestrians. The traffic control plan should include such items as signing, application and removal of pavement markings, construction scheduling, methods and devices for delineation and channelization, placement and maintenance of devices, roadway lighting, traffic regulations, and surveillance and inspection.

Federal Programs

Part VI of the *Manual on Uniform Traffic Control Devices* (MUTCD) is the national standard for all traffic control devices used during construction, maintenance, and utility activities. Augmenting the MUTCD is the *Traffic Control Devices Handbook* published by the Federal Highway Administration. It explains how to apply the standard of MUTCD to various work situations.

Contact: Greg Speier, Federal Highway Administration, Office of Traffic Operations (HTO-21), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (9202) 426-0411.

Since 1977 the Federal Highway Administration has sponsored several studies which have produced documents that provide guidelines and principles related to work-zone safety. A partial list appears in the *Applicable Reference* section.

Other reports are available and other studies are underway.

Contact: Justin True, Federal Highway Administration, Traffic Control and Operations Division (HSR-30), Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, VA 22101, (702) 285-2427.

Training documents and instruction materials are available from several sources including:

- FHWA's National Highway Institute. **Contact:** Harry Hersey (202) 426-9141
- Institute of Transportation Engineers. **Contact:** Mark Norman (202) 554-8050
- American Traffic Services Assoc., Inc. **Contact:** Robert M. Garrett (703) 659-4122

Local Programs

Phoenix, Arizona, has published a ***Traffic Barricade Manual*** to help reduce accidents involving motorists, pedestrians, and workmen. The manual suggests ways to reduce congestion and confusion by providing uniform applications of standard traffic control devices in construction and maintenance areas.

Contact: James W. Spark, Traffic Engineering Department, 251 West Washington Street, Phoenix, AZ 85003, (602) 262-6284.

Applicable References

Design Considerations for Two-Lane, Two Way Work Zone Operations (FHWA/RD-83/112, Midwest Research Institute, Oct. 1983).

"Economic Feasibility of Floodlighting in Construction Zones" (published in *Public Roads,* Dec. 1980).

Guidelines for the Application of Arrow Boards in Work Zones (FHWA-RD-79-58, Midwest Research Institute, Dec. 1978).

Improved Pedestrian Controls in Highway Work Zone.

A Model to Calculate Road User Costs at Work Zones (FHWA/TX-83-20 and 292-1, Texas Transportation Institute, Sept. 1982).

Pain, Richard F., Hanscom, Fred R., and McGee, Hugh W., "Work Site Traffic Controls in the U.S.: Existing and New Technologies," *Traffic Engineering Control,* Vol. 24, No. 10, October 1983.

Planning and Scheduling Work Zone Traffic Control (Implementation Package, FHWA-IP-81-6, User Guide, JHK Assoc., Oct. 1981).

Review of Channelizing Devices for Two-Lane, Two-Way Operations (FHWA/RD-83/056, Russel M. Lewis, June 1983).

Transit

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*Priority topics

Financing Transit Capital Costs

Problem Statement

The increasing competition for Federal funds for investment in new or improved transit equipment and facilities, coupled with local opposition to increased taxation, results in a need for innovative methods to finance capital expenditures, especially for major new systems.

Possible Solutions

Implement funding techniques, such as special benefit assessments, negotiated investments, tax increment financing (dedicated to property tax revenues), leasing or selling of existing facilities or development rights, certificates of participation (equipment trust certificates), interest arbitrage, lease-purchase agreements, "Safe Harbor" leasing, vendor financing, zero coupon bonds, and voluntary participation programs (donations for capital improvements) and lottery programs.

Solution Considerations

The application of innovative capital financing methods must be evaluated for each specific case within the context of legal, political, financial, and other implementation issues. Among the legal issues are requirements for State taxing authority, authority of the transit agency to issue long-term debt, enabling legislation for special assessments and taxation, and IRS qualifications for a public agency.

Political issues may involve tradeoffs among demands for special taxation, opposition to taxation, and the equity issue. Others can be positive, such as issuance of short-term vs. long-term debt.

The financial results must be considered with respect to the cost of developing and maintaining the capital fund measure. Local resources must be tapped for matching funds.

Federal Programs

Current Federal programs can fund portions of capital expenditures for bus equipment purchases and rail modernization projects. Limited funding is available for "new starts" for major rail or exclusive bus systems. The **Urban Mass Transportation Administration** sponsors research on alternative funding sources.

Contact: Paul Verchinski, Office of Planning Assistance, Urban Mass Transportation Administration (UGM-22), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-2360.

Local Programs

In **Miami, Florida**, a private sector task force, consisting of public and private members was formed to develop a funding mechanism to match Federal funds for the downtown peoplemover system—Metromover. Numerous alternative financing mechanisms were evaluated with the resulting formation of a "non-ad valorem" special assessment district in Miami CBD to support and service a $20 million municipal bond issue. In addition, Dade County will provide funds through private sector leverage leasing, property dedication, connector fees, and station cost sharing. Other funds are to come from the State and city. This plan provides a full funding program of dedicated and contingency funds. Since the project was initiated, the County has been able to negotiate for property at no cost or very low cost, and has worked out easement agreements for joint development above or below the raised structure.

Contact: James Moreno, Project Manager, Miami Metromover, Metropolitan Dade County Transportation Administration, 44 W. Flagler, Miami, FL 33130, (305) 579-3800.

The **Southern California Rapid Transit District (SCRTD)** raised $29 million toward the purchase of 1,000 new buses by selling 10-year equipment trust certificates at 8 percent to private investors. The certificate holders have title to 200 of the new buses, or 20 percent, and lease them back to SCRTD for an annual amount equivalent to one-tenth of the principal and 100 percent of the debt service. This enabled the Urban Mass Transportation Administration's 80-percent interest in the buses to be unencumbered.

Contact: Joseph Scatchard, Controller/Treasurer, Southern California Rapid Transit District, 425 S. Main Street, Los Angeles, CA 90013, (213) 972-6581.

Applicable References

The Office of the Secretary of Transportation, Technology Sharing Program, has distributed a number of studies:

Knoxville-Knox County Metropolitan Planning Commission, *Evaluation of Innovative Financing Techniques* (DOT-I-84-45, prepared for Urban Mass Transportation Administration.

Rice Center. *Revenue Forecasts for Innovative Light Rail Financing Options,* Denver Case Study, Report No. DOT-I-83-36, prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, September 1983.

Robert J. Harmon & Associates, Inc., *Miami's Downtown Component of Metrorail,* Public-Private Coventure Financing Using A Special Assessment District, Report No. DOT-I-84-16, prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, February 1984.

University of California, *Intergovernmental Responsibilities for Financing Public Transit Services,* Report No. DOT-I-83-30, prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, August 1983.

Financing Transit Operating Costs

Problem Statement

Federal subsidies for transit operating costs have decreased recently; similarly, State and local support for transit operations has been curtailed in many areas.

The gap between farebox revenues and operating costs is continuing to increase, and transit properties must seek methods other than increased revenues to meet operating costs and eliminate deficits.

Possible Solutions

Adjust fare policies.

Apply capital cost initiative techniques to operating and maintenance needs.

Implement special benefit assessments.

Implement taxes and user charges, such as corporate payroll taxes, employee income taxes, peak-hour surcharges, tax increments dedicated to transit, motor vehicle taxes, and fuel taxes.

Develop voluntary participation programs, such as employer-sponsored pass programs, lottery programs, and private provision of transit service.

Solution Considerations

This issue is highly complex and involves a question of equity among users and nonusers as well as among various jurisdictions. In some cases, taxing authority must be granted by the State Legislature. Voluntary programs still require considerable involvement of government officials. If transit service is to be maintained, solutions must be achieved systematically, perhaps by combining several innovative techniques.

Federal Programs

Under current proposals, Federal operating assistance would be reduced further. The Urban Mass Transportation Administration has been researching innovative financing methods.

Contact: Paul Verchinski, Office of Planning Assistance, Urban Mass Transportation Administration (UGM-22), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-2360.

