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AN ANALYSIS OF TRANSPORTATION PLANNING EFFECTIVENESS

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16. Abstract

This document analyzes the impact of the Urban Mass Transportation Administration Section 9 Technical Study Grant program on urban areas' transportation planning effectiveness. The analysis reports how the amount and quantity of Technical Study Grants alter the local institutional climate, encourage professional planning capability, foster acquisition of capital equipment, and result in introduction of new or improved services with existing facilities. This analysis employs data from twenty urban areas, stratified by population size and length of time since award of initial Technical Study Grant.

The conclusions suggest that the Technical Study Grants have been directly responsible for upgrading the quality of local transportation planning as well as for facilitating capital acquisitions and service changes. Additionally, this document reports a novel methodology and analysis procedure for measuring a program's effect.

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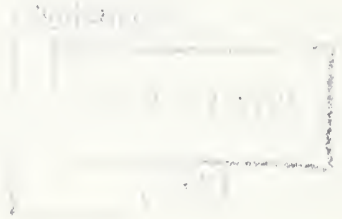


PREFACE

This report was prepared under PPA UM-732, Transit Planning Studies, sponsored by the Office of Planning Assistance, UTP-20, Charles H. Graves, Director. It is part of a review of the Urban Mass Transportation Administration's Section 9 Technical Study Grant Program. This report analyzes the impact of the Technical Studies Grant Program on planning effectiveness. This analysis was designed to determine how Technical Study Grants have impacted local transportation policy and decision-making and have guided capital investments and service improvements. Data is drawn from case studies of urban areas selected to represent all UMTA regions, a range of population sizes, residential densities, and demographic characteristics. The case studies are summarized in Appendix A of this report; a complete data set is contained in a report titled, "Transportation Planning Effectiveness: Twenty Case Studies."

The Transportation Systems Center appreciates the cooperation and assistance received from the UMTA UTP-20 staff, the UMTA Regional Offices, and from the many people contacted in the twenty case study data sites. The analysis and interpretation of the case study data reflect TSC's understanding of the material provided and of discussions held relative to the receipt and use of Technical Study Grants.

Many people contributed to the production of the report. Michael Fusco and Nancy Cooney, Raytheon Service Company, made major contributions to the development and presentation of this report; they carried out the data analysis and interpretation of results. David Rubin, TSC, and Herbert Bogen, Raytheon Service Company, provided guidance in developing this report. Trans-Urban East Organization also contributed substantial portions to the data collection on which this study is based. Lou Mraz, Senior UMTA Representative for Region I, provided technical comment on the analysis plan. Ronald Karr of Raytheon Service Company provided technical editing assistance and Jan Lanza of TSC, and Valerie Roketenetz and Janet Burley of Raytheon Service Company provided the technical typing.

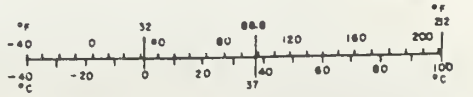
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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EXECUTIVE SUMMARY

This study analyzes the impact of the Urban Mass Transportation Administration Section 9 Technical Study Grant Program on transportation planning effectiveness. It is based on data from case studies of a representative group of twenty urban areas, conducted during 1976, which are reported in a companion report titled, "Transportation Planning Effectiveness: Twenty Case Studies."

The analysis was designed to determine how Technical Study Grants have impacted local transportation policy and decision-making and have guided capital investments and service improvements. Specifically, the study reports the influence of Technical Study Grants on transportation planning effectiveness which is measured by the development of professional planning capability, acquisition of new capital equipment, introduction of new or improved services with existing facilities, and alterations in the local institutional climate.

In order to understand impacts of Technical Study Grants on planning effectiveness and subsequent service changes, it is necessary to analyze the relationships between grants and outcomes. The following assumptions support the relationships analyzed in this study.

> Technical Study Grant impact varies according to extensiveness of urban area participation in the Technical Study Grant Program. Program participation is measured by cumulative per capita funding and by number of years since receipt of initial Technical Study Grant.
>
> Technical Study Grant-generated planning effectiveness is manifested by system operating changes, measured as mean annual ridership change.
>
> Local urban area characteristics may independently affect system operation through constraints in institutional, ecological, and political structures and demographic characteristics. Local area characteristics are measured by existence of an RTA, source of local funding, transit goal identification, availability to transit operator of "pass through" planning funds, citizen participation, density and population of the urban area.

Based on these assumptions, a diagram has been prepared to show the structure of the analytic sequence employed (see Figure 2). The

diagram traces the impacts of Technical Study Grants on planning effectiveness. The arrows portray expected sequence of impacts.

Data to analyze the hypothesized relationships are drawn from case studies of urban areas which have received at least one Technical Study Grant as of March 31, 1975. The twenty urban areas represent all UMTA regions, a range of population sizes, residential densities, and demographic characteristics. The case studies are reported in a uniform format which focuses on transportation planning effectiveness but also includes the urban area's socio-economic and travel characteristics, transit and transportation planning history. Appendix A of this report summarizes the twenty case studies.

The analyses of the relationships between Technical Study Grants and planning effectiveness use non-parametric measures of association to determine which relationships are statistically significant, $p \leq .10$. Figure 3 elaborates the sequence of relationships between program participation and planning effectiveness. The dashed arrows represent statistically significant relationships between measures.

The following summarizes the major results of this analysis.

Increased spending for Technical Study Grants (as measured in funds per capita) relates directly to

- improvements in the professional planning capability
- increased capital acquisitions
- introduction of new or improved services with existing facilities

Number of years in the Technical Study Grant Program relates directly to

- increased capital acquisitions

Average annual increase in transit system ridership since receipt of initial Technical Study Grant relates directly to

- increased capital acquisitions

existence of a regional transit authority

stable funding source for transit planning and operations

identification of a comprehensive set of transit service goals.

In conclusion, this analysis shows that Technical Study Grants have been directly responsible for upgrading the quality of local transportation planning as well as for facilitating capital acquisitions and service changes. Technical Study Grants influenced ridership increases by stimulating adequate planning which in turn resulted in Capital Assistance Grants (Section 3) to expand system capacity. Ridership increases appear also to be encouraged by local characteristics which provide structural and financial support to the transit system.

The existence of relationships between program characteristics and impacts suggest it is possible to understand the multiple influences on planning effectiveness and system operation. It should be recognized, however, that the conclusions apply only to the sequence of relationships analyzed which may oversimplify the actual complexity of urban areas' participation in UMTA programs.

1. INTRODUCTION

1.1 Objectives

This is a review of the Technical Studies Grant Program, Section 9, to determine the program's impacts on local transportation planning processes. This review utilized case studies of twenty urban areas as a data base. The review:

> Defines and measures the impact of the Technical Studies Grant Program on the overall planning and subsequent operation of local transportation systems.
>
> Separates the effect of the Technical Studies Grant Program, Section 9, on transit system operation from the effect of other UMTA programs, particularly Section 3 Capital Assistance and Section 5 Operating Assistance.
>
> Reveals institutional issues in planning and implementation which could aid future administration of the Technical Studies Grant Program.

1.2 Historical Perspective

Congress mandated the UMTA Technical Studies Grant Program in 1966 to assist localities to plan, engineer, design, and evaluate mass transportation projects. The program expanded rapidly and more than 350 Technical Studies Grants were awarded in FY76. Currently, nearly all urbanized areas receive Technical Study Grant funding. Additionally, many smaller urbanized areas, in anticipation of future growth, have received these grants themselves or through Technical Study Grant funding administered by state DOT's for smaller, non-urban areas.

The federal requirement that local areas produce a Transit Development Plan (TDP) in order to receive UMTA Section 3 Capital Assistance funding has been a strong impetus for the growth of Technical Studies Grant funding. A TDP could be produced using local funding, but most areas apply for federal assistance in developing a TDP through the UMTA Technical Studies Grant Program.

1.3 Overview

UMTA Technical Studies Grant funding has facilitated the evolution of public transportation over the past ten

years. Typically, the recent history of mass transit has witnessed a rapid decline in the number of private transit operators and a subsequent need for public takeover and operation of private transit in order to maintain provision of service.

This increasing trend towards public provision of transit service has been impelled by a national interest in increased support for public transit, by the greater availability of capital assistance financial support, and by the recent availability of operating assistance, as well as by the financial difficulties of private transit operators.

The UMTA Capital Assistance Program, Section 3, has assisted public operators to take over private transit operations by paying acquisition costs and by transforming the deteriorated physical facilities of the private operators into a viable public system. Because public takeover of a privately operated transit system involved planning for physical stock, financial structure, operational characteristics and service delivery, Technical Studies Grant funding has been frequently used to produce a Transit Development Program to address these issues. The TDP satisfies the Section 3 Capital Assistance Program requirements of adequate planning.

UMTA Technical Studies Grants are usually awarded to that local planning agency which has been designated by the governor as the Metropolitan Planning Organization (MPO). Award of Technical Studies Grants to an MPO facilitates the "continuing, comprehensive and cooperative" transportation planning process and ensures the availability of sufficient planning expertise to undertake a Transit Development Plan.

Prior to 1966 and the availability of the UMTA Technical Studies Grant Program funding for mass transit planning, local planning agencies were principally concerned with highway planning. The availability of funding for mass transit planning has encouraged these agencies to develop transit planning capabilities. Professional transit planning skills have been increased through in-service training, hiring of professional transit planners, and use of consultants.

2. APPROACH

This review of the Technical Studies Grant Program investigates the impact of the Technical Study Grants on local transportation planning processes in urban areas throughout the country. It is designed to assess the effectiveness of the program to date and to point out

institutional issues which might be useful in shaping future policy relating to the program.

The overall outcome of the transportation planning process in a given locality is conditioned by a number of local factors exogenous to the Technical Study Grant Program. Additionally, the amount of time a locality has participated in this program can have important effects on the status of the transportation planning process. Because of the idiosyncratic nature of local planning processes and the importance of historical factors, a case study approach was deemed the most appropriate methodology for this study. A case study format permits simultaneous consideration of all the factors contributing to the outcomes of the transportation planning process.

