TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
UMTA/TX-90/2004-1F		

4. Title and Subtitle	5. Report Date
Transit Study Needs in Texas	September 1989
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Robert W. Stokes	Technical Report 2004-1F

9. Performing Organization Name and Address	10. Work Unit No.
Texas Transportation Institute The Texas A&M University System College Station, Texas 77843-3135	11. Contract or Grant No. Study No. 2-11-89-2004
	13. Type of Report and Period Covered Final - September 1988 September 1989
12. Sponsoring Agency Name and Address Texas State Department of Highways and Public Transportation; Transportation Planning Division P. O. Box 5051 Austin, Texas 78763	14. Sponsoring Agency Code

15. Supplementary Notes

Research performed in cooperation with TX, UMTA.
Technical Research Study Title: Development of a Public Transportation Technical Studies Agenda for Texas

16. Abstract

This report presents the results of a survey conducted to identify transit study needs in Texas. The report summarizes the study needs identified from the survey, presents a general prioritization of those needs, and outlines a preliminary study agenda to address these study needs. The results of the survey indicate that the most pressing unmet transit study needs in Texas are in the following general areas: 1) Improving coordination and cooperation between local service providers and state and local transportation agencies; 2) Defining and quantifying the appropriate role(s) of transit in meeting the state's mobility needs; and 3) Developing innovative, broad-based funding strategies for the state's transit systems. The survey respondents also cited the need for studies concerning the development of training and continuing education programs for transit and transportation agency personnel, studies concerning the development and testing of technologies to comply with EPA clean air standards, human resources management, and transit service strategies for serving suburban and low density travel markets.

17. Key Words	18. Distribution Statement
	No restrictions. This document is available to the public through the National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	44	

Form DOT F 1700.7 (8-69)

TRANSIT STUDY NEEDS IN TEXAS

By

Robert W. Stokes
Associate Research Planner

Technical Report 2004-1F
Study No. 2-11-89-2004
Development of a Public Transportation Technical Studies Agenda for Texas

Sponsored by

Texas State Department of Highways and Public Transportation
in cooperation with the
U.S. Department of Transportation
Urban Mass Transportation Administration

Texas Transportation Institute
The Texas A&M University System
College Station, Texas 77843

September 1989

This study was financed in part through a grant from the Urban Mass Transportation Administration, United States Department of Transportation under the Urban Mass Transportation Act of 1964, as amended.

METRIC (SI*) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
in	inches	2.54	millimetres	mm
ft	feet	0.3048	metres	m
yd	yards	0.914	metres	m
mi	miles	1.61	kilometres	km
AREA				
in^2	square inches	645.2	millimetres squared	mm^2
ft^2	square feet	0.0929	metres squared	m^2
yd^2	square yards	0.836	metres squared	m^2
mi^2	square miles	2.59	kilometres squared	km^2
ac	acres	0.395	hectares	ha
MASS (weight)				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
VOLUME				
fl oz	fluid ounces	29.57	millilitres	mL
gal	gallons	3.785	litres	L
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yd^3	cubic yards	0.0765	metres cubed	m^3

NOTE: Volumes greater than 1000 L shall be shown in m^3.

TEMPERATURE (exact)

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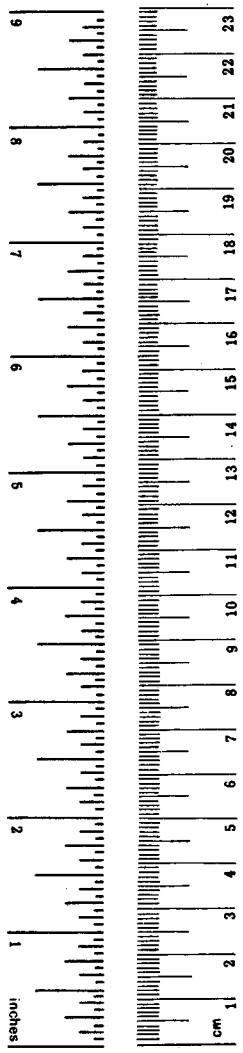

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
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mm	millimetres	0.039	inches	in
m	metres	3.28	feet	ft
m	metres	1.09	yards	yd
km	kilometres	0.621	miles	mi
AREA				
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m^2	metres squared	10.764	square feet	ft^2
km^2	kilometres squared	0.39	square miles	mi^2
ha	hectores (10 000 m^2)	2.53	acres	ac
MASS (weight)				
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kg	kilograms	2.205	pounds	lb
Mg	megagrams (1 000 kg)	1.103	short tons	T
VOLUME				
mL	millilitres	0.034	fluid ounces	fl oz
L	litres	0.264	gallons	gal
m^3	metres cubed	35.315	cubic feet	ft^3
m^3	metres cubed	1.308	cubic yards	yd^3

TEMPERATURE (exact)

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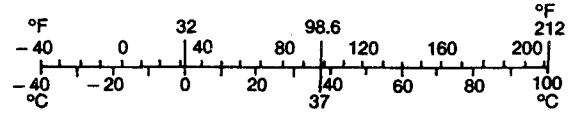

These factors conform to the requirement of FHWA Order 5190.1A.