Local Programs

A special taxing Authority was formed in **Portland, Oregon**, to impose a 0.6-percent payroll tax on employees. The revenue from this corporate payroll tax is used to defray operating expenses and contribute to the local match for capital expense for the Tri-County Metropolitan Transportation District (Tri-Met). In 1983, the tax covered 53 percent of the Tri-Met operating budget. The imposition of the tax was tested in court and found to be constitutional.

Contact: David Auxier, Accounting Manager, Tri-County Metropolitan Transportation District, 4012 Southeast 17th Avenue, Portland, OR 97202, (503) 238-4807.

Cincinnati, Ohio, enacted an employee payroll tax of 0.3 percent dedicated to transit, both capital and operating costs. At that time, the State did not have an income tax. About 30 percent of the Southwest Ohio Regional Transit Authority (SORTA) operating budget was financed in 1982 by this tax.

Contact: Robert Kaufman, Secretary-Treasurer, Southwest Ohio Regional Transit Authority, 432 Walnut, Suite 1108, Cincinnati, OH 45202, (513) 651-3020.

Since 1978, the **Washington Metropolitan Area Transit Authority (WMATA)** has imposed a peak-hour fare surcharge on both bus and rail service. The differential is about 15 cents for the average rail trip. For buses the zone fares are dropped in the offpeak. All farebox revenue is used to defray WMATA's operating costs.

Contact: Robert Pickett, Assistant Director, Office of Planning, Washington Metropolitan Area Transit Authority, 600 Fifth Street, N.W., Washington, DC 20001, (202) 637-1255.

Applicable References

The Office of the Secretary of Transportation, Technology Sharing Program, has distributed a number of studies:

Public Technology, Inc., *Inflation-Responsive Transit Financing,* Report No. DOT-I-82-27, prepared for the U.S. Department of Transportation, June 1982.

Rice Center, *Alternative Financing for Urban Transportation,* State-of-the-Art Case Analysis, Report No. DOT-I-83-54, prepared for the Federal Highway Administration and Urban Mass Transportation Administration, October 1983.

Rice Center, *A Guide to Innovative Financing Mechanisms for Mass Transportation,* Report No. DOT-I-82-53, prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, December 1982.

Rice Center. *Revenue Forecasts for Innovative Light Rail Financing Options,* Denver Case Study, Report No. DOT-I-83-36, prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, September 1983.

University of California, *Intergovernmental Responsibilities for Financing Public Transit Services,* Report No. DOT-I-83-30, prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, August 1983.

Transit Pricing Policies

Problem Statement

Cost-effective alternatives and synergistic solutions to existing transit pricing policies need to be identified.

Transit fare pricing involves several aspects: the system fare rate structure, promotional fares, marketing, and fare collection techniques. The fare structure is concerned with issues such as financial return, i.e., the portion of total or operating costs to be covered by fares, equity and efficiency results of change on ridership, etc. The other aspects are concerned with cost to implement and maintain, effect on ridership, public information, and (for fare collection techniques) security, reliability, and ease of use. These are complex issues and frequently must address conflicting goals in several jurisdictions of an urban area.

Possible Solutions

Implement changes in rate structures, such as graduated distance-based fares, flat fares, surcharges based on type of service, peak-hour surcharges (or, conversely, fare reduction for off-peak travel), and targeted fares.

Develop promotional programs, such as reduced fares to senior citizens, students, and other special groups; "Shoppers" shuttles and shuttles from remote parking lots; and reduced fares to new service areas.

Improve marketing techniques, including the use of flash cards, weekly, and monthly fare passes, special route coupons, and shoppers' tokens.

Institute new fare collection methods, such as self-service, automatic, and fare prepayment systems.

Solution Considerations

Solutions tailored to each transit operation and coverage areas must be devised and evaluated by management in a systematic manner, and tailored to each transit operation and coverage area. Returns and costs of implementation and servicing must be carefully managed and evaluated with respect to overall cost and revenue objectives for the system. Private sector participation should be secured when possible.

Federal Programs

The **Urban Mass Transportation Administration** is continually researching and supporting demonstration projects on fare policy.

Contact: Bert Arrillaga, Chief of Pricing and Marketing, Services and Methods Division, Urban Mass Transportation Administration (URT-31), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4984.

Local Programs

Tri-Met in Portland, Oregon, instituted a self-service fare collection system. On-board bus equipment included a ticket validator for prepaid tickets, with no intervention by the driver, and a ticket dispenser from which the driver issued a ticket for a single ride when a passenger deposited the correct fare. While the system was considered highly successful, with only about 5-percent evasion rate, it also proved to be costly to maintain and was dropped except for CBD loading in a fareless zone. The system will be used on the light rail transit route to open in 1986.

Contact: Gerald Fox, Manager of Self-Service Fare Project, Tri-County Metropolitan Transportation District of Oregon, 4012 Southeast 17th Avenue, Portland, OR 97202, (503) 238-4974.

The Metropolitan Transit Commission (MTC) in Minneapolis-St. Paul, Minnesota, employs a variety of fare prepayment schemes. These include monthly passes in 10 denominations for 40 one-way trips, commuter books of 10 one-way punch tickets in 9 denominations, and 60-cent tokens (base fare). These may be purchased at MTC booths and retail outlets. Banks recently dropped the service in an effort to focus on banking operations; however, retail outlets have readily picked up the sale of passes because it brings more customers into the stores. Monthly passes may also be purchased through payroll deduction plans at an 8.3-percent reduction.

Contact: Roger L. Downey, Manager of Communications, Metropolitan Transit Commission, 560 6th Avenue, N., Minneapolis, MN 55411, (612) 349-7681.

A graduated distance-based fare structure is in effect for both the Metrorail and Metrobus systems operated by the **Washington Metropolitan Area Transit Authority**. On Metrorail, automated fare computation is performed at the exit gate; the computation includes distance (point of entry and exit), time, and a peak-period surcharge beyond the first 3 miles. Similarly the bus system includes peak-period and zone fare differentials. The base fare for both peak and nonpeak periods is $.80; rail surcharges are based on mileage; bus surcharges are based on zones.

Contact: Paul W. Willis, Information Specialist, Office of Public Affairs, Washington Metropolitan Area Transit Authority, 600 5th Street, N.W., Washington, DC 20001, (202) 637-1047.

Applicable References

Ecosometrics, Inc., *The Costs of Transit Fare Prepayment Programs, A Parametric Cost Analysis,* Technical Report, prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, February 1982.

Organization for Environmental Growth (OFEGRO), *Graduated-Based Fare Collection*—December 1983, *Rural Transportation*—April 1984, *Transit Fare Prepayment: A Guide for Transit Managers*, and *Self-Service Fare Collection*—August 1983, a series of studies prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration (available through NTIS).

SG Associates, *Establishing an Employee Pass Program,* Transit Operation Guide, prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, 1982.

Transit System Productivity

Problem Statement

Techniques for reducing transit operating costs need to be developed and communicated to the transit industry.

Most transit services focus on serving downtown areas, while employment and recreational centers continue to develop outside these areas. It is therefore unlikely that public support for transit will increase substantially in the near future. Without more public support, transit properties have little prospect for increased transit ridership and revenues. They consequently must find more productive ways to operate if they are to remain viable.

Possible Solutions

Automate diagnostic, information, and recordkeeping functions.

Contract maintenance and supplemental services from the private sector.

Find better ways to use human resources.

Conduct better and tougher labor negotiations.

Solution Considerations

Emphasis should be placed on improving operating and maintenance practices as well as strengthening management control, internal and external communications systems, and procedures for performance monitoring and evaluation.

Federal Programs

The **Urban Mass Transportation Administration** and the **American Public Transit Association** are jointly sponsoring a technical assistance program. Elements of the program include strategic management and organizational productivity, productivity in human resource utilization, maintenance management and productivity, and data base management productivity.

Contact: Brian E. McCollom, Urban Mass Transportation Administration (URT-41), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-9271.

The **Urban Mass Transportation Administration** and the **Federal Highway Administration** are jointly sponsoring a program to provide for exchange of technical information concerning the application of microcomputers to support decisions in transit operations. A user group has been formed and a 2-day introductory course on the basics of microcomputers is also offered.