2.1 Urban Area Selection Process

Case studies are reported for a selection of urban areas which had received at least one Technical Study Grant as of March 31, 1975. To select urban areas for study, all urban areas which had received at least one Technical Study Grant were rank ordered according to city size, density, proportion of elderly, proportion of carless households, and proportion of families with incomes below the poverty line. Urban areas were computer-sorted to maximize variation with respect to their distribution on the relevant variables.

This process selected twenty urban areas which, collectively, have the following characteristics:

At least one urban area from each population size grouping (<50,000, 50,000-100,000, 100,000-250,000, 250,000-500,000, >500,000).

At least one urban area with a high population density and one urban area with a low population density with respect to the national mean.

At least one urban area with a high median family income and one urban area with a low median family income with respect to the national mean.

At least one urban area with a high proportion of transit dependent (carless households) and one urban area with a low proportion of transit dependent with respect to the national mean.

At least one urban area with a high proportion of elderly and one urban area with a low proportion of elderly with respect to the national mean.

In addition:

At least one urban area from each of the ten UMTA regions.

At least one urban area with a rapid rail system.

Case studies were conducted in the twenty urban areas selected using these criteria. See Table 1 for a listing of selected urban areas.

2.2 Data Collection Process

The case study approach details information on transportation planning and implementation experiences in each of the twenty selected urban areas. Multiple sources of information were used to generate the case studies, including review of planning documents and interviews with local planners and officials.

Following selection of urban areas, there was a thorough review of each area's transportation planning documents which were available from the Urban Mass Transportation Administration, Office of Planning Assistance, UTP-20. The document review provided an understanding of the cumulative planning process which had occurred in the twenty urban areas. Documents examined included grant applications, quarterly progress reports, Unified Work Programs, and Transit Development Programs.

UMTA regional offices were contacted to discuss the status of, and issues related to, the relevant urban area. UMTA regional staff described the urban area's planning history and current planning process. Regional office staff identified persons to contact within each urban area who were most involved with transportation planning and implementation. Site visits lasted from two to four days. Interviews were typically conducted with personnel of the regional planning agency, personnel of the regional transit authority or principal urban carrier, and with local public officials.

For each urban area, one local agency or ad hoc set of agencies has been designated by the governor as the official Metropolitan Planning Organization (MPO) charged with coordinating transportation planning within the urban area. Another state level designation is A-95 review agency, which reviews and approves all federal grants proposed for the urban area. At the local level, the same agencies are often designated as the MPO and the A-95 agency. Meetings were held with personnel of MPO and A-95 agencies in each urban area. When relevant, interviews were also conducted with

TABLE 1. AREAS SELECTED FOR STUDY

Birmingham, Alabama
Flagstaff, Arizona
Little Rock, Arkansas
San Diego, California
Colorado Springs, Colorado
Cedar Rapids, Iowa
Worcester, Massachusetts
Hattiesburg, Mississippi
Billings, Montana
Omaha, Nebraska
Manchester, New Hampshire
Albuquerque, New Mexico
Syracuse, New York
Cleveland, Ohio
Erie, Pennsylvania
Rhode Island
Dallas-Fort Worth, Texas
Salt Lake City, Utah
Charlottesville, Virginia
Seattle, Washington

state officials involved in the transportation planning process. Additional local planning documents, not already obtained from UMTA offices, were obtained during the site visits.

2.3 Case Study Format

In order to summarize information obtained from multiple sources including reports, records, as well as many personal contacts, and in order to develop uniform and comparable data about each of the twenty urban areas, a uniform case study format was developed specifying major categories for data collection and discussion (see Figure 2). The case study format describes an urban area's socio-economic characteristics, trip characteristics, transit history and transportation planning history, and also focuses on the outcome of the implementation of transit planning. The case study format also provides information about each urban area's transportation goals, agencies and participation in the Technical Study Grant Program.

2.4 Planning Effectiveness Measures

The overall effectiveness of transit planning and implementation in each urban area was recorded in each case study using indicators of planning effectiveness. The planning effectiveness sections are the major content focus of the case study format (see Figure 1, Subheads 4.0 and 5.0). Planning effectiveness incorporates four areas: development of professional planning capability, new capital acquisitions, new or improved services with existing facilities, and changes in the institutional climate.

The following are topics defined as measuring the four planning effectiveness components:

1. Development of Professional Planning Capability

   This planning effectiveness component is derived from evidence of increased competence in:

   Long-range planning
   Short-range planning
   Operational planning
   Comprehensive planning
   Modelling capacity
   Regional data base development
   Use of consultants
   Employment of professional transit planners
   Staff training programs.

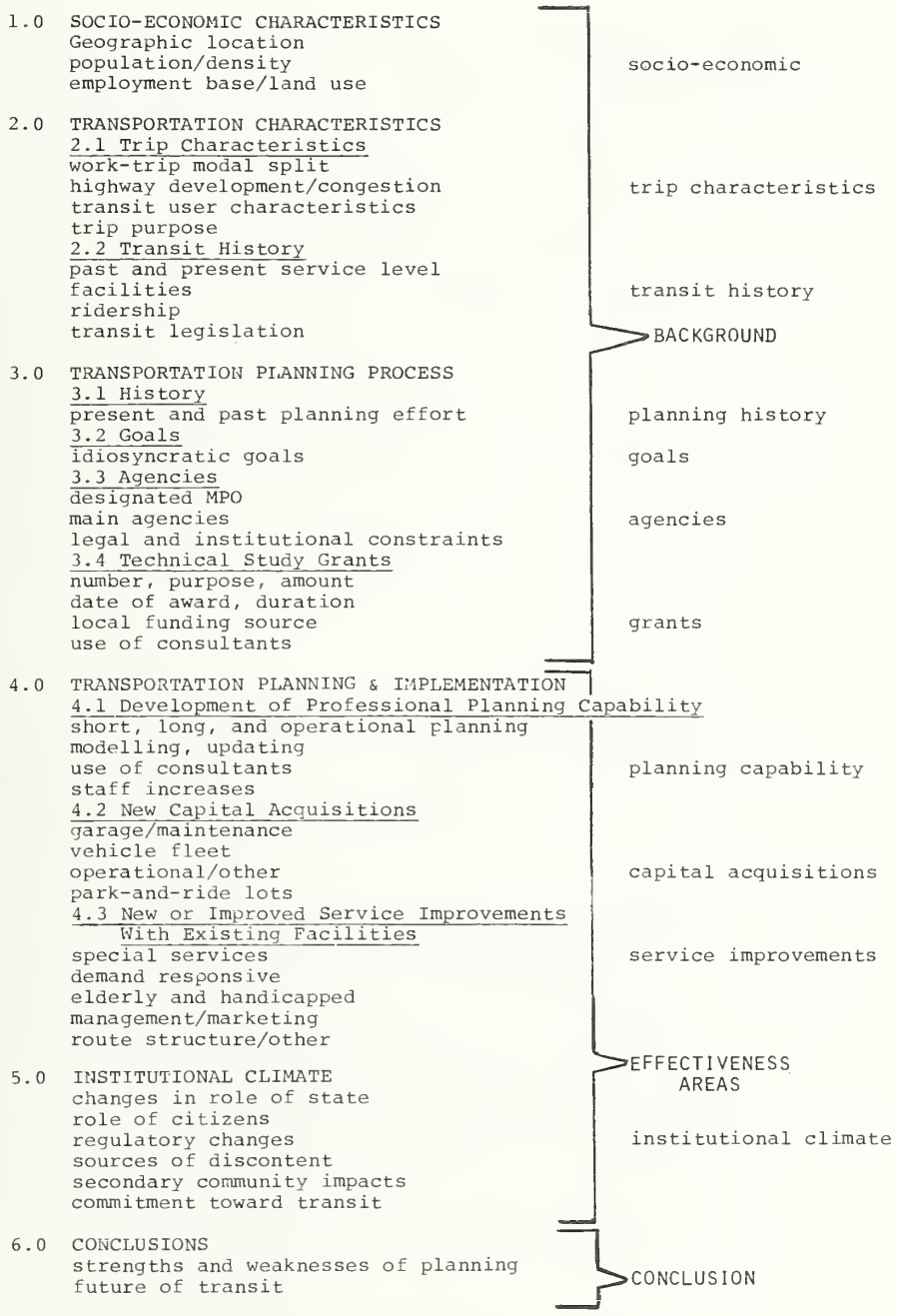


FIGURE 1. CASE STUDY FORMAT

2. Capital Acquisitions

This effectiveness component reflects application for, or receipt of, capital assistance grants for any of the following:

- Fleet replacement or expansion
- Garage/maintenance/operations center construction or renovation
- Park-and-ride facility construction
- Bus shelters, registering fare boxes, bus stop signs, etc.

3. New or Improved Services with Existing Facilities

Planning effectiveness under this component is based on implementation of policies which make better and more efficient use of existing transit facilities. Examples of such innovations are:

- Fare-free zones
- Downtown circulator services
- Special services for elderly, youth or recreational purposes
- Demand-responsive services
- Fare reductions
- Management information systems
- Promotional campaigns
- Market analysis
- Expanded route coverage
- Expanded scheduling.

4. Institutional Climate

This effectiveness component measures changes in the professional transportation planning structure toward improved cooperation and coordination. The following are examples of such changes:

- Establishment of a regional transit authority or other mechanism for coordination of local transit operations
- Clear delineation of responsibilities in the planning process with one agency acting as lead agency
- Establishment of effective citizen participation mechanisms
- New methods for local share and/or deficit financing.

Using the case study format as an outline (Figure 1), narrative case studies were produced for each urban area

which detail the impact of the Technical Studies Grant Program on the local planning process in terms of planning and implementation. Additionally, abstracts or case study summaries are available which highlight the unique features of each local area, including background information on the urban area and planning and institutional characteristics. These are included in Appendix A.