* SI is the symbol for the International System of Measurements

ABSTRACT

This report presents the results of a survey conducted to identify transit study needs in Texas. The report summarizes the study needs identified from the survey, presents a general prioritization of those needs, and outlines a preliminary study agenda to address these study needs. The results of the survey indicate that the most pressing unmet transit study needs in Texas are in the following general areas: 1) Improving coordination and cooperation between local service providers and state and local transportation agencies; 2) Defining and quantifying the appropriate role(s) of transit in meeting the state's mobility needs; and 3) Developing innovative, broad-based funding strategies for the state's transit systems. The survey respondents also cited the need for studies concerning the development of training and continuing education programs for transit and transportation agency personnel, studies concerning the development and testing of technologies to comply with EPA clean air standards, human resources management, and transit service strategies for serving suburban and low density travel markets.

ACKNOWLEDGEMENTS

The author wishes to thank the following individuals and agencies for their contributions to this study.

- Jesse Balleza, San Antonio VIA
- John Bartosiewicz, Ft. Worth Transportation Authority
- Paul Bay, Houston Metro
- Representative David Cain
- Dick Chapman, SDHPT, Austin
- Wayne Cook, San Antonio VIA
- Walter Crook, SDHPT, Beaumont
- William Harvey, SDHPT, Amarillo
- David Hitchcock, Rice Center
- Larry Jacobs, Houston Metro
- James Karr, Caprock Community Action (Crosbyton)
- Scott Keller, Texas Bus Lines
- Robert C. Lanier, Houston Metro
- Naomi Lede', Houston Metro/Texas Southern University
- Tim Lomax, Texas A&M University (TTI)
- Philippos Loukissas, Rice Center
- John McBeth, Brazos Transit System
- Martin Minkoff, Capital Metro (Austin)
- Jerome Moore, SDHPT, Houston
- Larry Morris, Beaumont Municipal Transit
- Tom Niskala, Corpus Christi Transit Authority
- Chris Olavson, SDHPT, Houston
- Steven Polunksy, Chief Clerk, House Transportation Committee
- Ricardo Pulido, El Metro (Laredo)
- Debbie Ruggles, Abilene Transit System
- Allan Rutter, Governor's Office of Budget and Planning
- Gordon Shunk, North Central Texas COG
- Bob Stout, Houston Metro

ACKNOWLEDGEMENTS (Cont.)

- Karen Thompson, Texas Transit Association
- Tom Urbanik, Texas A&M University (TTI)
- Blas Uribe, UMTA Region VI
- Bill Ward, University of Texas at Austin (CTR)
- John Wilson, Lubbock Citibus
- Marcus Yancey, SDHPT, Austin

IMPLEMENTATION STATEMENT

This report presents the results of a survey conducted to identify transit study needs in Texas. The report summarizes the study needs identified from the survey, presents a general prioritization of those needs, and outlines a preliminary study agenda to address these study needs. Given the relatively small amount of transit study funds currently available to the state, the results of this study should be useful to state and local transit officials by providing a basis for the development and implementation of a systematic transit study agenda for Texas.

DISCLAIMER

SUMMARY

This report presents the results of a study designed to identify transit study needs in Texas. The objectives of the study were accomplished through a survey of state, local, and private transportation officials and agencies in Texas. A mail-out questionnaire, which was supplemented with telephone and personal interviews, was used to solicit input from individuals and agencies responsible for planning, designing, implementing, operating and maintaining the state's transportation systems. Representatives of the following agencies were invited to participate in the survey:

1) Texas State Department of Highways and Public Transportation, including Texas State Department of Highways and Public Transportation Commissioners;

2) Local public transportation agencies;

3) University transportation research centers;

4) Private transportation service providers;

5) Governor's office and elected state officials;

6) Regional Urban Mass Transportation Administration (UMTA) officials; and

7) Metropolitan Planning Organizations (MPOs).

Table S-1 provides a summary of the agencies surveyed in terms of the numbers of individuals contacted and survey response rates.

The survey results were categorized under the following six general headings: 1) Planning; 2) Policy; 3) Technology; 4) Management; 5) Funding; and 6) Training. Table S-2 presents a summary of the general study needs identified for each of these categories.