Contact: Thomas J. Hillegass, Urban Mass Transportation Administration (URT-41), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-9271.

William A. Martin, Federal Highway Administration (HHP-22), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-0182.

The **Urban Mass Transportation Administration Service and Methods Demonstrations (SMD)** also sponsors the Public Transportation Network. This is a technical assistance program in areas of resource productivity, private sector involvement, etc., through developer demonstrators and other resource people.

Contact: Eric Harris, c/o Crain & Associates, 343 Second Street, Suite A, Los Altos, CA 94022, (415) 949-1472.

State Programs

The **Wisconsin Department of Transportation** is conducting a project to assist transit managers better understand the characteristics and capabilities of microcomputers, assess their use, and implement an automated information management system using microcomputers. The project involves 16 small public transit systems located throughout the state. A group approach is being used in order to establish a forum from which managers and staff can receive training, exchange ideas, and discuss mutual concerns.

Contact: James A. Beckwith, Wisconsin Department of Transportation, 4802 Sheboygan Avenue, P.O. Box 7914, Madison, WI 53707, (608) 266-1379.

Local Programs

The **VIA Transit Authority in San Antonio, Texas,** developed a new sampling technique for collecting passenger and passenger-related data required under the UMTA Section 15 program. The technique derives passenger and passenger-mile data from routinely collected farebox revenue statistics. The methodology, which will result in considerable cost savings for the industry, is being tested with data from a sample of other transit properties.

Contact: Robert Stark, VIA Transit Authority, 800 West Myrtle, San Antonio, TX 78212, (512) 227-5371.

The **Ann Arbor, Michigan, Transportation Authority** has developed a performance monitoring system that highlights a performance audit on operations and administrative functions. The performance audit is intended to be a management tool that will allow the system to set priorities for future directions and take corrective actions. Implementation of the plan has resulted in many capacity and operational changes, which, in turn, have resulted in improved system productivity and public acceptance.

Contact: Richard J. Simonetta, Executive Director, Ann Arbor Transportation Authority, 3700 Carpenter Road, Ypsilanti, Ann Arbor, MI 48197, (313) 973-6500.

The **Orange County Transit District** conducts a program to implement productivity strategies for a mixed fleet of vehicles. The program focuses on standardizing parts, computerizing inventory control, and training employees. The objective of the maintenance training certification program, which is a major part of the program, is to train mechanics to troubleshoot problems accurately, disassemble components, evaluate their usability, and reassemble them to create a functional piece of equipment.

Contact: Timothy C. Payne, Manager of Maintenance, Orange County Transit District, 11222 Acacia Parkway, Garden Grove, CA 92642, (714) 971-6418.

Screening Programs for Transit Employees

Problem Statement

Transit drivers comprise over 50 percent of the transit employee work force; however, screening during preemployment and the initial hiring period is not consistent throughout the industry.

The need for standardized transit employee screening should be examined, with the view that preemployment and subsequent training could provide a useful and cost-effective tool for transit agencies.

Possible Solutions

Develop minimum guidelines for use throughout the transit industry for preemployment screening and new-hire training that is compatible with the needs of various transit properties.

Solution Considerations

A commitment to human resources utilization is needed to identify the capability of individuals to respond to the demand placed on transit drivers.

Federal Programs

The **AFL-CIO Appalachian Council** and the **Urban Mass Transportation Administration** have developed training courses in passenger relations, bus maneuvers and defensive driving, emergency and accident procedures, and new employee orientation. The courses are taught by a transit agency's own employees who have attended a special train-the-trainer session.

The **Transportation Safety Institute** conducts a series of workshops on bus operator training, using materials developed by the AFL-CIO Appalachian Council.

Contact: Charles Morison, Urban Mass Transportation Administration (URT-32), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-9274.

Local Programs

The **Chicago Transit Authority's** program to screen transit drivers consists of a 14-day training program that encompasses classroom work, simulation studies, and hands-on experience in vehicle operation. During this probationary period, a prospective driver is given every opportunity to pass the required curriculum; however, in the event of a candidate's inability, an attempt is made by CTA to place the candidate in another position.

Contact: Marjorie Holmes-Banks, Human Resources Department, Chicago Transit Authority, P.O. Box 3555, Merchandise Mart Plaza, Chicago, IL 60654, (312) 664-7200, ext. 3510.

Applicable References

Transportation Center, University of Tennessee, *Driver Selection and Training for Human Service Agencies*, DOT-I-83-17, prepared for the Department of Health and Human Services, 1983.

Training Programs for Transit Employees

Problem Statement

Improved communication techniques need to be developed within transit organizations.

Communication is often identified as the cornerstone to effective management and training. A commitment to human resources management is necessary to acknowledge the importance of communication as the one essential ingredient in improving transit operational and service effectiveness.

Possible Solutions

Develop a comprehensive, upwardly mobile series of training courses: transit-run and -sponsored courses, home-study courses, university level courses, personal well-being (stress-related) courses, and public relations courses designed to promote interaction throughout the organization.

Solution Considerations

A commitment to human resources management should be made to acknowledge the importance of improved communication throughout the transit agency and transit industry.

The tools currently being applied to improve communication in transit should be identified, as should the conditions necessary for these tools to be effective.

Federal Programs

The **Transportation Safety Institute** conducts a series of workshops on bus operator training, using materials developed by the AFL-CIO Appalachian Council and presented in a "train the trainer" format.

Contact: Charles Morison, Urban Mass Transportation Administration (URT-32), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-9274. (Also may be contacted for other programs noted.)

The **National Cooperative Transit Research Program** of the Transportation Research Board is planning four workshops focusing on application techniques of quality of work life. Workshops will be presented to managers and union leaders in the transit industry.

Contact: Crawford Jenks, Transportation Research Board, 2101 Constitution Avenue, N.W., Washington, DC 20418, (202) 334-3224.

Ohio State University, under a grant from the **Urban Mass Transportation Administration,** is developing a train-the-trainer course to focus on first-line maintenance supervisors. The course will be held in regional sessions using selected transit agencies as hosts. The goal is to equip transit agencies to initiate their own in-house training programs.

Contact: James B. Hamilton, National Center for Research and Vocational Education, 1960 Kenny Road, Columbus, OH 43210, (614) 486-3655.

Local Programs

The Southern California Rapid Transit District under contract from UMTA administered a regional transit training center that provided all levels of training to employees of transit agencies in 14 western states. Development and presentation of materials was based on the common needs of all participating agencies. A training resource library was also developed. The library provides transit training programs, audio visual aids, and information on speakers, instructors, and technical referral.

Contact: American Public Transit Association, Technical Information Center, 1225 Connecticut Avenue, N.W., Washington, DC 20036, (202) 828-2848.

San Diego, California, is conducting a Group Supervision Program that combines job restructuring for supervisors with direct supervision for bus operators. Measures of effectiveness include absenteeism and experienced reduction in turnover rates.

Contact: Frank Shipman, San Diego Transit Corporation, P.O. Box 2511, San Diego, CA 92112, (619) 238-0100.

Metro Dade Transportation Administration is conducting a program to encourage labor/management cooperation in developing human resources. The program consists of a series of activities, including quality circles, stress management, and capacity training (courses for union officials) designed to upgrade personnel performance and encourage the employee to take a larger stake in the job and the company.

Contact: Carman H. Davis, Metro Dade Transportation Administration, 3400 N.W. 32nd Avenue, Miami, FL 33152, (305) 638-5734.

The **Southeastern Pennsylvania Transportation Authority** (SEPTA), under UMTA sponsorship, is developing a set of classroom and shop training materials for use by the entire bus maintenance staff.

Contact: John J. Grosso, Manager of Capital Projects, SEPTA, 200 W. Wyoming Avenue, Philadelphia, PA 19140, (215) 456-4659.

Applicable References

Human Resource Dimensions of Productivity, Transit Productivity Program sponsored jointly by the U.S. Department of Transportation, Urban Mass Transportation Administration, and American Public Transit Association, December 1983.

Regional Transit Training Center, Final Report, Southern California Rapid Transit District, Los Angeles, California, April 1983.