Using case study data, each urban area's planning effectiveness is calculated and scored based on standardized scoring procedures for the four planning effectiveness components. Urban areas are scored according to frequency of improvements in planning capabilities, capital acquisitions, service improvements, and institutional changes which result from receipt of Technical Studies Grants. The scores provide a way to compare and contrast urban area experiences in the Technical Studies Grant Program in terms of the impact of extensive program participation, as well as the program's ultimate impact on transit system operations and delivery of transit service. These analyses are the focus of this report and are detailed in Section 3.0.

2.5 Methodology

The methodology used to determine the influences on and results of planning effectiveness requires tests of association between variables to reveal statistical significance. The results of statistical tests of association are analyzed to assess the strength of the relationships between elements of the transportation planning process.

The analyses use descriptive statistics and measures of association. Bi-variate frequency distribution tables reveal patterns in the data. Spearman's rho (r_s), a non-parametric procedure, is calculated to determine the association between program participation and planning effectiveness (3.2) and between planning effectiveness and system operation (3.3).[1] The Spearman's rho (r_s), could not be used for all analyses due to limitations in the data. Instead, chi square values were used to measure associations between local area characteristics and system operation in Section 3.4.

---

[1]Loether, Herman J. and Donald G. McTavish, Descriptive Statistics for Sociologists, Allyn and Bacon, Boston, MA, 1974.

Due to the exploratory focus of this study, the statistical discussion analyzes statistical significance levels of the relationships to discover where impacts of Technical Study Grants most probably occur. Variables with a statistical significance of $p \leq .10$ are considered to be related; this liberal interpretation is appropriate to the exploratory nature of this study.

3. ANALYSIS OF PLANNING EFFECTIVENESS

3.1 Background

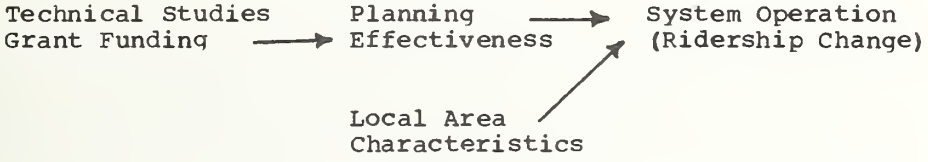
The relationship between urban areas' program participation and subsequent planning effectiveness is quantitatively analyzed to identify more precisely the impact of the UMTA Technical Studies Grant Program on urban areas' transportation planning and implementation.

Planning effectiveness, a concept with four measurable components, includes development of specialized planning capabilities as well as implementation impacts of planning and results from receipt of UMTA Technical Studies Grants. The professional planning component measures the increased sophistication and professionalization of the planning process, through use of consultants, hiring of professional transit planners, development of short- and long-range plans and the use of comprehensive models in the planning process. The capital acquisition component reflects an area's ability to translate planning into actual upgrading of equipment and facilities by means of federal capital assistance funds. The new or improved services component measures implementation of policies designed to provide better and more efficient service using existing facilities, such as improved marketing techniques, new fare structures, new route structures, and special services for elderly, handicapped, and youth. The institutional climate component addresses impacts of Technical Studies Grants on institutions involved in the planning process. It reflects the degree of cooperation between the regional planning agency and the transit operator, the amount of local consensus on local share funding and planning service allocation and the degree of citizen involvement in the planning process.

Planning effectiveness should ultimately be manifested by increased efficiency and productivity of transit system operations. Ridership change is selected as an outcome measure of planning effectiveness resultant from service improvements. Ridership change should respond to changes in service quality and quantity, as well as public acceptance of transit. Hence, it is a global measure of overall system operation.

In addition to the impact of planning effectiveness on system operations and ridership change, various local urban area characteristics, both physical and institutional, exogenous to the Technical Studies Grant Program, may impact system operations. Specifically, local funding mechanisms available to support transit may affect the planning process and its outcomes. The presence of a regional transit authority may affect transit planning and implementation. Transit goals developed from the political process in the urban area may affect the direction of the planning process. Physical characteristics, such as density, influence the kinds of services that can be successfully implemented. Such local area characteristics are also included in this analysis.

The following diagram models the interrelationship of elements involved in the transportation planning process on the local level. Arrows indicate the expected direction of interrelationships of the elements of the transportation planning process. These interrelationships, marked by arrows, are analyzed in this section.



Analysis follows this diagram. Section 3.2 portrays the impact of Technical Studies Grants on planning effectiveness. Subsequent sections examine the impact of planning effectiveness on system operation, specifically, ridership change, Section 3.3 and the impact of local area characteristics on systems operation, Section 3.4.

Quantitative indicators are available for Technical Studies Grant Program impact and for system operation. However, for planning effectiveness a scoring system was applied to derive quantitative indicators. The planning effectiveness scoring procedure was formulated such that a high score was positive and meant that an urban area carried out extensive activity on that effectiveness component.

3.2 Technical Studies Grant Program Participation and Transportation Planning Effectiveness

Participation in the Technical Study Grant Program measures the duration and magnitude of an urban area participation in this UMTA program. Two indicators measuring program participation are:

> Total length of time in years in the program since receipt of initial grant;
>
> Total amount of Technical Studies Grant funding received cumulatively since initial participation.

Length of time in the program is measured in years from receipt of the initial Technical Studies Grant until 1976. The cumulative total of Technical Studies Grant funding is calculated on a per capita basis to control for variation in the size of the urban areas. Tables 2 and 3 contain the distributions for both indicators.

The analysis in Table 4 was performed to understand the significance of duration and funding as measures of Technical Study Grant Program participation. Contrary to the expectation that larger urban areas would have greater per capita funding due to longer program participation and their complex transit problems, funding per capita per years of program participation has a curvilinear relationship with urban area population size. The funding measure of program participation represents the range of urban area experiences and is not biased towards larger areas having greater population.

TABLE 2. URBAN AREA PARTICIPATION IN UMTA TECHNICAL STUDY GRANT PROGRAM IN YEARS

No. of Years Since Initial Technical Study Grant	No. of Urban Areas
1 - 2	4
3 - 4	7
5 - 6	6
7 - 9	3
Total	20

Mean Years in Program = 4.5

TABLE 3. URBAN AREA PARTICIPATION IN UMTA TECHNICAL STUDY GRANT PROGRAM BY PER CAPITA FUNDING

Cumulative Per Capita Technical Studies Grant Funding	No. of Urban Areas
$ .0 - .49	2
.50 - .99	9
1.00 - 1.49	5
1.50 - 1.99	2
2.00 - 2.49	1
2.50 - 2.99	1
Total	20

Mean Per Capita Funding = $1.07

TABLE 4. TECHNICAL STUDY GRANT FUNDING RELATED TO SIZE OF URBAN AREA

Urban Area Population	Cumulative Technical Study Grant funding per capita (1)	Mean no. of years since receipt of initial grant (2)	Funding per capita per year since receipt of initial grant (2 1)	Mean funding of Technical Study Grant	Total
larger than 500,000	$1.42	5.6	$ .39	$450,410	7
100,000 - 500,000	.91	4.6	.50	53,071	8
less than 100,000	.85	2.8	.33	30,933	5
Total					20

Planning effectiveness is scored according to the four components of professional planning capability, capital acquisition, new or improved services with existing facilities, and institutional climate. A score sheet was developed for each of the four effectiveness components listing constituent elements, i.e., improvements contributing to that component of planning effectiveness. Elements were scored as 0, 1, or 2 based on the progress the area had made toward implementation of the improvement. These scores were totalled and standardized to generate summary scores ranging between 0 and 25 for each component. Tables 5 through 8 are samples of the score sheets used for each of the components.

Using the components of planning effectiveness, each urban area received a score for each of the four components. A composite score on planning effectiveness was calculated by summing the scores of the four components for each urban area.

The association between program participation and planning effectiveness is shown in bi-variate frequency distributions. Tables 9, 10, 11, and 12 show the relationship between program participation, measured as cumulative total funding per capita and planning effectiveness, measured according to the four components.

The Spearman rho measures of association (r) shown in Tables 9 through 12 suggest that cumulative Technical Studies Grant funding per capita is strongly related to increased professional planning capability, capital acquisition,

TABLE 5. PLANNING EFFECTIVENESS SCORE SHEET

Professional Planning Capability

Inventory	Scoring Factors		
	2	1	0
A. Planning expertise			
° Staff	Expanded Staff	Staff	No Staff
° Consultants	In-House	Consultants/In-House	Reliance on Consultants
° Training	Transit Planners	Highway Orientation	No Training
° Agencies	Joint Staffing	Informal Coordination	No Coordination
B. Type of Planning			
° Short Range	Regularly Updated	Ad Hoc Revisions	No Revisions
° Long Range	Applied	Integrated	Pro Forma
° Comprehensive	Applied	Integrated	Pro Forma
° Operational	Applied	Conducted	None
° Modelling	Applied	Conducted	None
C. Other Factors			
° Regional Data Base	Common Data Base	Information Exchange	None
SCORE CALCULATION	RAW SCORE X ADJUSTMENT FACTOR = FINAL SCORE (25 MAXIMUM)		
	_____ X 1.25 = _____		

TABLE 6. PLANNING EFFECTIVENESS SCORE SHEET

New Capital Acquisitions

Inventory	Scoring Factors		
	2	1	0
A. Fleet Replacement	Implemented	Planned	None
B. Fleet Expansion	Implemented	Planned	None
C. Garage/Maintenance Renovation	Implemented	Planned	None
D. Garage/Maintenance Construction	Implemented	Planned	None
E. Park and Ride	Implemented	Planned	None
F. Operational/Other (Bus shelters, Registering Fare Boxes, Bus Stop Signs)	Implemented	Planned	None
SCORE CALCULATION	RAW SCORE X ADJUSTMENT FACTOR = FINAL SCORE (25 MAXIMUM)		
	_____ X 1.79 = _____		