Table S-1. Summary of Agencies Surveyed

Agency	No. of Individuals Contacted	No. Responses Received
State Department of Highways and Public Transportation	6	4
Local Transit Agencies	21	13
University Research Centers	6	6
Private Providers	2	1
Governor's Office/State Representatives	2	2
UMTA (Region VI)	1	1
Metropolitan Planning Organizations	2	1
Total	40	28

The results of the survey indicate that the most pressing unmet transit study needs in Texas are in the following general areas: 1) Improving coordination and cooperation between local service providers and state and local transportation agencies; 2) Defining and quantifying the appropriate role(s) of transit in meeting the state's mobility needs; and 3) Developing innovative, broad-based funding strategies for the state's transit systems. The survey respondents also cited the need for studies concerning the development of training and continuing education programs for transit and transportation agency personnel, studies concerning the development and testing of technologies to comply with EPA clean air standards, human resources management, and transit service strategies for serving suburban and low density travel demands.

The results of this study indicate that the state's short-term (1990-1994) transit technical studies program should focus on the following areas.

1) Improving coordination and cooperation between local service providers and state and local transportation agencies.

2) Defining and quantifying the appropriate role(s) of transit in meeting mobility needs.

Table S-2. Summary of Survey Results

Study Category	Study Topics	No. Times Cited as Study Need
Planning	• Justification/Role of Transit in Texas	31 (2)*
	• Needs/Strategies/Funding for suburban transit services	11 (7)
Policy	• Lack of coordination between local and state agencies/providers	36 (1)
	• Drug testing	3 (10)
Technology	• Compliance with EPA clean air standards	15 (5)
	• Use of technology in planning, management and operations	9 (8)
	• Vehicle design, safety and component reliability	8 (9)
Management	• Human resource management	12 (6)
	• Marketing transit	9 (8)
	• Risk management	3 (10)
Funding	• Need for stable, equitable local funding sources	19 (3)
Training	• Training/educational programs	18 (4)

*(X) denotes study topic rank (1 = most frequently cited study need).

3) Identification and evaluation of local funding sources for transit.

4) Development of training and continuing education programs for transit and transportation agency personnel.

5) Identification of key factors in the transit work environment that affect employee performance (human resources management).

6) Development of transit service strategies for serving suburban and low density travel markets.

The identification of these six general areas should be useful in formulating a transit study agenda and in programming the state's transit study funds for the next five years. While the areas listed above are prioritized, a balanced technical studies program is

suggested (i.e., annual study agenda should, to the extent possible, address a range of issues).

Table S-3 presents a suggested transit technical studies agenda for 1990-94. The basic study agenda shown in Table 3 appears realistic from the standpoint that it is based on the results of this survey and is consistent with past SDHPT funding levels for transit studies. Of course, other issues such as funding levels, shifts in program and policy emphasis and any "special needs" that might arise will need to be considered in formulating specific study activities.

Table S-3. Suggested Transit Technical Studies Agenda (1990-94)

Fiscal Year	Suggested Study Topics	Comments
1990	• Automated Transit Ridership Data Collection	Continuation of Study No. 2-11-89-1087
	• Roles for Transit in Texas	
	• Performance Measures for Transit	
1991	• Alternate SDHPT Roles in Transit	
	• Alternate Funding Sources for Transit	
	• Guidelines for Evaluating Transit Performance	Compilation of previous SDHPT studies
1992	• Use of Computer/Automation Technologies in Transit	
	• Development of Training/Continuing Education Programs	A transit short-course has been suggested.
	• Techniques for Improving Transit/Highway Agency Cooperation	
1993	• Management Techniques for Improving Transit Productivity	
	• Suburban Transit Services	
	• Effects of EPA Clean Air Standards on Transit in Texas	
1994	• Transit Marketing	
	• Human Resources Management	
	• Computer Software for Transit Planning, Operations and Management	

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

BACKGROUND AND STUDY OBJECTIVES

The federally sponsored transit technical studies program has frequently changed directions. These changes in the orientation of transit studies have been due, in part, to changes in perceptions concerning the role of public transportation. Early programs emphasized planning and systems studies. This phase was followed by a technology-oriented approach, which focused on the development and application of high-technology as the means to solve transit problems. More recently, the technical studies program has focused on improvements directed at making more efficient use of existing facilities and on transit operating problems. Privatization and management issues designed to improve the overall efficiency of transit operations have also received considerable attention in recent years (1).

While the nation's technical studies program has attempted to support a broad range of transit studies, funding levels have dropped by nearly two-thirds since the 1970s and have generally not been sufficient to maintain such a broad-based program. As a result, there is a need to develop a transit study agenda to insure that decisions concerning the use of the limited funds available are based on a systematic assessment of the state's transit needs. This study has been designed to provide the basis for developing such a technical studies agenda. Specific objectives of the study were to:

1) Identify the transit study needs of the State of Texas;

2) Categorize and prioritize these needs; and

3) Develop a technical studies agenda to address these study needs.

This report presents the results of a survey conducted to identify transit study needs in Texas. The report summarizes the study needs identified from the survey, presents a general prioritization of those needs based on the survey results, and outlines a preliminary study agenda to address those study needs.