Transit Security Systems

Problem Statement

Lack of adequate information on the magnitude of crime and vandalism on transit vehicles and waiting areas has resulted in inadequate budgeting for research and preventive measures.

Although the incidence of crime and vandalism has not necessarily increased, both the public and transit properties are more alert to those problems and are seeking solutions. Fears for personal safety can affect ridership, as well as performance levels of transit employees.

Possible Solutions

Apply suitable technology, such as closed circuit television monitors in transit stations, improved lighting, and two-way communications systems.

Augment techniques with local or transit police presence on vehicles and in waiting areas.

Implement employee training courses and better information reporting systems.

Solution Considerations

Prevention of vandalism and personal crime on transit systems requires knowledge of the problem, involvement and cooperation of outside agencies, and sufficient funds to establish an effective system. Of particular importance to this problem is a management commitment to a systematic security program and recognition that security impacts each element of the system. Solutions will vary, depending on the local environment and conditions.

Federal Programs

The **Urban Mass Transportation Administration** has recently completed case studies of security on four bus systems. Further studies are planned on state-of-the-art security countermeasures for various transportation systems. UMTA also funds security training courses for transit employees.

Contact: Gwen Cooper, Program Administrator, Office of Safety and Security, Urban Mass Transportation Administration (URT-6), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-2896.

Local Programs

A concerted effort by the **Dade County, Florida,** police was effective in reducing transit-related crime by over 50 percent and achieving about 100-percent convictions in arrests. A team of undercover police, working with decoys and electronic surveillance equipment, was used. This effort was aided by a grant from the Urban Mass Transportation Administration and is continuing with local funding.

Contact: Capt. Arnold DeLuca, Metro Dade Police Department, 3401 N.W. 36th Street, Miami, FL 33142, (305) 638-5751.

In an effort to reduce vandalism and attacks by youth gangs, **AC Transit in Oakland, California**, initiated a program to work directly with these gangs. An official of AC Transit met with gang leaders to explain that the transit system is a public entity and offered jobs to members if vandalism were reduced. In addition to the direct approach with the youth, the area was saturated with security personnel. Within 3 months, there was a 60-percent reduction in vandalism and the youth were employed by the transit property.

The program has expanded and now involves several community groups, both public and private. The youth now perform jobs such as painting, which formerly went to contractors, and they have begun to clean up their own neighborhoods.

Contact: Charles Lacy, Chief of Security, AC Transit, 508 16th Street, Oakland, CA 94612, (415) 891-4811.

An effective safety and security information system has been developed by the **Southeast Michigan Council of Governments (SEMCOG).** Using the Department of Justice Uniform Crime Reporting System (UCR), SEMCOG is able to analyze incidents systemwide for a variety of parameters, such as location and time of day. As a result, security manpower can be deployed where needed. The onboard police, "Bluebirds," are augmented by precinct police, with proven effectiveness in reducing robberies and attacks at bus stops. The reporting system is being converted for microprocessing.

Contact: Anne Nolan, Manager, Public Safety Programs, SEMCOG, 1249 Washington Boulevard, Detroit, MI 48226, (313) 961-4266.

Applicable References

Case Study of Transit Security on Bus Systems, Report No. VA/06-0088-83-1, U.S. Department of Transportation, Urban Mass Transportation Administration, August 1983.

Bus Rehabilitation

Problem Statement

Bus rehabilitation may provide transit authorities a way to extend the useful life of their bus fleets.

No statistics are available to determine whether bus rehabilitation is more or less cost beneficial than new bus acquisition. Transit authorities, therefore, prefer to purchase new buses whenever Federal block grant funds can be used.

Possible Solutions

Establish standards to be used in monitoring bus performance in order that rehabilitation versus buying can be predicted.

Further evaluate life-cycle costing and service requirements.

Solution Considerations

Levels of bus rehabilitation should be defined, their requirements for determining whether bus rehabilitation is cost effective and guarantees can be made.

Federal Programs

The **Urban Mass Transportation Administration**, Office of Bus Technology, is working with the American Public Transit Association to establish levels of rehabilitation by category and requirements for guarantees.

Contact: Ramon Lopez, Chief, Vehicle and Facilities Systems Division (URT-21), Urban Mass Transportation Administration, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-8483.

Local Programs

The **Washington Metropolitan Area Transit Authority** is actively involved in rehabilitation projects. In one recent program, WMATA remanufactured 260 GM buses. This program is expected to add 6-7 years of life to the buses. The second program involves installing rebuilt engines, transmissions, air starters, and electro lube oil refiners, as well as some body shop, cosmetics, and paint work.

Contact: Lloyd Gimple, Resource Support Officer, Department of Bus Service, WMATA, 600 5th Street, N.W., Washington, DC, (202) 637-1187.

The **Southeastern Pennsylvania Transportation Authority** currently has a program to rehabilitate 292 buses, 272 of which have been contracted out and 20 of which are being done in-house. This program is designed to add a minimum of 5 years to the bus life cycle, which will make the total life at least 20 years. SEPTA also has an in-house trolley rehabilitation program for 110 trolleys. To date, 60 have been completed.

Contact: Jeffrey McCormick, Manager, Automotive Equipment Maintenance,SEPTA, 200 Wyoming Avenue, Philadelphia, PA 19140, (215) 456-4500.

Applicable References

Bus Rehabilitation Guidelines, Battelle Laboratories, Columbus, Ohio, U.S. Department of Transportation, February 1983.

Economic Comparison of New Buses Versus Rehabilitated Buses, Battelle Laboratories, Columbis, Ohio, U.S. Department of Transportation, February 1983.

Puget Sound Council of Governments (PSCOG), *The Role of Rehabilitation in Transit Fleet Replacement*, March 1983. Available from U.S. Department of Transportation, Technology Sharing I-30, 400 7th Street, S.W., Washington, DC 20590.

Bus Garages and Maintenance Facilities

Problem Statement

There is a need for wider dissemination of information on standards, criteria, and operating requirements for bus garages and maintenance facilities.

The siting, design, and operation of bus garages and maintenance facilities involves a number of complex problems. For instance, many facilities are old, have outmoded equipment, and may be located in highly congested areas. Others are located in marginal areas where access is difficult and employee parking is scarce or unsafe. Design problems are encountered with obsolete equipment, poorly designed space arrangements, badly spaced or designed service islands, lack of storage space for equipment, poor pit design, inappropriate lift/hoist equipment, etc. Operating difficulties are encountered in fueling, heating and ventilating systems, traffic flow, etc. New garages and facilities encounter obstacles to efficient siting and frequently are underdesigned.

Possible Solutions

Prepare a revised bus maintenance facilities handbook detailing the state-of-the-art developments.

Develop standards for design and operation.

Encourage broader technology sharing.

Solution Considerations

Maintenance is vital to effective equipment management and deserves the attention of top management. Repeated equipment failures and inadequate facilities tend to discourage effective maintenance programs. The long lead time required to site, design, and construct a new bus garage results in a need for continuous state-of-the-art monitoring by transit properties.

Federal Programs

Bus maintenance facilities research is conducted on a limited basis by UMTA.

Contact: Steve Asatoorian, Office of Bus Technology, Urban Mass Transportation Administration (URT-2), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4935.

Local Programs

The **Washington Metropolitan Area Transit Authority** is upgrading design and operational procedures for its new on-line garage facility. Traffic flows in one direction to avoid collisions. In addition, all parking is pull-in/pull-out, which eliminates reverse backing. The location of service islands permits buses to park and receive proper servicing. This includes a computerized monitoring system to report fuel, oil, and coolant usage and printout exception reports for any parameter that exceeds guidelines. Fueling and interior sweeping can be carried out simultaneously. Wide drains are located at the service islands to capture spillage and prevent contamination of recycled water in the washing area.

Contact: Paul Gillum, Assistant Director for Training and Quality Assurance, Washington Metropolitan Area Transit Authority, 2250 26th Street, N.E., Washington, DC 20018, (202) 635-4392.