TABLE 7. PLANNING EFFECTIVENESS SCORE SHEET

New and Improved Services with Existing Facilities

Inventory	Scoring Factors		
	2	1	0
A. Special Services			
° Fare-Free Zone	Implemented	Planned	None
° CBD Circulator	Implemented	Planned	None
° Youth/Recreation	Implemented	Planned	None
B. Demand Responsive			
° General Population	Implemented	Planned	None
° E & H	Implemented	Planned	None
C. Fare Changes			
° General Population	Decrease	No Change	Increase
° E & H	All Day Discount	Off Peak Only	None
D. Management	Implemented	Planned	None
E. Marketing			
° Advertising	Implemented	Planned	None
° Analysis	Implemented	Planned	None
F. Route Structure			
° Coverage	Implemented	Planned	None
° Scheduling	Implemented	Planned	None
SCORE CALCULATION	RAW SCORE X ADJUSTMENT FACTOR = FINAL SCORE (25 MAXIMUM) _____ X 1.04 = _____		

TABLE 8. PLANNING EFFECTIVENESS SCORE SHEET

Institutional Climate

Inventory	Scoring Factors		
	2	1	0
A. Jurisdictional Issues			
° RTA	RTA Established	Coordination	No Coordination
° MPO Authority	Lead	Shared	Disjoint
° Citizen Participation	Participatory	Informational	Pro Forma
° Geographical Area	Cooperative	Central City Dominance	Disagreement
° MPO, A/95 Relationship	A/95, MPO Same	A/95,MPO Separate	None
° State's Role	Supportive	Neutral	Conflicting Directives
B. Funding Mechanism			
° Section 9	Regional Financing	Central City	Uncertain
° Section 3	Regional Financing	Central City	Uncertain
° Section 5	Regional Financing	Central City	Uncertain
SCORE CALCULATION	RAW SCORE X ADJUSTMENT FACTOR = FINAL SCORE (25 MAXIMUM)		
	_____ X 1.39 = _____		

TABLE 9. URBAN AREA PARTICIPATION IN UMTA TECHNICAL STUDY GRANT PROGRAM BY PER CAPITA FUNDING AND PROFESSIONAL PLANNING CAPABILITY

Cumulative Per Capita Technical Study Grant Funding	Professional Planning Capability		
	Low	High	Total
$ .0 - .49	2		2
.50 - .99	6	3	9
1.00 - 1.49	3	2	5
1.50 - 1.99		2	2
2.00 - 2.49		1	1
2.50 - 2.99		1	1
Total	11	9	20

r_s= .42, p .07

NOTES:

r_s = "Spearman's rho is a non-parametric measure of association for ordinal variables based on the difference between ranks. Rho has a value of +1.0 for a perfect match between ranks, - 1.0 if the ranks are exactly opposite, and 0 if there is no rank pattern between the two variables."

"Rho therefore can be interpreted in terms of absolute magnitude; positive sign with rho indicates a direct relationship, negative sign with rho indicates an inverse relationship."

"The formula for Spearman's rho is a Pearsonian r computed on ranks." (Spearman's $r_s = 1 - \frac{6 \Sigma D^2}{N(N^2-1)}$

Source: Loether, Herman J. and Donald G. McTavish, Descriptive Statistics for Sociologists, Allyn and Bacon, Boston, MA.

p = probability that this result could have occurred by chance. The procedure used to determine p is the following:

"The sampling distribution of r_s is approximately normal for $N \geq 10$. The standard deviation of the distribution is given by $1/\sqrt{N-1}$. The probability that r_s is in fact representative of the population is computed using the formula $Z = \frac{r_s - 0}{1/\sqrt{N-1}}$ and using the normal table to convert the standard score, Z, into a probability level, p." Source: Blalock, Hubert M., Jr., Social Statistics, McGraw-Hill, New York, 1960, p. 317-319.

TABLE 10. URBAN AREA PARTICIPATION IN UMTA TECHNICAL STUDY GRANT PROGRAM BY PER CAPITA FUNDING AND CAPITAL ACQUISITION[1]

Cumulative Per Capita Technical Study Grant Funding	Capital Acquisition		
	Low	High	Total
$ .0 - .49	1		1
.50 - .99	8		8
1.00 - 1.49	2	3	5
1.50 - 1.99	1	1	2
2.00 - 2.49		1	1
2.50 - 2.99		1	1
Total	12	6	18

$r_s = .92$, $p \leq .01$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

TABLE 11. URBAN AREA PARTICIPATION IN UMTA TECHNICAL STUDY GRANT PROGRAM BY PER CAPITA FUNDING AND NEW OR IMPROVED SERVICES WITH EXISTING FACILITIES[1]

Cumulative Per Capita Technical Study Grant Funding	New or Improved Services with Existing Facilities		
	Low	High	Total
$ .0 - .49	1		1
.50 - .99	6	2	8
1.00 - 1.49	2	3	5
1.50 - 1.99	1	1	2
2.00 - 2.49		1	1
2.50 - 2.99		1	1
Total	10	8	18

$r_s = .63$, $p \leq .07$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

TABLE 12. URBAN AREA PARTICIPATION IN UMTA TECHNICAL STUDY GRANT PROGRAM BY PER CAPITA FUNDING AND INSTITUTIONAL CLIMATE

Cumulative Per Capita Technical Study Grant Funding	Institutional Climate		
	Low	High	Total
$ .0 - .49	1	1	2
.50 - .99	4	5	9
1.00 - 1.49	3	2	5
1.50 - 1.99	1	1	2
2.00 - 2.49		1	1
2.50 - 2.99	1		1
Total	10	10	20

$r_s = -.10$, $p \leq .66$

service improvements, but not to institutional climate. These findings imply that Technical Study Grants promote increased professionalization of the planning process which in turn facilitate plan implementation.

By contrast, institutional climate appears unrelated to the dollar volume of the Technical Studies Grant funding. Examination of specific urban areas suggests the lack of relationship may be due to the simultaneous occurrence of two different types of relationships between institutional climate and Technical Study Grant funding. In one case, receipt of Technical Study Grants frequently results from a well-integrated, responsive, local institutional climate. Alternatively, in other urban areas receipt of these grants may facilitate an improved or more coordinated institutional climate. In the former case, the urban area has evolved an institutional matrix for planning and implementation able to expedite activity as well as corresponding well to federal guidelines regarding proper institutional and regional representation. In the latter case, Technical Study Grants provide localities with a vehicle to redefine locally specific transportation planning and operating agencies into regionally-oriented institutional formats better reflecting federal guidelines.

Tables 13 through 16 reveal the relationship between Technical Study Grant Program participation in terms of length of time in the program and planning effectiveness by the four components. Only Table 14, program participation by years and capital acquisitions, has a sufficiently significant statistical association to suggest there may be a relationship. The relationship with participation measured in years may reflect the "start-up" time associated with receipt of Technical Studies Grant funding, formation of plans, application for federal capital assistance, receipt of assistance and implementation of capital improvements.

The apparent lack of relationship between time in the program and the three of the four components of planning effectiveness, when contrasted with the more frequent relationship with funding, suggests the amount of planning assistance received may be more crucial than duration of experience. If an area has been in the program a long time, but has not been successful in receiving continuing Technical Studies Grant funding, its planning process may be mired in local institutional problems.

TABLE 13. URBAN AREA PARTICIPATION IN UMTA TECHNICAL STUDY GRANT PROGRAM BY YEARS AND PROFESSIONAL PLANNING CAPABILITY

No. of Years Since Initial Technical Study Grant	Professional Planning Capability		
	Low	High	Total
1-2	3	1	4
3-4	4	3	7
5-6	3	3	6
7-8	1	1	2
9-10		1	1
Total	11	9	20

$r_s = .29$, $p \leq .20$

TABLE 14. URBAN AREA PARTICIPATION IN UMTA TECHNICAL STUDY GRANT PROGRAM BY YEARS AND CAPITAL ACQUISITION[1]

No. of Years Since Initial Technical Study Grant	Capital Acquisition		
	Low	High	Total
1-2	2		2
3-4	4	3	7
5-6	4	2	6
7-8	2		2
9-10		1	1
Total	12	6	18

$r_s = .38$, $p \leq .09$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

TABLE 15. URBAN AREA PARTICIPATION IN UMTA TECHNICAL STUDY GRANT PROGRAM BY YEARS AND NEW OR IMPROVED SERVICES WITH EXISTING FACILITIES[1]

No. of Years Since Initial Technical Study Grant	New or Improved Services With Existing Facilities		
	Low	High	Total
1-2	2		2
3-4	2	5	7
5-6	3	3	6
7-8	2		2
9-10		1	1
Total	9	9	18

$r_s = .07$, $p \leq .94$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

TABLE 16. URBAN AREA PARTICIPATION IN UMTA TECHNICAL STUDY GRANT PROGRAM BY YEARS AND INSTITUTIONAL CLIMATE

No. of Years Since Initial Technical Study Grant	Institutional Climate		
	Low	High	Total
1-2	3	1	4
3-4	2	5	7
5-6	4	2	6
7-8		2	2
9-10	1		1
Total	10	10	20

$r_s = .09$, $p \leq .70$

3.3 Transportation System Operation and Planning Effectiveness

System operation is measured as change in transit system ridership; ridership change is a proxy for productivity and efficiency. Ridership change is calculated as average annual ridership changes since initial program participation. This avoids bias due to length of time in the program.

Average annual ridership change varied considerably among urban areas, from decreasing ridership to substantial ridership increases. Ridership changes fall into three categories: expanded, preserved, and declining as shown in Table 17. It should be noted that the three categories correspond to UMTA's objectives of "expanding, preserving, and upgrading failing transit systems."

Tables 18, 19, 20, and 21 reveal the impact of planning effectiveness on system operation or ridership change. The associations are weak. However, capital acquisitions had the strongest association with expanded ridership, though not at the $p \leq .10$ level. This relationship is expected in an effective planning environment.

It is likely that the tenuousness of the associations in Tables 18, 20, and 21 reflect the extended causal chain suggested in these analyses. Professional planning capability and institutional climate have the least association with ridership change which would be expected according to the temporal sequence of events.

3.4 Local Area Characteristics and Transit System Operation

A number of local characteristics, exogenous to the Technical Studies Grant Program, potentially affect transit system operation. These local area characteristics are analyzed to determine their association with ridership change. The local area characteristics discussed are listed in Table 22.