The report also presents a brief overview of national transit study needs. This national perspective on public transportation provides a useful point of departure for subsequent discussions regarding the transit study needs of the State of Texas.

NATIONAL PERSPECTIVE ON PUBLIC TRANSPORTATION STUDY NEEDS

The nation's transit industry faces a continuing challenge to provide safe and reliable service at a cost that taxpayers will support. Because of the pressure of meeting daily operating concerns, the importance of technical studies, the benefits of which may not be realized for many years, may be overlooked. Yet such studies are central to solving the very problems that transit operators experience as they manage today's services (1).

The Urban Mass Transportation Administration (UMTA) has been the principal sponsor of transit studies for more than 20 years. UMTA spending, however, has dropped sharply from a yearly average of $60 million in the 1970s to approximately $22 million today (1). The orientation of UMTA studies also has shifted in response to changes in perceptions concerning the role of public transportation. These changes in UMTA program funding and emphasis suggest that there is a need for a critical review of the transit studies program in terms of its responsiveness to the problems facing local transit agencies.

The following sections of this report present a brief overview of the major issues that need to be resolved if public transportation is to play an important role in serving the nation's urban travel demands in the years ahead. The review of these issues is presented in two parts: 1) Current transit study needs; and 2) The future of public transportation. This national perspective on public transportation should be useful in identifying study needs that may be unique to Texas.

Current Study Needs

Since the beginning of federal involvement in public transportation, UMTA has provided the funding and guidance for the nation's transit technical studies program. Some have argued that relying primarily on UMTA to conduct studies has proved ineffective from the operator's standpoint (1). In this "top-down" arrangement, transit providers have had limited influence over the direction of the technical studies agenda, and results have not always been relevant to, or applied by, their intended audience. The drawbacks of this arrangement were underscored by operator criticisms that the advanced-technology

orientation of the federal program during the early to mid 1970s largely ignored pressing operating concerns (1).

A recent Transportation Research Board (TRB) study (1) suggests that an effective transit technical studies program should support a wide range of research activities including:

- Federal mission support: studies to guide development of federal public transportation programs and policies in support of national goals and budgetary priorities.

- Technology development: studies that search for innovative technologies, products, or processes in other industries or countries that could be applied successfully to transit.

- Problem solving: highly applied studies geared to solving the problems that local transit operators experience as they manage today's services.

The TRB study (1) concludes that problem-solving studies are the most pressing unmet need, and transit agencies must take the lead in reestablishing this activity. According to the TRB study (1, pp. 3-4), the following list of seven broad topics is representative of the kind of questions uppermost in the minds of today's transit managers. The list emphasizes "basics," such as maintenance, operating concerns, and human resources management. These topics illustrate the basic thrust of a problem-solving technical studies program and indicate that promising opportunities exist in this area.

- Human resources management: study topics could include identifying key factors in the transit work environment that affect employee performance, controlling absenteeism, assessing the productivity implications of alternative work rules and use of part-time labor, and introducing incentive programs and restructuring jobs to motivate improved performance.

- Service configuration and marketing: study topics could include developing service strategies, like timed-transfer, to accommodate decentralized development, improving existing routes and scheduling and using marketing techniques to increase ridership.

- Service delivery models: study topics could include examining methods for improving service coordination in a multiprovider environment, identifying types of services or functions most amenable to privatization, and reducing the barriers to contracting with private providers.

- Internal efficiencies: study topics could include developing energy management programs, identifying effective insurance strategies, improving fare structures and collection equipment, and getting the most out of automation.

- Maintenance: study topics could include recruiting and training maintenance personnel, developing effective supervisory programs, using computerized maintenance management information systems, and developing simplified vehicle subsystems and diagnostic equipment.

- Equipment: study topics could include introducing automated equipment, improving component reliability and life, increasing energy efficiency, responding to environmental regulations, developing better vehicle inspection techniques, and improving procurement practices and policies.

- Innovative financing: study topics could include analyzing the benefits of innovative financing techniques such as joint development, identifying the factors necessary to their successful introduction, assessing the impact of tax reform on innovative financing for mass transit, and defining appropriate roles for the private sectors in public-private partnerships.

Long-Term Study Needs

The future of public transportation in this country has been the subject of considerable debate. It has been suggested that recent changes in the transit industry are "both the death rattle of outdated institutions for delivering transportation service and the painful birth of many new delivery systems" (2). A 1982 TRB Report (3) cataloged the causes of the transit industry's problems under the following three general headings.

1) Societal conditions and trends that are largely beyond the control of the transit industry or transportation policy makers. These include:

- Rising income, decentralization, and increasing automobile mobility over the long term;
- Changing perceptions of transit's market and function by the middle class;
- Poor perceptions of automobile and highway costs in relation to transit because of the differences in which costs are experienced by the public;
- Skewing of local and state government policies relating to land development in favor of the automobile and highway system; and
- Lack of linkages at the local level between transit and planning for related activities such as land development controls, traffic controls, and community facilities.