The **Utah Transit Authority** recently constructed a bus garage and maintenance facility that consists of three buildings: a repair shop, a fueling center, and a wash and brake adjustment building. The facility serves 190 buses, with a design capacity of 250. Buses are stored in adjacent carports, which helps to prevent windshield frosting; 210v block heaters are used to assist starting buses in winter months. In the repair shop, buses are backed into one of the 17 repair bays, which are situated so that the foreman can easily view all work in progress. The parts area, lockers, and rest rooms are located in the center of the structure, and six pit positions for preventive maintenance occupy the third sector. Buses are cycled through hold and ready lines by helpers.

Contact: James A. Ercanbrack, Director of Maintenance, Utah Transit Authority, 3600 South 7000 West, Salt Lake City, UT 84031, (801) 262-5626.

Another new facility, built by the **Phoenix Transit System (PTS)**, is designed as a heavy maintenance facility for 400 buses. It serves as an operations center for 200 buses. The site is comprised of four buildings—operations, maintenance, wash/inspection, and fuel/tire—and a sun canopy for bus parking. The repair bays are designed for back-in/pull-out operation. The facility was designed with input from maintenance personnel. It has numerous positive design features, such as special floor surfaces for easy cleaning, high pressure sodium lights, closed-circuit television monitors for security, drains in each work area for dumping waste oil, and efficient and safe in-ground hoists.

Contact: T. J. Ross, Director of Maintenance, City of Phoenix Transit System, P.O. Box 4275, Phoenix, AZ 85030, (602) 256-3460.

Applicable References

The Mitre Corporation, *Bus Maintenance Facilities*, Report No. UMTA-VA-06-004-75-5, prepared for the U.S. Department of Transportation, Urban Mass Transportation Administration, November 1975.

Taxicabs as Public Transit

Problem Statement

Taxicabs can provide a needed service where fixed route public transit service is infrequent or nonexistent.

Shared-ride services can often be provided cost effectively, but they may be prohibited or discouraged by local or state ordinances.

Possible Solutions

Initiate taxi service to provide:

- feeder service to fixed route transit
- service to low-density areas
- substitute service for fixed-route transit during off-peak hours

Examine the possibility of modifying or revising regulations, subsidy and payment methods, and labor requirements.

Solution Considerations

Information on experiences with innovative, exemplary taxicab services should be disseminated. A model taxicab ordinance may be useful.

Federal Programs

Boston, Massachusetts, is studying the feasibility of implementing shared-ride taxi services for the general public. The project is concentrating on a pilot neighborhood and is examining institutional and regulatory barriers, fare structure, driver and user acceptance, and dispatching problems.

Contact: Lawrence A. Bruno, Urban Mass Transportation Administration, Services and Methods Demonstration (URT-31), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4984.

Local Programs

Metro Dade County, Florida, is conducting a project to integrate taxi and transit services. A major component of the project is computer-assisted routing, scheduling, dispatching, and management information systems. The county has adopted extensive changes in taxi regulations.

Contact: Carl Marsella, Metro Dade County Transportation Administration, 44 Flagler Street, 14th Floor, Miami, FL 33130, (305) 579-2594.

Ann Arbor, Michigan, is demonstrating the feasibility of contracting with private taxi operators to provide service during late night hours when conventional transit is uneconomical. Door-to-door taxi service is provided by a city-licensed taxi operator with dedicated vehicles within the city limits of Ann Arbor from 11:00 p.m. to 6:00 a.m.

Contact: G. Christopher White, Ann Arbor Transit, 3700 Carpenter Road, Ypsilanti, MI 48197, (313) 973-6500.

The **Seattle, Washington** City Council revised its taxicab regulations, removing the previous statutory limit on total taxicab permits and permitting variable pricing by operators with rate changes permitted up to four times a year. The new regulations also include increased vehicle safety and inspection criteria and retain operator qualification requirements under open entry. Seattle was the first American city to make such comprehensive regulatory revisions.

Contact: Regina Glenn, Director of Licenses and Consumer Affairs, Municipal Building, 600 4th Avenue, Room 102, Seattle, WA 98104, (206) 625-2536.

Portland, Oregon, has reimposed restrictions on entry and stiffened requirements for driver permits. Authority for determining operator qualifications and other regulations was removed from the Taxi Supervisor and placed again with the City Council.

Contact: Linda Francin, 1120 Southwest 5th, Room 930, Portland, OR 97204, (503) 796-7237.

San Diego, California, has revised its regulations to replace standard fares with maximum rates, abolish public convenience and necessity certification requirements, provide for fixed-route and shared-ride services, and standardize licensing fees, insurance and reporting requirements.

Contact: Barbara Lupro, Paratransit Administrator, City of San Diego, 202 C Street, Mail Station 8-A, San Diego, CA 92101, (619) 236-7117.

Chapel Hill, North Carolina, has been operating a ***shared-ride taxi service*** since August 1977 as a replacement for an under utilized fixed-route evening service. The ordinance was recently amended to give the passenger the option whether to share the ride.

Contact: Robert Godding, Chapel Hill Transit, City of Chapel Hill, 306 North Columbia Street, Chapel Hill, NC 27512, (919) 929-1111.

Applicable References

Taxicabs as Public Transit, An Urban Consortium Information Bulletin, U.S. Department of Transportation, prepared by Public Technology, Inc., September 1980.

Taxicab Innovations, Services, and Regulations: Proceedings of the National Conference on Taxicab Innovations. U.S. Department of Transportation, edited by Public Technology, Inc., 1980.

Shared Ride Taxi Services as Community Public Transit, Institute of Transportation Studies, University of California, Irvine, March 1980. Available from NTIS, PB 80 226 475.

Transportation for the Elderly and Handicapped

Problem Statement

The most efficient use is not being made of local transportation resources, and many elderly and handicapped persons remain unserved.

In many cities and regions, special transportation services for the elderly and handicapped are provided or funded by a variety of social service agencies and organizations. A wide range of approaches is available, and a coordinated transportation program, using public and private transportation firms in conjunction with social service agencies, could provide at least a partial solution to the problem.

Possible Solutions

Encourage interagency referral of information.
Identify cost-effective approaches to data collection.
Facilitate joint purchasing arrangements.
Consolidate equipment and services.
Provide information on the effectiveness of various types of services.

Solution Considerations

Local agencies must be able to identify the location and transportation requirements of elderly and handicapped persons and develop services to meet those needs. Technical assistance should be available to provide information on applicable regulations and effective planning methods.

Federal Programs

The **Urban Mass Transportation Administration** is directly subsidizing the cost of trips purchased by the elderly and handicapped rather than subsidizing the transportation providers. User-side subsidies in the form of discounted rates for bus or taxi fares through the use of tickets or voucher systems have been provided in a number of cities. This concept has been used as a catalyst for coordinating social service transportation services.

Contact: Lawrence A. Bruno, Urban Mass Transportation Administration (URT-31), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4984.

A recent **Urban Mass Transportation Administration** project provided technical assistance to designated State and local areas in the planning of improved transportation services for handicapped persons. This project was designed to help local agencies help themselves, and to improve mobility for the handicapped through the dissemination of information.

Contact: Patricia Cass, Urban Mass Transportation Administration (URT-31), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4984.

An **Urban Mass Transportation Administration** study analyzed existing elderly and handicapped services to determine what has been accomplished by improved special transportation services, particularly those designed to accommodate wheelchair users and semiambulatory persons.

Contact: Richard Steinmann, Urban Mass Transportation Administration (UBP-30), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4004.

Local Programs

The city of **Huntsville, Alabama,** has developed neighborhood transportation services using volunteers. The city provides used vans to neighborhood associations, who are responsible for operating the vans. The city views the service as the most cost-effective means of providing transportation to the transportation disadvantaged because it is able to provide a higher level of service at a lower cost than is possible with fixed-route bus service.

Contact: Ira Doom, Department of Transportation, 100 Church Street, Huntsville, AL 35801, (205) 532-7440.

The **Pittsburgh, Pennsylvania, Paratransit Broker Demonstration** was designed to coordinate transportation services for the elderly and handicapped through the use of a broker. The broker ensured the availability of dispatching and transportation resources, provided a mechanism for the flow of funds, marketed the system actively, and monitored the entire system.