The presence or absence of a legally-created Regional Transit Authority (RTA) is viewed as impacting the influence of transit system improvements because the existence of an RTA demonstrates an institutional commitment to transit. For example, an RTA is able to facilitate regional administration of a transit system in relation to financing and service coordination.

Table 23 examines the relationship between an RTA and ridership change. It shows that the existence of an RTA is somewhat related to expanded ridership.

TABLE 17. MEAN ANNUAL RIDERSHIP - CHANGE BY URBAN AREA

System Operation	Mean Annual Ridership Change	No. of Years of Ridership Data[1]	No. of Years in Program[2]
EXPANDED			
Salt Lake City	32.3	4	4
Colorado Springs	28.0	4	4
Cedar Rapids	15.0	1	2
San Diego	8.6	9[3]	6
Erie	7.0	7	8
Manchester	6.7	3	4
Cleveland	5.0[4]	4	4
PRESERVED			
Providence	2.5	4	4
Omaha	2.4	7	7
Syracuse	2.2	5	5
Seattle	1.4	9	9
Birmingham	.0	6	6
Albuquerque	.0	2	2
DECLINING			
Little Rock	-2.5	6	6
Dallas/Ft. Worth	-2.5[5]		6
Worcester	-4.0	3	3
Hattiesburg	-8.0	5	5
Charlottesville	-11.7	3	3
FIRST GRANTS RECEIVED DURING FY 1975-1976			
Billings	NA	NA	1
Flagstaff	NA	NA	1
MEAN	4.6		4.5

[1]This represents reporting years for ridership figures. Some systems had 1975 data, others had 1976 data.

[2]This is equal to 1976 less date of award of first Section 9 grant.

[3]San Diego recieved a HUD grant in 1967 which was used for transit improvements; ridership change is figured from that date. However, number of years in program is figured according to UMTA grants.

[4]Cleveland's ridership change encompasses a shift from decreasing to increasing ridership during this time period, due to total system reorganization into a regional transit service.

[5]Dallas and Fort Worth ridership changes are calculated together weighted for the different ridership volumes. Ridership changed from 3.16M for Dallas to 25M; Fort Worth changed from 4.2M to 5M. This produces an aggregate ridership decline from 35.8 to 30M over six years, approximately 2.5%/year.

TABLE 18. PROFESSIONAL PLANNING CAPABILITY AND SYSTEM OPERATION - RIDERSHIP CHANGE[1]

Professional Planning Capability	Mean Annual Ridership Change		
	Expanded ($\geq$ +5%)	Preserved ($<$ +5%)	Declining ($<$ 0%)
High	4	3	1
Low	3	3	4
Total	7	6	5

$r_s = .27$, $p \leq .44$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

TABLE 19. CAPITAL ACQUISITION AND SYSTEM OPERATION - RIDERSHIP CHANGE[1]

Capital Acquisition	Mean Annual Ridership Change		
	Expanded ($\geq$ +5%)	Preserved ($<$ +5%)	Declining ($<$ 0%)
High	5	1	2
Low	2	5	3
Total	7	6	5

$r_s = .49$, $p \leq .16$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

TABLE 20. SERVICE IMPROVEMENTS AND SYSTEM OPERATION - RIDERSHIP CHANGE[1]

Service Improvements	Mean Annual Ridership Change		
	Expanded ($\geq$ +5%)	Preserved ($<$ +5%)	Declining ($<$0%)
High	5	2	2
Low	2	4	3
Total	7	6	5

$r_s = .32$, $p \leq .36$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

TABLE 21. INSTITUTIONAL CLIMATE AND SYSTEM OPERATION - RIDERSHIP CHANGE

Institutional Climate	Mean Annual Ridership Change		
	Expanded ($\geq$ +5%)	Preserved ($<$ +5%)	Declining ($<$0%)
High	4	4	2
Low	3	2	3
Total	7	6	5

$r_s = .29$, $p \leq .40$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

TABLE 22. LOCAL AREA CHARACTERISITCS

Local Area Characteristics	Significance
Regional Transit Authority	Present/Absent
"Pass Through" Funds - availability of planning funds to transit operator	Present/Absent
Source of Local Funding - for transit planning and implementation	General Revenues/ Transit-specific Funding Mechanism
Transit Goal Identification - locally recognized transit service goals	Transit Dependent Only/ Comprehensive Goals
Citizen Participation - in the planning process	Pro Forma/Informational/ Participatory
Density of Urbanized Area	Persons Per Square Mile
Population of Urbanized Area	

TABLE 23. LOCAL AREA CHARACTERISTICS - RTA AND SYSTEM OPERATION - RIDERSHIP CHANGE[1]

Local Area Characteristics-RTA	Mean Annual Ridership Change			
	Expanded ($\geq$ +5%)	Preserved (< +5%)	Declining (< 0%)	Total
Present	4	5	2	11
Absent	3	1	3	7
Total	7	6	5	18

$x^2 = 2.27$, df = 2, $.10 \leq p \leq .20$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

In some urban areas, the local planning organization, designated as the MPO, "passes through" a certain portion of Technical Studies Grant funds to the transit operator for transit planning. Such an arrangement suggests a close integration regarding goals between the planning agency and the transit operator.

Table 24 examines the relationship between the receipt of "pass through" funds and ridership changes. It shows no association between "pass through" funds and expanded ridership. This relationship may be too subtle to be revealed by this exploratory study.

A stable source of local funding may aid the expansion of a transit system because it provides a firmer base for planning and policy formation. Table 25 examines source of local funding in relation to ridership change. Because the categories of funding are not mutually exclusive in each local area, it is impossible to statistically analyze Table 25. However, it appears that sales taxes are associated with expanded ridership, while property taxes and state aid are associated with preserved or declining ridership.

Sales taxes appear to have more potential for keeping up with inflation than do property taxes. Both sales taxes and property taxes typically have legislative limits on their expansion. However, sales taxes are usually more recent and hence are more in tune with current fiscal requirements. State aid usually involves payment for a fixed percentage of operating expenses. In some cases it also pays a percentage of the local share of capital assistance grants. It may not be as effective as a sales tax in supporting transit financing.

The types and variety of goals that emanate from the local political process may influence the direction and degree of transit system improvements. Table 26 portrays typical goals defined for transit service and their relationship with ridership changes. Again, reflecting on actual local area experience, the goal categories are not mutually exclusive, prohibiting statistical analysis.

It appears that areas with transit service goals which are inclusive of more than transit dependent service are more likely to have expanded ridership. Broader service goals may be connected with increased comprehensiveness and possibly professionalization of the planning process.

The UMTA requirement of citizen participation in the planning process is interpreted in a variety of ways by local areas. A pro forma level of citizen participation typically involves token citizens on planning agency committees or citizen advisory committees with minimal input

TABLE 24. LOCAL AREA CHARACTERISTICS - "PASS THROUGH" FUNDS AND SYSTEM OPERATION - RIDERSHIP CHANGE[1]

Local Area Characteristics - "Pass Through" Funds	Mean Annual Ridership Change			
	Expanded ($\geq$ +5%)	Preserved (< +5%)	Declining (< 0%)	Total
Present	4	3	1	8
Absent	3	3	4	10
Total	7	6	5	18

$x^2 = 1.69$, df = 2, $.30 \leq p \leq .50$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

TABLE 25. LOCAL AREA CHARACTERISTICS - SOURCE OF LOCAL FUNDING AND SYSTEM OPERATION - RIDERSHIP CHANGE[1]

Local Area Characteristics- Source of Local Funding	Mean Annual Ridership Change			
	Expanded ($\geq$ +5%)	Preserved (< +5%)	Declining (<0%)	Total
General Revenues Only[2]	3	2	2	7
Sales Tax	3	1	-	4
Property Tax	-	2	2	4
State Aid	1	4	3	8
Federal Revenue Sharing	-	-	1	1
Total	7	6	5	18

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

[2]This category is mutually exclusive, but the other categories are overlapping.

TABLE 26. LOCAL AREA CHARACTERISTICS - TRANSIT GOAL IDENTIFICATION AND SYSTEM OPERATION - RIDERSHIP CHANGE[1]

Local Area Characteristics Transit Goal Identification	Mean Annual Ridership Change			
	Expanded (≥ +5%)	Preserved (< +5%)	Declining (<0%)	Total
Transit Dependent Only[2]	4	3	4	11
Choice Rider[3]	2	1	1	4
Urban Development[4]	3	5	1	9
Efficiency[5]	4	1	2	7
Total	13	10	8	31

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

[2]This category is mutually exclusive, but the other categories are overlapping.

[3]Includes strategies designed to attract non-transit dependent riders.

[4]Includes CBD preservation and urban growth management goals.

[5]Includes strategies to improve the efficiency of transit system operation and management.

to planning formulation. An informational type of citizen participation suggests there have been efforts by the planning agency to inform the public of transit developments through public meetings, media and mailings. Active form of citizen participation would include actual review of transit proposals by representative citizen groups prior to implementation.

Table 27 examines the relationship between extent of citizen participation and ridership change. There appears to be no association between active citizen participation and expanded ridership.

One of the urban area selection criteria is density, and the urban areas selected represent a range of densities. Because urban area density may be related to transit use independently, it is necessary to examine transit improvements in relation to density when explaining ridership changes. Table 28 describes density as it relates to ridership change and shows that density is not related to ridership changes.

Urban area population size is also a case study selection criteria and the twenty urban areas represent a range of population sizes. It is posited that larger urban areas might have more extensive ridership markets and therefore would be more likely to report increased ridership. This is not found in Table 29. Likelihood of ridership increase appears unrelated to urban area size.

The two demographic characteristics, population and density, are not associated with changes in ridership. It does not appear that the denser urban areas have more potential for ridership increase than less dense areas based on the experience in these twenty urban areas.