2) Federal policy that contributes to transit's problems. Examples include:

- Emphasis for many years on promotion of large-scale new rail systems with too little attention to rehabilitation and maintenance;
- Creation of a large-scale operating subsidy program with little attention to productivity;

- Increasing influence of labor through the Section 13c review process;

- Rapid increase in the number and complexity of federal requirements;

- Frequent major changes in the direction of federal policy and changing emphasis on specific technologies;

- Tendency of the federal program to link local transit planning to the federal process and to separate it from planning for other closely related local functions;

- Ineffective federal role in relation to the need to standardize equipment specifications and stabilize the market;

- Ineffective coordination of highway and transit policy and programs; and

- Recent de-emphasis of long-range transit policy.

3) Management problems in the transit industry. These problems include:

- Ineffectiveness in attracting new personnel and training new managers and skilled employees;

- Emphasis on reducing investments in rehabilitation of infrastructure in favor of keeping most of the system in operation during periods of decline in patronage and revenue;

- Emphasis on satisfying all political constituencies by extending service to all areas and being unwilling to cut back where service is no longer justified;

- Insufficient attention to new markets in developing areas and to new forms of service suited to these areas;

- Continuing adversarial relationship with private providers and failure to recognize the potential for reduction of overall subsidies that is possible through selective contracting for service;

- Lack of attention to the potential of various forms of paratransit; and

- Ineffectiveness in joining forces to achieve common objectives with respect to equipment specifications, improvement of reliability, and research and development.

The problem areas outlined above are generally accepted as the principal factors affecting public transportation operations in this country. As a result, many of the studies that have been proposed focus on these basic issues. For example, Schofer (4) has identified the following eight areas where changes in public transportation are most needed.

1. Significant diversification of services beyond conventional fixed-route, fixed-schedule, line-haul services and toward a wide variety of ridesharing and paratransit options.

2. A change in organizational and management structure to include smaller scale, decentralized operations.

3. An increased role of the private sector in the provision of transportation services.

4. A shift toward increased efficiency. This may be accomplished by controlling unit costs by increasing market size (economies of density) and/or by making more efficient use of resources in delivering services.

5. Technological innovations in the form of smaller more flexible vehicles; articulated vehicles for high density markets; and battery-electric and perhaps even fly-wheel vehicles for some applications. On a smaller scale, increased use of microcomputers could make maintenance management, service and manpower planning, and travel analysis more efficient and effective.

6. Fare structures must be made more equitable, more reflective of the true cost of services, and more productive in revenue generation. Available evidence indicates that this will require shifting to distance-based fares, or at least zone fares, as well as peak-period pricing and premium service surcharges.

7. One of the more certain sources of change for transit in the future will come from changes in the character of travel demand. This will occur as a result of changes in land use patterns, shifts in technology and a decrease in the peak-to-base ratios.

8. The final change the industry will have to make is adopting a posture of survival. This means remaining honestly open to change in terms of services needed and offered, who should offer them, and how they should be structured.

Peterson (5) suggests that transit's future hinges on its ability to: 1) Implement cost reduction strategies to increase efficiency; 2) expand markets; 3) develop more sophisticated pricing policies; 4) increase investment in capital infrastructure, people, and research and development; and 5) make long-term commitments to research programs.

Orski (6) outlined seven elements which could alter the future of transit. These elements are:

1. Developer involvement in transportation improvements,

2. Private-sector sponsorship of transportation services,

3. Transportation management associations,

4. Downtown transportation management,

5. Private operation of transit service,

6. Decentralizing service delivery, and

7. Private financing of transit infrastructure.

Page (7) recommends a unified approach to "futuring" through the use of strategic planning. The components of such a plan should include: 1) Cooperation with labor; 2) productive scheduling of transit system's work force; 3) exploiting technological advances; 4) developing a valid and reliable system of performance indicators and; 5) investing in human resources and organizational development.

The Transportation Research Board (8) has reviewed the nation's transit study needs and suggests the following areas as the most critical to the future of transit in this country.

- Studies concerning the relationship between transit's travel market and changing demographic, economic, and land use conditions of urban areas.

- Development of quantitative forecasts of transit and paratransit market shares specifically addressing low-density markets and private-sector involvement.

- Studies concerning the processes for adequate involvement of private-sector transportation providers in the development of transportation plans.

- Studies aimed at improving the pricing of transportation services in relationship to particular travel market segments, including technology for more effective zone pricing arrangements.

- Studies concerning the monetary value of transit service at varying levels to various types of land uses and industries, to provide a basis for negotiating service agreements, tax increment financing, and other forms of privately supported transit improvements.