Contact: Tom Letky, Port Authority Transit, Beaver and Island Avenues, Pittsburgh, PA 15233, (412) 237-7260.

The **Share-A-Fare program in Kansas City, Missouri,** uses two taxi companies to provide transportation services to the elderly and handicapped. The participating taxis are permitted to offer shared-ride service under a special exemption of the taxicab ordinance. The city is currently determining user satisfaction with the program and assessing the need for door-to-door service.

Contact: Verna Shumate, Director of Special Transit, Transportation Department, 414 East 12th Street, Kansas City, MO 64106, (816) 274-1802.

Dade County, Florida, provides curb-to-curb transportation to handicapped persons. The county contracts with several taxicab companies to provide the routing and scheduling and the transportation service. Most trips are made in nonmetered vehicles. The program also provides transportation of the handicapped to local community colleges.

Contact: Orrie R. Strubinger, STS Project Manager, 44 West Flagler Street, 14th Floor, Miami, FL 33130, (305) 579-2594.

Applicable References

Bell, W.G., and Revis, J.S., *Transportation for Older Americans—Issues and Options for the Decade of the 1980's,* prepared for the U.S. Department of Transportation, Office of the Secretary of Transportation, Office of Technology and Planning Assistance, April 1983.

Del Green Associates, Inc., *Use of Volunteers in the Transportation of Elderly and Handicapped Persons,* DOT-I-84-02, prepared for Urban Mass Transportation Administration, January 1984.

Airports

500

Airport Parking and Access

Problem Statement

Increased air traffic resulting from deregulation and improved economic conditions has resulted in increasing congestion at and around major metropolitan airport terminals.

There is a need for planning, design, and operation of innovative solutions, including greater utilization of high-occupancy access modes. Access highways to most major airports have limited capacity, many terminal frontage areas are congested, and airport parking frequently reaches capacity. Implementation of improvements is complicated by the many overlapping jurisdictions. These groundside problems will be exacerbated as air traffic increases, more wide-bodied aircraft are employed, and more flight delays occur. Additional air freight service also burdens access roads.

Possible Solutions

More control of access roads by airport operators.
Improved curbside facilities for passenger loading and unloading.
Direct transit access (bus or rail).
Downtown or satellite terminals.
Improved information on available public transportation services.
Better enforcement of curbside dwell-time limits.
Funding for capital investment.
Accessible short-term parking.

Solution Considerations

Because access is generally dependent on the regional highway network, with one major roadway providing direct access, there are conflicts as airport peak activity periods frequently coincide with commuter peak-period use of highways. Although high-occupancy vehicle service is desirable, it is difficult to implement because of the widely dispersed origins and destinations of most airport users. Many hub airports are unable to handle the increasing number of aircraft, causing system delays that result in greater terminal congestion.

Federal Programs

The **Federal Aviation Administration** provides planning assistance grants to local government airport sponsors for master planning (including access) and systems plans through the National Plan of Integrated Airport Systems (NPIAS) which identifies airports that are eligible for planning grant assistance through the Airport Improvement Program (AIP).

Contact: Regional FAA office or James V. Mottley, Manager, National Planning Division (APP-400), Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, DC 20591, (202) 426-3451.

Lowell H. Johnson, Manager, Grants-in-Aid Division (APP-500), Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, DC 20591, (202) 426-3831.

The **Federal Aviation Administration** recently inaugurated the **Washington Flyer** coach and minibus system serving Dulles International and Washington National Airports from downtown and suburban Maryland and Virginia hotels. The system is funded by FAA and a private contractor operates the service.

Contact: Richard Griesbach, Commercial Operations Branch, Metropolitan Washington Airports, Washington National Airport, Washington, DC 20001, (703) 557-2045.

Local Programs

The Greater Cleveland Rapid Transit Authority (RTA) provides direct heavy rail service from downtown to an enclosed terminal at the Cleveland-Hopkins International Airport. The airport extension was opened in 1968 on old railroad right-of-way. Running time is about 25 minutes to Public Square at present, but is expected to increase when new, larger rail cars go on line later this year. All cars have luggage space.

Contact: Charles Hunt, Director of Rail, Greater Cleveland Rapid Transit Authority, 615 Superior Avenue, Cleveland, OH 44113, (216) 566-5084.

San Francisco International Airport maintains a 15-person Office of Landside Operations to oversee access. About 20 percent of the passengers utilize the SFO Airporter bus which uses a centrally located downtown terminal and designated loading areas at each of the three airport terminal buildings. A user-interactive computerized Ground Transportation Information System demonstration project provides travelers with information on costs and travel times to numerous destinations. The parking garage is designed to encourage short-term trips away from terminal curbs. Color-coded areas are designated for ground transportation modes.

Contact: Sheldon R. Fein, Assistant Deputy Director, Airport Operations, San Francisco International Airport, P.O. Box 8097, San Francisco, CA 94128, (415) 876-2237.

The **FLYAWAY** program provides express bus service to **Los Angeles International Airport** from a remote bus terminal at Van Nuys. This program has operated successfully for several years, serving 721,842 passengers in 1983. Parking in the 1,400-vehicle lot costs $1.00 per day and the 25-mile bus trip is $3.00 each way. The buses run on one-half headways and maintain good average ridership. Negotiations are underway with three major airlines to provide ticket counters at the remote terminal.

Contact: Rick Wells, Senior Facilities Planner, Department of Airports, 1 World Way, Los Angeles, CA 90009, (213) 646-6261.

Applicable References

Mundy, Ray A., Editor, *Airport Ground Transportation, Problems and Solutions*, Airport Ground Transportation Association/Caltrans Conference Proceedings, February 23-25, 1981, distributed by U.S. Department of Transportation, DOT-I-82-48, February 1981.

Airport Noise Compatibility

Problem Statement

Aircraft operation results in the production of noise. The cumulative amount of noise produced will vary, depending on the type of aircraft flown, the total number of operations, and the schedule of the operations. If there is a significant cumulative amount of noise beyond the boundary of the airport, there is a need to consider the impact of that noise on noncompatible land uses around the airport (e.g., residential areas, schools, hospitals, auditoriums, some recreational facilities). A significant noise impact over a substantial amount of noncompatible uses tends to cause friction between the airport and the community.

Possible Solutions

Site new airports in areas of maximum compatible land use.

Enact local land use controls, including zoning, to prevent noncompatible development.

Design airport operational areas to minimize proximity of ground facilities and aircraft overflights to noise-sensitive areas.

Adjust flight procedures.

Acquire additional property as noise buffer.

Soundproof noise-sensitive buildings and acquire easements.

Solution Considerations

Airport noise compatibility is a complex issue. Solutions are site specific, i.e., what works best at one airport location may not be desirable at another. Consideration of an airport's noise problem and the study of potential solutions should not be done in a vacuum solely by the airport proprietor, but should involve public and planning agencies with jurisdiction around the airport, community representatives, airport users, and the Federal Aviation Administration (FAA). The cooperation of one or more of these groups may be necessary to implement solutions. In some cases, circuitous flight tracks designed to relieve noncompatible land uses may result in increased costs to operators.

Federal Programs

The **Federal Aviation Administration** has issued Federal Aviation Regulation (FAR) Part 150, Airport Noise Compatibility Planning, to implement the Aviation Safety and Noise Abatement Act of 1979. FAR Part 150 prescribes the procedures, the standards, and methodology governing the development of airport noise compatibility programs and their review by FAA. Projects in FAA-approved airport noise compatibility programs are eligible for Federal assistance through the Airport Improvement Program.

Contact: Regional FAA Airport Division or Lynne S. Pickard, Manager, Community and Environmental Needs Division (APP-600), Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, DC 20591, (202) 426-3263.

Lowell H. Johnson, Manager, Grants-in-Aid Division (APP-500), Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, DC 20591, (202) 426-3831.

Local Programs

The noise abatement plan for **Portland International Airport** was developed on a cooperative basis with an advisory committee comprised of representatives of the community, the airlines, FAA, and the Air Transport Association. Interim operational procedures have recently been instituted to reduce the impact on residential areas by concentrating arrival and departure flight tracks along the Columbia River. Turns are prohibited until reaching 6,000-feet altitude. The number of residents adversely affected has dropped by nearly 70,000.