TABLE 27. LOCAL AREA CHARACTERISTICS - CITIZEN PARTICIPATION AND SYSTEM OPERATION - RIDERSHIP CHANGE[1]

Local Area Characteristics- Citizen Participation	Mean Annual Ridership Change			
	Expanded ($\geq$ +5%)	Preserved (< +5%)	Declining (<0%)	Total
Pro Forma	2	1	3	6
Informational	2	2	1	5
Active Participation	3	3	1	7
Total	7	6	5	18

$x^2 = 2.38$, df = 4, $.50 \leq p \leq .70$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

TABLE 28. LOCAL AREA CHARACTERISITCS - URBANIZED AREA DENSITY AND SYSTEM OPERATION - RIDERSHIP CHANGE[1]

Local Area Characteristics- Urbanized Area Density	Mean Annual Ridership Change			
	Expanded ($\geq$ +5%)	Preserved (< +5%)	Declining (<0%)	Total
< 3,200	6	-	1	7
3,200 - 3,600	4	2	1	7
> 3,600	4	-	-	4
Total	14	2	2	18

$x^2 = 3.39$, df = 4, $.30 \leq p \leq .50$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

TABLE 29. LOCAL AREA CHARACTERISTICS - URBANIZED AREA SIZE AND SYSTEM OPERATION - RIDERSHIP CHANGE[1]

Local Area Characteristics- Urbanized Area Size	Mean Annual Ridership Change			
	Expanded ($\geq$ +5%)	Preserved (< +5%)	Declining (<0%)	Total
<100,000	1	3	3	7
100,000 - 500,000	-	3	3	6
>500,000	2	2	1	5
Total	3	8	7	18

$x^2 = 3.55$, df = 4, $.30 \leq p \leq .50$

[1]Excludes Flagstaff and Billings due to the recentness of their entry into the program.

4. CONCLUSIONS

4.1 Overview

In formulating conclusions to this analysis of planning effectiveness, it is useful to examine again the model diagrammed in Section 3. Figures 2 and 3 portray a proposed model of the components of transportation planning effectiveness which are represented by boxes; the entries under each box, marked by bullets, are the ways in which each component is measured. Figure 2 presents the relationships measured in this study, including measurements used for each model component. The statistically significant $p \leq .10$ relationships between measurements of each transportation planning effectiveness component are shown in Figure 3.[2]

[2]Two of these relationships, system operation and source of local funding and system operation and transit goal identification, were not statistically estimated due to the nature of the data. However, visual examination of the frequency distributions shown in Tables 25 and 26 show a potential pattern of relationships.

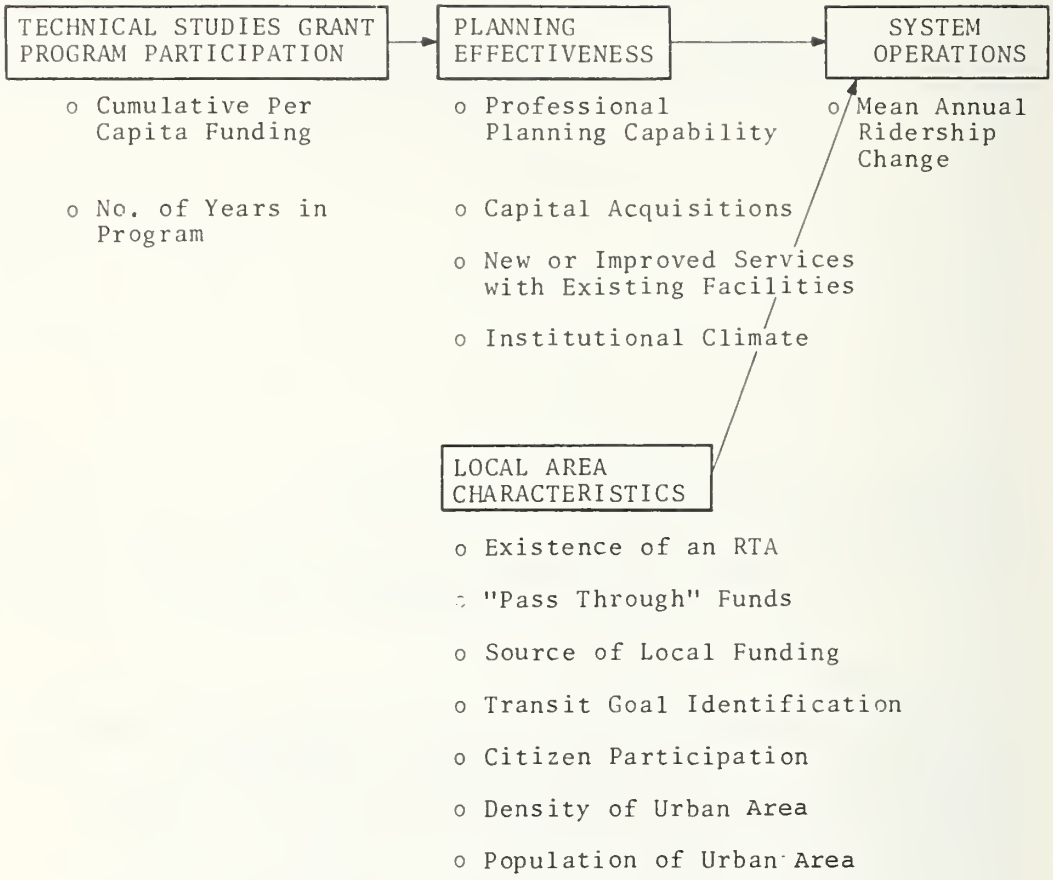


FIGURE 2. PROGRAM PARTICIPATION AND PLANNING EFFECTIVENESS MODEL

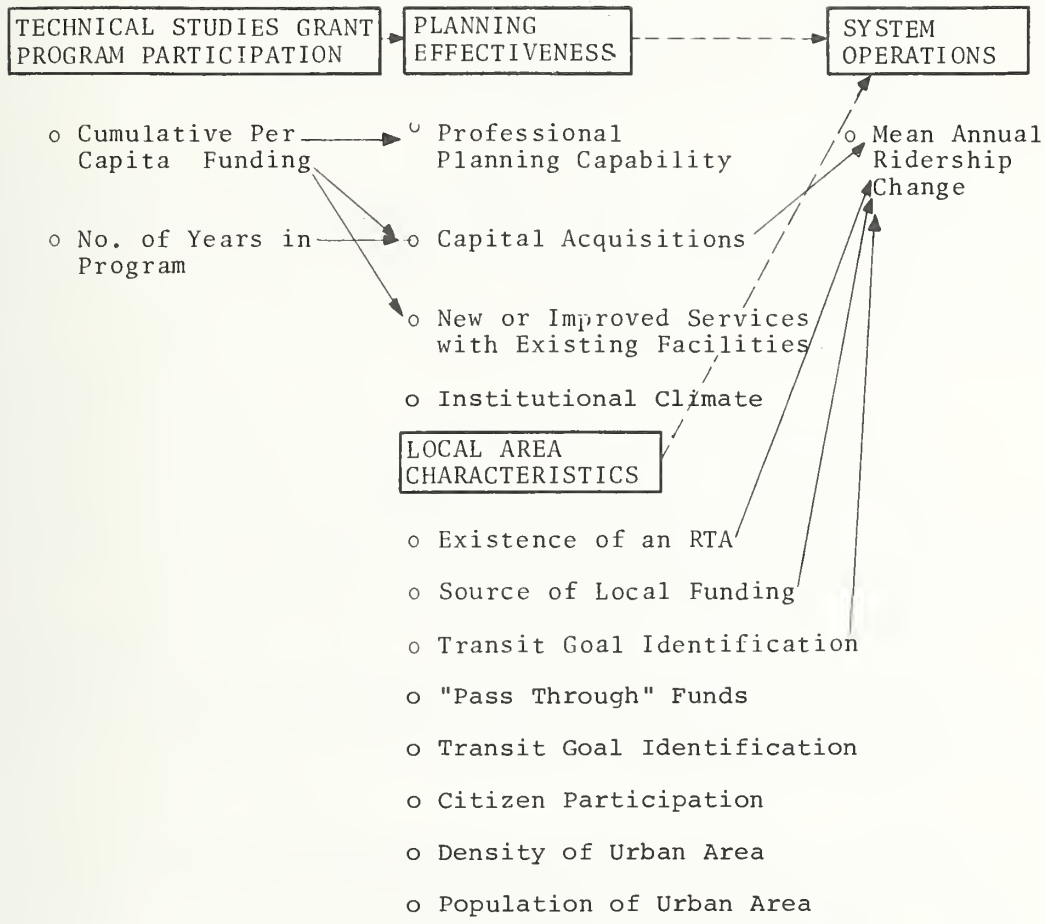


FIGURE 3. ELABORATION OF PROGRAM PARTICIPATION AND PLANNING EFFECTIVENESS MODEL

4.2 Impact of Technical Study Grant Program Participation on Planning Effectiveness

The intent of this analysis was to identify whether and how program participation in the Technical Study Grant Program affected transportation planning. The cumulative funding aspect of program participation appears to be related to improved planning effectiveness. By contrast, program participation, measured by years in the program, is associated only with the capital acquisition element of planning effectiveness.

The relationship between program participation and planning effectiveness appears clearly and reflects increased planning capabilities and service provision. The Technical Study Grant Program appears to have been directly responsible for upgrading the quality of local transportation planning as well as facilitating capital acquisitions and service changes.

4.3 Impact of Planning Effectiveness on System Operation

In order to trace the repercussive effect of Technical Study Grant Programs, the impact of the planning effectiveness generated by this program was measured on system operation, or average annual ridership change. Admittedly, the planning effectiveness is only one of many factors influencing ridership change and therefore only slight relationships should be anticipated.

Of the four components of planning effectiveness, the physical stock related component, capital acquisitions, had the strongest relationship with ridership change. This is a logical relationship as capital acquisition also is a proxy measure of system capacity.

Additionally, capital acquisitions usually result from the urban area's participation in the UMTA Section 3 Capital Assistance program which requires, as a funding precondition, certification of planning adequacy. Revelation of the statistical association between capital acquisition and ridership increases reflects a prior

sequence of adequate planning generating this result. This relationship demonstrates the combined ability of Section 3 and Section 9 funding to bring about increased system utilization confirming the original collective intent of these UMTA programs.