- Development of more effective personal security measures.

- Development of computerized information systems to aid the public in using the system.

- Development of a computerized system for dispatching demand-responsive service, building on the systems that have already been implemented in Canada and West Germany and the taxi dispatching system being implemented in Houston.

- Improvement of demand data and relationships in a form more useful for operations planning (as distinct from system planning), including data on the response of different market segments to various forms of service.

- Application of microcomputers for inventory control, maintenance record keeping and analysis, performance monitoring, route and schedule planning, and other operations planning functions.

- Development of more standardized rolling stock and other equipment with improved reliability and performance characteristics in cooperation with transit and manufacturing industries.

- Development of systems for monitoring performance and condition of critical components of rolling stock to provide information needed for improving preventive maintenance.

- Development of automated transit system technology to achieve long-term gains in reliability, operating and maintenance cost, and overall system efficiency, and to position U.S. industry to capture a larger share of the future equipment market.

TRANSIT STUDY NEEDS IN TEXAS

Study Method

The objectives of this study were accomplished through a survey of state, local, and private transportation officials and agencies in Texas. A mail-out questionnaire, which was supplemented with telephone and personal interviews, was used to solicit input from individuals and agencies responsible for planning, designing, implementing, operating and maintaining the state's transportation systems. Representatives of the following agencies were invited to participate in the survey:

1) Texas State Department of Highways and Public Transportation (SDHPT), including SDHPT Commissioners;

2) Local public transportation agencies;

3) University transportation research centers;

4) Private transportation service providers;

5) Governor's office and elected state officials;

6) Regional Urban Mass Transportation Administration (UMTA) officials; and

7) Metropolitan Planning Organizations (MPOs).

Table 1 provides a summary of the agencies surveyed in terms of the numbers of individuals contacted and survey response rates.

The survey process was structured to solicit opinions concerning the state's transit study needs in the following general problem areas.

Table 1. Summary of Agencies Surveyed

Agency	No. of Individuals Contacted	No. Responses Received
State Department of Highways and Public Transportation	6	4
Local Transit Agencies	21	13
University Research Centers	6	6
Private Providers	2	1
State Government	2	2
UMTA (Region VI)	1	1
Metropolitan Planning Organizations	2	1
Total	40	28

1) Policy-Related Studies. These could include studies directed at guiding state public transportation programs, policies, and funding arrangements.

2) Technology-Related Studies. These could include studies that search for, and/or develop, innovative technologies, products, or processes that could be applied to transit.

3) Planning, Management and Operations Studies. These could include applied studies geared to solving the problems that local transit operators experience as they manage today's services. Examples might include: human resource management; service configuration and marketing; service delivery methods; internal efficiencies; maintenance; equipment; innovative financing; and fare policies.

Survey Results

The survey results were categorized under the following six general headings: 1) Planning; 2) Policy; 3) Technology; 4) Management; 5) Funding; and 6) Training. Table 2 presents a summary of the general study needs identified for each of these categories.

A prioritized listing of the study needs identified from the survey is presented below. The study needs were prioritized according to the number of times (n) they were cited in

Table 2. Summary of Survey Results

Study Category	Study Topics	No. Times Cited as Study Need
Planning	• Justification/Role of Transit in Texas	31 (2)*
	• Needs/Strategies/Funding for suburban transit services	11 (7)
Policy	• Lack of coordination between local and state agencies/providers	36 (1)
	• Drug testing	3 (10)
Technology	• Compliance with EPA clean air standards	15 (5)
	• Use of technology in planning, management and operations	9 (8)
	• Vehicle design, safety and component reliability	8 (9)
Management	• Human resource management	12 (6)
	• Marketing transit	9 (8)
	• Risk management	3 (10)
Funding	• Need for stable, equitable local funding sources	19 (3)
Training	• Training/educational programs	18 (4)

*(X) denotes study topic rank (1 = most frequently cited study need).

the survey (See Table 2). These topics are discussed in detail in the following subsections.

1.0 Lack of coordination between service providers and between local and state agencies (n = 36).

2.0 Justification for transit (n = 31).

3.0 Need for stable, equitable local funding sources for transit (n = 19).

4.0 Development and/or dissemination of training/educational programs/materials (n = 18).

5.0 Studies concerning compliance with EPA's clean air standards (n = 15).

6.0 Human resource management (n = 12)

7.0 Needs, strategies and funding for suburban/low density transit services (n = 11).

8.1 Use of computer/automation technology in planning, management and operations (n = 9).

8.2 Marketing transit (n = 9).

9.0 Vehicle design, safety and component reliability (n = 8).

10.1 Risk management (n = 3).

10.2 Drug testing (n = 3).

Lack of Coordination

The lack of coordination between service providers and between local and state transportation agencies was identified as the state's most important transit study need. Those respondents who cited the need for studies in this area frequently referred specifically to the need for a clarification of the role of SDHPT's new Public Transportation Division (D-11). Other needs cited by the survey respondents included:

- The need for coordinated transportation planning at the state level (including short- and long-range state transportation plans);

- The need to consolidate all transportation-related functions (including regulation) under a single state agency (i.e., need to create a state DOT);

- The need for improved coordination between local transit agencies and local and state highway agencies in planning highway improvements;

- The need for policies/guidelines concerning the development of "transit friendly" roadways (sidewalks, pedestrian access);

- The need for policies/guidelines concerning use of transit sales tax revenues for street improvements; and

- The need to consider transit in land use policy decisions.