Contact: John P. Newell, Noise Abatement Officer, Portland International Airport, P.O. Box 3529, Portland, OR 97208, (503) 231-5000, ext. 407.

As part of the noise abatement plan at Eppley Airfield in **Omaha, Nebraska**, a secondary commercial runway was extended 2,000 feet to allow departing aircraft to make a noise abatement turn prior to reaching a residential area in Council Bluffs, Iowa. This major improvement was accomplished in advance of the planned date.

Contact: Dan L. Schultz, Director of Planning and Development, Omaha Airport Authority, Box 19103, Eppley Airfield, Omaha, NE 68119, (402) 422-6800.

As part of its noise abatement plan at **Hartsfield Atlanta International Airport**, approximately 2,000 feet were added to each end of a major runway. To do this, residential developments were purchased and converted to runway or noise compatible commercial or industrial uses.

Contact: Maxwell Walker, Deputy Commissioner, Hartsfield Atlanta International Airport, Department of Aviation, Atlanta, GA 30320, (404) 530-6600.

Ports

600

Landside Access to Port Facilities

Problem Statement

Conflicts between port access needs and other urban land uses and traffic patterns can result in local antagonism and in loss of business to ports with minimal access problems.

Truck access to port facilities is frequently restricted by traffic congestion on bridges and in tunnels, poor routing and signing, and additional travel required to reach remote terminals and rail heads. Increased port traffic and the advent of high-wide loads have exacerbated this problem. Rail access to many sites is similarly affected by inadequate bridges, short track curve radii, and rail routes that may impede vehicular traffic movements.

Possible Solutions

Incorporate multimodal port access into the overall transportation planning process conducted by metropolitan planning organizations (MPOs).

Encourage active participation by the private sector in planning, designing, financing, and implementing solutions.

Modernize and improve existing terminals, roads, and railroads.

Support costs of improvements with user fees, when possible.

Construct special ramps and improve utilization of toll roads to improve traffic flow to port areas.

Solution Considerations

Port connectivity is often considered to be outside the purview of local or regional transportation planning agencies. However, landside improvements can have a positive effect in addressing issues, such as traffic congestion, air and noise pollution, impact on residential streets, and energy consumption. Similar solutions can be applied to nonport intermodal terminals.

Federal Programs

The **Maritime Administration (MARAD)** monitors local programs to improve access.

Contact: John R. Pisani, Director of the Office of Port and Intermodal Facilities, Maritime Administration (MAR-830), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4357.

Local Programs

The **ports of Los Angeles and Long Beach** are cooperating with the Southern Pacific Railroad (SP) in the construction of a major Intermodal Container Transfer Facility (ICTF). On land leased from the Port of Los Angeles, the SP plans to build a double-ended facility within about 5 miles of the container terminals at both ports, thus eliminating 20-22 miles of truck drayage to the SP rail head. The $50 million facility will be financed by revenue bonds to be issued by a joint governing body of the ports. The 16-lane entrance/exit gate will provide port checkpoints for arriving trucks.

Contact: Arthur B. Goodwin, ICTF Project Manager, Port of Los Angeles, 425 S. Palos Verdes Street, P.O. Box 151, San Pedro, CA 90733, (213) 519-3658.

In **Baltimore, Maryland**, the Dundalk Marine Terminal is conducting a program to handle increased truck traffic of over 2,000 vehicles daily. Due to both physical and operational obstacles, the trucks were clogging city streets while awaiting processing. These problems are being alleviated by enlarging the gate area so trucks can queue inside the terminal. In addition, weighing and checking operations will be conducted inside the terminal.

Contact: Louis W. Willett, Director of Planning and Research, Maryland Port Administration, The World Trade Center—Baltimore, Baltimore, MD 21202, (301) 659-4794.

An aggravating situation existed at the **City of Salem, NJ, Municipal Port** due to a major city road that went through the center of the port. Stacking of tractor-trailers waiting to unload blocked 30 percent of the roadway width. In addition, a blind corner also posed a safety hazard to motorists. A solution was found when the port assumed control of the road and installed a series of barricades and gates to segregate traffic. City traffic was diverted at a logical point to a reconstructed by-pass road.

Contact: Louis Joyce, Director of Planning, City of Salem Municipal Port Authority, 62 Front Street, Salem, NJ 08079, (609) 935-6380.

Intermodal Port Planning

Problem Statement

In many coastal areas port planning has typically involved only land port facilities without consideration of the synergistic effects of waterside access, impacts on adjacent port facilities, or on landside activity. More recently, with the advent of regional port planning and coastal zone management, these considerations hove been identified, but not always sufficiently well addressed. There is further need to include all affected agencies in the planning process. Some recent railroad mergers have resulted in loss of yard and access capacity.

Possible Solutions

Greater participation by the U.S. Maritime Administration (MARAD) in regional port planning guidance.

Involvement of all areawide planning agencies in the process.

Inclusion of railroad and trucking representatives in the planning, and continued interface during port development.

Persistence in implementing the plan during the port development process.

Within the region, rational allocation of forecasted cargoes to individual ports.

Solution Considerations

A resurgence of international trade, coupled with a greater demand for waterside land, has resulted in competition, not only for cargoes and facilities, but also for competing uses of land. More joint development of sites and facilities will be required.

Federal Programs

The **Maritime Administration (MARAD)** provides information on regional port planning and siting.

Contact: John R. Pisani, Director of the Office of Port and Intermodal Facilities, Maritime Administration (MAR-830), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4357.

Local Programs

In the **San Francisco Bay** area the Metropolitan Transportation Commission (MTC) and the Bay Conservation and Development Commission (BCDC) developed the Bay Area Seaport Plan. The plan was unique in bringing cooperation in port facilities planning among traditional adversaries, including individual ports. The plan provides the basis for permitting, and must be reassessed if existing terminals fall into disuse for an extended time period.

Contact: Dennis R. Fay, Metropolitan Transportation Commission, Metro Center, 101 8th Street, Oakland, CA 94607, (415) 464-7700.

A study of the **lower Mississippi** resulted in a large fleeting site requirements plan that can serve as a guide to other siting operations.

Contact: Carl Sobremisama, Office of Port and Intermodal Facilities, Maritime Administration, (MAR-830), U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590, (202) 426-4357.

Applicable References

E.J. Bentz and Associates, Inc., *Lower Mississippi River Regional Barge Fleeting Assessment, Plan, and Handbook Guide,* prepared for Maritime Administration, Office of Port and Intermodal Development, December 1984.

U.S. Maritime Administration, *A Report to the Congress on the Status of the Public Ports of the United States,* August 1984.

Appendices

Appendix A
Preliminary List of Transportation Needs and Programs

The following is a list of 243 needs and program candidate topics from which the priority list of topics was selected.

100 TRANSPORTATION PROGRAM MANAGEMENT

110 ADMINISTRATION AND POLICY

110.1 Institutional Concerns

- Intergovernmental coordination in transportation system expansion
- Management of transportation organizations
- Traffic disruption (handling, responsibility)
- Accelerated implementation procedures
- Successful use of minority business

110.2 Interagency Interaction

- Public/private transportation coordination
- Conflicts between MPOs and implementing agencies
- The role of TSM in interagency activity
- Coordination of parking strategies with public transportation

110.3 Marketing

- Transportation project marketing
- Marketing special services

120 FINANCE AND TAXATION

- Innovative local funding
- New financing methods

130 REGULATION

- Federal air quality requirements and measurement techniques

140 GENERAL PLANNING

- Growth management investment
- Computer use for planning
- Project management
- Non-CBD redevelopment procedures
- Telecommunications resources, availability
- Techniques for transportation decisionmaking
- Citizen participation
- Risk management
- Project prioritization
- Alternatives analysis
- Transportation planning and impact forecasting tools

150 EVALUATION

- Economic impacts of traffic restrictions
- Social impacts of new major transportation facilities
- Urban blight study
- TSM, air quality, and energy conservation
- Transportation energy contingency planning
- Traffic in residential areas
- Urban neighborhood traffic volumes
- Noise abatement programs
- Urban transportation improvement impacts
- Urban rail system impacts
- Street impact analysis for Woonerfs