4.4 Impact of Local Area Characteristics on System Operation

Recognizing that planning and system operation occur in a complex social and physical environment, various local area characteristics were selected and analyzed to determine their relative influence. Only three of the seven local area characteristics appear to be associated with system operation or average annual ridership change.

The local area characteristics associated with ridership change include existence of a regional transit authority (RTA), a stable source of local funding, and enunciation of comprehensive transportation service goals. Several of the local area characteristics, not related to ridership change, were surprising as they contradict conventional wisdom; these include urban area density, population, intensiveness of citizen participation in planning, and transit operator use of "pass through" planning funds.

In summary, local area characteristics conducive to increased transit ridership appear to be structural and financial. Characteristics not associated with ridership change can be characterized as market potential and public participation.

4.5 Concluding Observations

Reviewing the significant influences of Technical Study Grant Program participation shown in Figure 3, some additional non-significant relationship should be noted. The more temporally attenuated relationship between program participation and system operation or ridership change is not statistically significant in itself. Because it is possible that annual ridership change masks a threshold effect generated by the discontinuous process of fleet acquisition and improvement, program participation was segmented by less than 4 years in the program versus more than 4 years. However, there was no significant relationship between program participation and ridership change segmented for threshold effects.

This analysis of the model in Figure 3 attempts to depict a very complex chain of events. Significant

relationships therefore occur when the variables have temporal proximity. The existence of such relationships in this exploratory analysis suggest it is possible to carry out multi-variate analyses to specify a model of program impacts, accounting for the simultaneous contribution of the multiple influences on planning effectiveness and system operation.

The model shown in Figures 2 and 3 has been used in a largely heuristic way; it suggests some of the mechanisms and the extent to which UMTA program participation and planning effectiveness might be predicted with planning and service variables. The conclusions only apply to the model formulation employed which may oversimplify somewhat the actual complexity of urban areas' participation in UMTA programs.

APPENDIX A - CASE STUDY SUMMARIES

BIRMINGHAM, ALABAMA

The Birmingham urbanized area encompasses 19 incorporated municipalities, as well as the city of Birmingham. The area, though moderately dense, has been experiencing a population decline. Between 1960 and 1970 the city's population declined 12 percent while the urbanized area grew 7 percent. The 1970 modal split was 8 percent. Transit ridership has been relatively stable since 1973. There is unregulated and unlicensed jitney service operating in this area which provides a quasi-taxi service, paralleling the bus routes and charging equivalent bus fares. In 1973 there was a public takeover of the private transit operators to establish the Birmingham-Jefferson County Transit Authority. Following public takeover, transit was provided to localities upon payment of a per capita tax which would then be used to produce the matching share for any capital assistance requests. Only 9 of the 19 municipalities decided to pay such a tax for transit service.

Highway planning began in this area in 1965, and by 1971 a highway plan, including land use elements, was developed. It was adpoted in 1972, on the condition that a role for transit be included. This created obstacles until FHWA decertified the area during 1974 through 1975, forcing improvement of the weak transportation planning process. Resolution required that the Birmingham Regional Planning Commission be responsible for long-range transportation planning and the BJCTA be responsible for the short-range planning which would be carried out under contract with the BRPC. The area has received $457,000 in Technical Studies Grants as a result of an initial submission, with two subsequent amendments. The initial request was to develop a TDP in preparation for the public takeover of the private carrier; the most recent amendment was intended to study possible reuse of abandoned rail trackage as a rapid transit system. Public takeover and fleet upgrading was accomplished through the receipt of three Capital Assistance Grants totalling $3.1 million.

The area has experienced institutional conflict which has hampered the evolution of the planning capabilities and transit improvements. For example, the contract management operating the public transit system has an operation focus and, therefore, has been unable tc carry out the transit planning recommendations of the TDP with regard to routing, management, and marketing. There are also problems in the financing of the public transit system; the new 5-year capital acquisition program reccmmended in the TDP probably will not occur because of an inability to generate the local share required by the grant. Institutional disputes between the BRPC and BJCTA regarding appropriate planning jurisdictions and responsibilities impeded progress in

transit planning; their omission of citizen participation mechanisms until recently has resulted in lack of sufficient community support for the system. A citizen's group, using HEW funds, is now providing the only handicapped and elderly service in the area. In order to expedite improved transportation, a group of businessmen raised sufficient money for the required local share for a Capital Assistance Grant to acquire a mini-bus fleet to improve access to the local division of the University of Alabama from the CBD. Despite their efforts, this project was rejected by the Regional Office.

FLAGSTAFF, ARIZONA

Flagstaff is the regional center of Northern Arizona because of its proximity to recreational and scenic attractions. The city grew 43 percent during the 1960's to its 26,117 population in 1970. An automobile-oriented city, it has two business districts, 4 miles apart. Its 1970 modal split was 1 percent, and household auto ownership was 93 percent. It has never had and does not currently have a full-service transit system.

Although there has been a history of highway planning and long-range comprehensive transportation planning in the area, there has been no transit planning until 1973. At this time, students and faculty in the City Planning Department at Northern Arizona University, through an UMTA University Research Training Grant, began transit planning activities, and stimulated a local interest in continuing this work through the Technical Studies Program. Coordination between NAU, the City Planning Department, and Northern Arizona Council of Governments, the comprehensive regional planning agency, stimulated the latter to make application and receive in 1975 a Technical Studies Grant to develop a TDP. At UMTA's request, a consultant was hired to produce the TDP, which recommended city purchase of a seven-vehicle fleet and a contract for its operation.

Presently, Flagstaff is at a crossroads, in that local adoption of a TDP is pending. Local adoption is perceived as tantamount to a public committment to transit. Because Flagstaff is not an urbanized area and therefore ineligible for Section No. 5 funding, the financial issues of generating a local share and subsequent operating subsidies are being considered simultaneously with the issue of TDP adoption. Despite strong community support by civic groups and business leaders, a satisfactory financial arrangement has yet to be developed. Current possibilities are a sales tax on hotel and motel revenue or use of revenue-sharing funds.

LITTLE ROCK, ARKANSAS

Little Rock, Arkansas, the state capitol, has low residential density and an increasing population. The city and urbanized area grew 23 percent and 20 percent respectively between 1960 and 1970. It is automobile-oriented and experiences no traffic congestion or parking problems. Transit ridership is comprised almost entirely of transit-dependent persons. The 1970 modal split was 5 percent, and household auto ownership was 83 percent. Subsequent to the public takeover of the two private operators in 1972, ridership had decreased 15 percent in 4 years. Metroplan is the transit operator and also the Regional Comprehensive Planning Agency. It acts as trustee for the jurisdictions served and contracts for transit management with a private firm.

There has been a tradition of extensive highway and transportation planning in the area. In 1964, HUD funding purchased replacement vehicles for the private operators, allowing them to continue to offer some service reliability. In recent years, Metroplan has received three Technical Studies Grants, totaling $158,000, to develop a TDP and planning refinements. Because of difficulty financing the operating deficit, the most recent grant has been used to improve the system's efficiency through service restructuring and the use of transfers.

Little Rock's experience with the Capital Assistance Grant Program typifies the current dilemma the area faces. In 1976 Metroplan returned 1.7 million dollars of the 2.4 million dollars they had received from UMTA through the Capital Assistance Program because their inability to meet the local share requirements for that stage of funding under this grant. The financial crisis was due to state legislation which limits the municipal tax base. This legislation is unlikely to be changed in the near future because of the rural dominance in the state legislature. The magnitude of the recent increases in operating costs was so large and unexpected that it is unlikely that Metroplan will apply for any additional UMTA assistance requiring a local share committment. The recent emphasis on programming and financial management strategies in the operation of the transit service reflects their current effort at system maintenance.

SAN DIEGO, CALIFORNIA

The San Diego urbanized area, which contains the second largest city in California and the nation's ninth largest, has been one of the fastest growing areas in the country. The urbanized area grew 43 percent between 1960 and 1970. Residential development, however, has taken place at low densities and in a "leap frog" pattern contributing to long trips and a separation of residences from shopping and work areas. Most trips are made by auto on a freeway system which contains more miles per capita than Los Angeles, ranking it among the best in the nation. The 1970 modal split was 5 percent, and household auto ownership was 88 percent. Travel by transit, however, has increased more than 60 percent in the last 7 years owing to major capital expansion and service improvements of the area's two major public carriers. The North County Transit System and the San Diego Transit Corporation, bought out by the city in 1967, have more than doubled their service levels since the receipt of the first Technical Studies Grant in 1969.

San Diego has been a pioneer in transportation planning, being one of the first metropolitan areas in the country to conduct multi-jurisdictional planning. Its first transit planning grant was received by the county in 1970 to develop a mode-split and urban development model. Since that time, 5 Technical Study Grants totalling $3.4 million have been awarded to the CPO, the area's designated MPO and HUD-701 planning agency. Planning grants have funded sophisticated and comprehensive short range, long range, multi-modal, and comprehensive land use plans for the region, including the plans for a 59-mile grade-separated rapid rail system. Although consultants have been heavily utilized in the planning process, approximately 50 percent of the plans have been prepared by a joint planning staff of county, state, and regional (CPO) planners. Based on these plans, the area's two largest transit operators have received more than $16.2 million in Capital Grants. Future capital expenditure is expected to reach $40 per capita due to the proposed rapid rail system, whose price tag is over $200 million.

Transit planning in San Diego, among the most comprehensive and sophisticated in the nation, serves as an excellent example of how transportation planning may be integrated with overall regional planning in a comprehensive systems framework. Its short range, long range, and multi-modal plans are highly integrated and mutually supportive of the region's economic, environmental, and growth policies. Recent controversy over the area's rapid rail system, however, threatens to fragment the planning process. The state legislature's desire to quickly build a rapid rail system has resulted in the creation of a separate planning

organization to plan and manage rapid rail transit. The absence of planned rapid rail lines into the north county area also contributed to the passage of legislation which created another planning organization for North County bus transit. As a result of these actions, the status of the CPO as the MPO is in doubt; a number of conflicts and inconsistencies with federal guidelines has also been created. The future of rapid rail is also in doubt since the technology has not been determined and the needed financial support is not certain.