Justification for Transit

The survey results indicate that the second most important study need is in the area of quantifying the role(s) of transit in meeting the state's mobility needs. Specific issues cited by survey respondents included the following:

- Identification of cost-effective roles for transit;

- Costs and benefits of transit;

- Identification of appropriate spending levels for transit;

- Procedures for comparing, ranking and selecting transit projects;

- Comparative assessments of alternative transit modes;

- Development of standard transit system performance measures;

- Guidelines for identifying and discontinuing unwarranted transit services; and

- Development of a statewide transit system performance data base.

Funding

According to many of the survey respondents, the recent shift in emphasis from federal support of transit to greater local self-sufficiency has presented local transit operators with an enormous challenge. Many of the respondents cited the need to develop innovative, broad-based financial strategies to address the combined effects of a deteriorating transportation infrastructure, increasing operating costs and the need to expand transit services in growth areas. In addition, several of the rural and small city transit service providers raised questions concerning the equity of current procedures for allocating state funds to transit systems in Texas. The following needs in the area of transit funding are representative of those cited by the respondents:

- Need to conduct a comprehensive evaluation of alternative funding sources (public and private) and assess the applicability of these sources to Texas;
- Evaluate alternatives to using state general revenues to fund transit; and
- Evaluate current approaches for allocating transit funds (state and federal allocation procedures).

Training

The concerns expressed in this area focused on the need to develop and implement ongoing programs to provide information and training on the state-of-the-art in planning, operating and managing public transportation systems. Many of the respondents stressed the need to develop training programs that would be of interest to <u>all</u> state and local transportation agencies (i.e., training programs should not be tailored solely or specifically for transit agency personnel). The following general topic areas for training programs were suggested:

- Roles of public transportation;
- Relationships between transit and highway improvements;

- Local, state and federal regulations and funding sources;
- Transit technologies;
- Transit planning methods;
- Grant application procedures;
- Computer software for transit planning, operations and management; and
- Vehicle specifications, quality control and procurement practices.

Clean Air Standards

The U.S. Environmental Protection Agency (EPA) has established strict emission standards for transit buses. These standards are scheduled to take effect in 1991. Currently, a proven technology for meeting the EPA standards does not exist. As a result, there is a need for studies concerning the use of alternative fuels and/or technologies in meeting EPA's clean air standards.

Human Resources Management

The survey respondents recommended several study topics concerning appropriate strategies for making more effective use of human resources. General topics cited by the respondents included the following:

- Identification of organizational structures that foster successful staff/board of directors relationships;
- Methods for attracting and keeping good managers;
- Improving labor-management relationships;

- Incentive programs for increasing labor productivity; and

- Creating and maintaining a drug-free work environment.

Suburban Transit Services

Since the early 1970s, population and employment have shifted to the suburbs of many of our larger cities, and traditional fixed-route, radial transit systems have not efficiently served the dispersed trip patterns that have resulted. The survey results indicate there is a need for studies directed at 1) quantifying the nature and magnitude of suburban travel demands, 2) identifying and evaluating alternative transit service strategies for meeting these demands, and 3) identifying and evaluating funding arrangements for providing these services.

Computer/Automation Technologies

The results of the survey indicate that the state should explore the development and application of computer and automation technologies to improve the efficiency of transit system planning, management and operations. Typical needs suggested by the survey respondents include:

- Development and testing of automated fare collection systems (to eliminate cash fare system and provide for implementation of distance-based fares);

- Development and testing of automated passenger counting systems;

- Use of electronic information display systems to aid the public in using transit systems;

- Use of computerized maintenance information systems; and

- Electronic surveillance systems for bus stops to reduce crime and vandalism.

Marketing

The survey respondents suggested that a wide range of benefits could be expected from technical studies on transit marketing strategies. Specific recommendations for study topics focused on two general areas: marketing strategies for improving transit's image; and development of marketing research tools for identifying and serving changing markets.

Vehicle Design, Safety and Reliability

The study needs identified in this problem area include the following:

- Improved vehicle component reliability (e.g., lifts, cooling systems);
- Development and testing of low capacity, fully accessible vehicles;
- Development of transit incident response procedures;
- Reducing transit vehicle fire hazards;
- Improved vehicle braking systems; and
- Passenger restraint systems.