160 OTHER ISSUES

Alternative fuels
Fuel and oil additives
Hazardous materials
Freight
Pipelines
Special events

200 TRANSPORTATION SYSTEMS MANAGEMENT

210 ADMINISTRATION

Financial impacts, forecasting
Taxation
Economics of transportation restrictions

220 CENTRAL CITY ISSUES

Circulation and transit facilities
Low-capital design schemes
Urban revitalization
Parking

230 OPERATIONAL CONTROLS

231.1 Preferential Treatment

Fringe parking and express buses
Priority treatment for HOVs
Exclusive lanes

231.2 Demand Modification

Ridesharing programs for commuters
Use of high-occupancy vehicles
Alternative work schedules

231.3 Parking

Parking and zoning requirements
Design standards
Parking in non-CBD areas
Parking area security
Parking for handicapped
Parking management
Parking enforcement

240 NON-MOTORIZED TRANSPORTATION

241.1 Bicycles

Integration with public transportation
Operator education
Bicycle parking
Facilities planning and implementation
Bicycle-pedestrian conflicts
Safety of bicycles on rapid rail
Law enforcement
Accident and volume data

241.2 Pedestrians

Pedestrian and street traffic design
Safety, amenities, transit access, and general movement
Wheelchair ramps
Provision of facilities

250 URBAN GOODS MOVEMENT
- Route selection and enforcement
- Double bottom trucks

300 STREETS AND HIGHWAYS

310 ADMINISTRATION

310.1 Finance and Budgeting
- Budget development
- Effects of budgetary limitations on traffic control strategies
- Innovative local funding
- New financing methods

310.2 Human Resources
- Manpower management
- Productivity assessment
- Resource allocation

310.3 Information Management
- Construction management systems
- Traffic control system management
- Street management information systems
- Driver information systems
- Accident information systems
- Street facilities inventory

320 DESIGN AND CONSTRUCTION

320.1 General Design
- Flexible Federal design standards
- Standard specifications for street construction
- Storm water runoff requirements
- Highway access control
- Freeway reconstruction standards
- Right-of-way management and acquisition
- Narrow right-of-way dedication
- Service road design and operations standards
- Parkway and boulevard development
- Improved railroad crossings
- Understreet utilities coordination
- Locating underground utilities
- Street lighting alternatives
- Bicycle considerations in design

320.2 Materials
- Anti-skid paving material
- Noise reduction pavement materials
- Crackfilling material
- Pothole patching materials
- Noncorroding bridge materials
- Asphalt repair, removal, and recycling
- Concrete repair, removal, and surface treatment
- Strength measurement

320.3 Structures
- Expansion joints in concrete pavements adjacent to bridges
- Improved manhole lid and frame seal
- Resilient signposts
- Pavement void detection

320.6 Soil Mechanics and Stabilization
- Soil and slope stabilizers
- Soil compaction techniques

330 MAINTENANCE
- Street standards maintenance management
- Financial forecasting
- 3R/4R cost impacts
- Herbicide spraying vs. mowing
- Curb, gutter, sidewalk repair
- Utility trench repair
- Snow removal and deicing techniques
- Bonding agents and adhesives

340 SIGNS AND MARKINGS
- Increased lane line reflectivity
- Alternatives to conventional paints
- Traffic paint removal
- Wear characteristics of pavement markings

350 OPERATIONS

350.1 Traffic Control Measures
- Traffic flow monitoring
- Ramp metering
- Traffic signal preemption alternatives
- Neighborhood traffic control
- Auto use restrictions
- Selective highway closure
- Permissive left-turn signal phasing
- Left turn on red
- Signal warrants for high-speed highways
- Warrant conditions for flashing beacons

350.2 Traffic Signals
- Signal system design
- Signal interconnection alternatives
- Standard controller cabinets
- Signal back-up systems
- Signal maintenance

350.3 Traffic Signs
- Warrants and guidelines for use of intersection controls
- Vandal-resistant sign materials
- Signing for high-speed signalized approaches
- Variable message signs

350.4 Other Traffic Control Devices
- Temporary barriers/barricades
- Removable channelization devices
- Comparison of traffic channelization measures
- Traffic and pedestrian route delineation devices

360 SAFETY
- Passenger restraints
- Driver education
- Law enforcement
- Methods to reduce traffic signal and sign violations

Construction and work zone safety
School zone safety
High-hazard locations
Cost-effective countermeasures

400 TRANSIT

410 ADMINISTRATION

410.1 Finance
Financing transit capital costs
Financing transit operating costs
Non-Federal alternatives for financing public transportation
Compliance with Federal funding requirements

410.2 Costs and Budget
Alternative approaches to budget preparation
Bus route cost analysis

410.3 Fares and Pricing
Transit pricing policies
Fare elasticity
Innovative fare collection options
Transfer policy

410.4 Productivity
Transit system productivity
Productivity cutbacks vs. service to transit dependent
Transit service evaluation standards
Improved energy use

410.5 Human Resources Management
Training programs for transit employees
Screening process for prospective transit vehicle operators
Absenteeism and morale problems
Part-time drivers
Work rule changes
Transit strike contingency planning

410.6 Marketing
Marketing public transportation
Transit marketing for small systems
Public transportation information
Transportation brokerage
Coordination of city and suburban transit

410.7 Information Management
Management information systems for transit
Management information systems for small transit agencies
Management information for subsidized transit service
Ridership data collection procedures

410.8 Safety and Security
Transit security systems
Fire safety in transit systems

420 DESIGN AND CONSTRUCTION
UMTA's alternatives analysis process
New transit systems
Ridership forecasting techniques
Downtown traffic intercept strategies
Route network design
Design criteria for transit terminals

Rapid transit construction
Transit service to recreational facilities
Interactive computer graphics for transit route development
Transit access along commercial strips
Transit service coordination

430 OPERATIONS AND MAINTENANCE

430.1 Buses

Bus rehabilitation
Improved bus tires
Improved bus cleaning equipment
Improved brake materials
Bus air conditioning
Reliable lift equipment
Bus garage and maintenance facility requirements
Computer linked route indicator
Schedule conformance
Small bus standards

430.2 Light and Heavy Rail

Equipment maintenance
Total energy requirements
Reliability concerns
Safety in station areas
Water intrusion into older tunnels

430.3 Circulation Systems

Collection/distribution systems
Center city circulation systems
Special area circulation systems
Special user needs (airports)

430.4 Paratransit and Special Services

Coordination of paratransit providers
Taxi services (shared ride)
Jitney services
Demand responsive services
Integration of paratransit with conventional transit
Taxicabs as paratransit providers
School bus use for non-school transportation
Subsidized transportation service

500 AVIATION

510 ADMINISTRATION

Financing airport improvements
Intermodal considerations

520 DESIGN AND LOCATION

520.1 Major Airports
520.2 Heliports
520.3 Short Take-off and Landing (STOL) Airports
520.4 Reliever Airports
520.5 Community Airports (General Aviation)

530 OPERATIONS AND MAINTENANCE

Congestion pricing for major airports
Joint use of military airports
Airport noise control
Airport parking
Airport ground access
Helicopter operation
Goods movement

600 WATERBORNE TRANSPORTATION

610 ADMINISTRATION

User fees and tolls

620 DESIGN AND CONSTRUCTION

Port expansion and new facilities

630 OPERATIONS AND MAINTENANCE

Intra-urban waterborne services
Traffic on heavily traveled highways, bridges, tunnels
Rail, barge, and truck access to port facilities
Conflicts with residential areas

Appendix B
List of Abbreviations

APA	American Planning Association
APTA	American Public Transit Association
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
BMI	Bellomo-McGee Inc.
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
ITE	Institute of Transportation Engineers
NCHRP	National Cooperative Highway Research Program
NCTRP	National Cooperative Transit Research and Development Program
NHTSA	National Highway Traffic Safety Administration
OST	Office of the Secretary of Transportation
RSPA	Research and Special Programs Administration
UMTA	Urban Mass Transportation Administration

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