Risk Management

Several of the survey respondents indicated that the climate in the insurance industry in recent years has been such that many transit properties in Texas have been forced to operate with less-than-adequate insurance protection levels. The respondents suggested that studies concerning the feasibility of establishing a statewide risk management pool could identify arrangements for lowering insurance costs for transit properties in Texas.

Drug Testing

The U.S. Department of Transportation has issued regulations requiring anti-drug programs in the aviation, motor carrier, railroad, maritime, mass transit, and pipeline industries, respectively. The results of the survey indicate that there is a need to conduct a review of drug testing programs that have been used by other transportation agencies, and to develop a model drug testing program for use by transit agencies in Texas.

SUMMARY AND RECOMMENDATIONS

Summary

The study topics identified from the survey of state and local transportation agencies indicate that there is a need for a basic transit technical studies program that emphasizes a comprehensive and coordinated multimodal approach to transportation planning. The most pressing unmet transit study needs in Texas are in the following general areas: 1) Improving coordination and cooperation between local service providers and state and local transportation agencies; 2) Defining and quantifying the appropriate role(s) of transit in meeting the state's mobility needs; and 3) Developing innovative, broad-based funding strategies for the state's transit systems. The survey respondents also cited the need for studies in the development of training and continuing education programs for transit and transportation agency personnel, studies concerning the development and testing of technologies to comply with EPA clean air standards, human resources management, and transit service strategies for serving suburban and low density travel demands.

With the exception of studies in the area of vehicle emissions, the list of needs identified from the survey emphasizes "basics," such as improving coordination and service delivery systems, development of standard system performance indicators and system monitoring procedures, funding, employee training and education programs, and human resources management. Because technology-oriented studies, such as those concerning use of alternative fuels and technologies to meet EPA clean air standards, would require a higher level of funding than is currently available to the state, it is suggested that the state concentrate its transit study efforts on the basic needs outlined above. Specifically, the results of this study indicate that the state's short-term (1990-1994) transit technical studies program should focus on the following areas. The study areas are listed in descending order of importance, as identified from the survey of state and local transportation agencies.

1) Improving coordination and cooperation between local service providers and state and local transportation agencies.

2) Defining and quantifying the appropriate role(s) of transit in meeting mobility needs.

3) Identification and evaluation of broad-based local funding sources for transit.

4) Development of training and continuing education programs for transit and transportation agency personnel.

5) Identification of key factors in the transit work environment that affect employee performance (human resources management).

6) Development of transit service strategies for serving suburban and low density travel markets.

Recommendations

The primary objective of this study was to develop a technical studies agenda to address the state's transit study needs. This is a difficult task in that the process for identifying and selecting study topics is a dynamic process that should be responsive to the needs of several agencies representing a range of priorities, programs and funding levels. A detailed assessment of the effects of these factors on the selection of transit study topics is beyond the scope of this limited study. Nevertheless, the general study needs outlined in this report provide a useful starting point for formulating a preliminary technical studies agenda for the next five years. The basic study agenda suggested in Table 3, for example, appears appropriate from the standpoint that it is based on the results of this survey and is consistent with past SDHPT funding levels for transit studies.

The suggested study agenda shown in Table 3 is intended to provide guidance to SDHPT in identifying and selecting transit study topics. The preliminary agenda shown in Table 3 follows the general priorities identified from the survey, but a balanced study agenda has been suggested (i.e., the annual study agenda attempt to address a range of issues). Clearly, other issues such as funding levels, shifts in program and policy emphasis and any "special needs" that might arise will need to be considered in formulating annual

Table 3. Suggested Transit Technical Studies Agenda, 1990-94

Fiscal Year	Suggested Study Topics	Comments
1990	o Automated Transit Ridership Data Collection	Continuation of Study No. 2-11-89-1087
	o Roles for Transit in Texas	
	o Performance Measures for Transit	
1991	o Alternate SDHPT Roles in Transit	
	o Alternate Funding Sources for Transit	
1992	o Guidelines for Evaluating Transit Performance	Compilation of previous SDHPT studies
	o Use of Computer/Automation Technologies in Transit	
	o Development of Training/Continuing Education Programs	A transit short-course has been suggested.
	o Techniques for Improving Transit/Highway Agency Cooperation	
1993	o Management Techniques for Improving Transit Productivity	
	o Suburban Transit Services	
	o Effects of EPA Clean Air Standards on Transit in Texas	
1994	o Transit Marketing	
	o Human Resources Management	
	o Computer Software for Transit Planning, Operations and Management	

study activities. In identifying specific study topics, it may be useful to review the individual study areas outlined in previous sections of this report. Additional input from SDHPT and transit agency personnel, and/or periodic follow-up surveys may also be needed to identify specific transit study topics.

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