COLORADO SPRINGS, COLORADO

Colorado Springs, with a 1970 population of 135,017, is a small, low density metropolitan area. It experienced rapid growth during the 1960's with the city and the urbanized area increasing 92 percent and 104 percent respectively over this period. It is one of the most auto-independent communities in the nation, with 92 percent of all households in the urban area owning at least one auto--well in excess of the national average, 80 percent. Auto use is encouraged by wide streets, a parking supply commensurate with demand, and a high degree of separation of home and workplace. Travel by transit accounts for less than 1 percent of all urban trips despite a doubling of transit ridership in the last 4 years. Transit ridership increases have been recorded since 1972 when the city acquired ownership of a failing private system and initiated municipal service with the aid of a private management firm. Although this service is provided to the central city as well as outlying communities, the cost of the system is financed entirely by the city of Colorado Springs through its general fund.

A 7-year multi-jurisdictional planning effort produced the area's first comprehensive long-range transportation plan in 1973. Individual municipalities rejected this plan, however, because of disagreement over the plan's projected growth rate and lack of viable transit alternatives. Plan revision was begun in 1972 with the aid of a Technical Study Grant for $34,500. Consultants were hired to produce short range and long range Transit Development Plan. Two more grants have since been awarded in 1974 and 1975 in order to continue the plan revision process and to update the area's first TDP. Based on this planning, the city acquired ownership of the transit system and was awarded a Capital Grant in 1975. Besides new buses, a garage/office facility and related equipment, as well as major low capital-intensive improvements have been initiated.

Colorado Springs is an example of a successful transition from a failing private transit system to a viable public transit operation. Under city ownership and private managment, the transit service level has been brought up to industry standards, system coverage has increased, and needed capital equipment has been acquired. Municipal ownership, however, has resulted in a number of institutional problems. Since the city subsidizes the entire transit operation, including service to outlying communities, it has come to dominate regional transportation planning. A sharp division between short and long range planning has also evolved because of the MPO's hesitancy to contradict city short range planning. Similarly, an urban-rural split recently fragmented the planning process when controversy developed over the proper geographic boundary of the planning area and how FAUS funds would be spent. This has resulted in proposals for a new reduced planning area and an impending change in the MPO structure.

Despite institutional conflict, the immediate future of transit in Colorado Springs is bright. The "go slow" philosophy of transit management has resulted in continued expansion of the transit system with remarkable operational stability. There is some uncertainty, however, over the city council's level of financial support once the transit deficit reaches one million dollars, and the willingness of outlying communities to support their fair share of transit subsidy. Future ridership increases and system expansion are expected to be dependent on the ability of the city system to attract nontransit-dependent riders.

CEDAR RAPIDS, IOWA

The city of Cedar Rapids, with 110,642 residents in 1970, experienced a 20 percent population increase during the 1960's while the urbanized area grew 26 percent.

Cedar Rapids is characterized by short trip distances and a grid network of wide urban streets which encourage auto use. The community's transit-dependent population is districtly small. The 1970 modal split was 3 percent, and household auto ownership was 88 percent. In 1967 a Regional Transit Authority was established to contract service from a reorganized private carrier, the Regional Transit Corporation (RTC). The transit system's service district is approximately the same as the urbanized area, including Cedar Rapids and its one suburb, Marion. Faced with decreased ridership and increased operating costs, Cedar Rapids agreed to subsidize RTC's entire budget deficit. Since Technical Studies Grant planning began in 1974, ridership has increased 15 percent annually and deficit costs have decreased from 34 percent to 26 percent of the annual operating budget, which was $703,000 in Fiscal Year 1976.

The Linn County Regional Planning Commission (LCRPC) coordinates transit planning. Since 1974 two Technical Studies Grants, totalling $69,000, have been received. Planning has focused upon expanding regular route service without increasing deficit costs and the use of marketing to sustain RTC's ridership growth. LCRPC and Cedar Rapids are currently evaluating ways to implement the recently developed Transit Service Improvement Program. The community has applied for an Operating Assistance Grant and two Capital Assistance Grants.

RTC's operations demonstrate remarkable managerial efficiency and attentiveness to passenger comfort and travel needs. Cedar Rapids is strongly committed to maintaining a need-responsive public transportation system. Planning is characterized by goal consensus among LCRPC, RTC, and municipal officials. Need responsiveness is interpreted as maximizing the use of transit facilities while minimizing deficit costs.

WORCESTER, MASSACHUSETTS

Worcester, with a 1970 population of 176,603, is located in central Massachusetts. The Worcester urbanized area is characterized by a dense central city, containing a high proportion of elderly and carless households. The 1970 modal split was 10 percent, and household ownership was 81 percent. Low population densities in suburban areas, however, coupled with the lack of congestion or parking problems in the central city, have contributed to decreasing use of transit. Decreasing transit ridership and a labor dispute precipitated a transit crisis in 1972. When the private operator threatened to cease all transit service, the city agreed to subsidize the failing private transit system. Initially city assistance took the form of 34 new buses purchased under UMTA's Emergency Capital Grant Program. Subsequently, Worcester and surrounding towns provided direct subsidy to the private operator through an RTA created in September 1974. Despite public subsidy, transit ridership has continued to decline, although the rate of decline has slowed to 2 to 3 percent a year.

Historically, transportation planning in the Worcester area has been done by individual communities on an ad hoc basis, with heavy emphasis on highway planning and scant attention to transit needs. In 1969 the area's first multi-jurisdictional long range transportation plan was completed, but it failed to adequately consider transit options. Comprehensive transit planning was first undertaken in 1973; the city was awarded a Technical Studies Grant to undertake the development of a TDP in order to qualify for full assistance on their earlier Capital Grant. A second Technical Study Grant was awarded in 1974 to fund the ongoing transportation planning process, to maintain the TDP, and for various special studies. Based on these planning grants, numerous route modifications and a vigorous program of elderly and handicapped service improvement has been initiated. A preliminary Section 3 (Capital Grant) application has been filed, but controversy over the liability of RTA under UMTA's 13-C labor clause is holding up the receipt of this grant as well as Section 5 (Operating Assistance) funds.

Planning in Worcester is characterized by a high degree of localism, cooperation, and conjoint planning/implementation. The existence of a single lead agency, which acts as the staff for the RTA, private operator, as well as formulating regional policy, has minimized institutional conflict. Similarly, a unique MPO structure, which includes the RTA, the private operator, the state, and the regional planning agency, has effectively linked planning and implementing agencies under one policy-making apparatus. However, the institutional climate is

somewhat unstable because of the continued existence of a private bus operator who is guaranteed a profit by RTA while the local subsidy increases. Private ownership has also resulted in a delay of Section 3 and Section 5 funds and precludes the construction of a badly needed garage/office facility because of UMTA's refusal to invest in a permanent structure on privately owned land. Future expansion of the transit system is also uncertain because of disinterest on the part of suburban communities, who fear that joining the RTA will lock them into high deficit subsidies.

HATTIESBURG, MISSISSIPPI

Hattiesburg, with 38,000 residents, is not an SMSA. Population density is low, and trip distances are comparatively long. An estimated one-third of all households do not own an automobile, and approximately 30 percent of families have an annual income that is below the poverty level. Hattiesburg is 29.1 percent black.

In 1975 the Hattiesburg Mass Transportation Administrative (HMTA) was established to resume bus service after a private company subsidized by the city had ceased operations. HMTA, which serves Hattiesburg and one suburb, Petal, currently operates five buses on six routes with 30-minute headways. A long term patronage decline has continued; transit ridership has decreased 40 percent since Technical Studies Grant planning began in 1972. Since 1960, ridership has declined 88 percent, and the proportion of black patrons has increased from 50 to 92 percent.

Hattiesburg is responsible for coordinating its own public transportation planning with advisory assistance from the Southern Mississippi Planning and Development District. The community has received one Technical Studies Grant for $51,000 and two Capital Assistance Grants totalling $270,000. Aside from initial preparation of a Transit Improvement Program, Hattiesburg has neither conducted continuing planning activities nor implemented its 1972 transit plan.

Public transportation in Hattiesburg is tenuous. The community annually allocates one percent of its property tax, $80,000, and a portion of federal revenue sharing funds, $50,000, to support transit. Since these funds are fixed, increased operating costs and decreased passenger revenues require that Hattiesburg reduce bus service annually. As a consequence of the community's political structure and the decline of transit use by whites, Hattiesburg demonstrates no institutional support for public transportation. If current conditions prevail, it is estimated that all transit services will be eliminated within 3 years.

BILLINGS, MONTANA

The city of Billings and its urbanized area grew during the 1960's, each by 17 percent. The 1970 population of Billings was 61,581. Billings is characterized by uniformly low population density and a grid network of wide streets. Traffic congestion is generally lacking. Since the community's population is also concentrated within the urbanized area, trip distances are relatively short. The 1970 modal split was 1 percent with household ownership at 90 percent. Unitl 1972 transit service was limited to five buses operating on four routes to the CBD. At that time, Billings established a public transportation authority and incorporated the Billings Transit System (BTS), which now operates 14 buses on 11 routes throughout the city. Since 1972 ridership has increased 473 percent, and bus miles traveled have increased 242 percent.

The Yellowstone City-County Planning Board (YCCPB) is the designated agency for urban transportation planning. Transit planning is a recent experience. Billings received its first Technical Studies Grant for $12,000 in December 1875. A consultant is currently revising a Transit Development Program drafted by YCCPB and is also preparing a long-range transit plan. YCCPB's planning has focused upon developing ways to sustain BTS's ridership growth and improve transit services while decreasing the transit system's operating deficit. The community has two application pending for Operating Assistance Grants.

Both transit and transit planning are in expanding developmental stages. The Technical Studies Grant program's initial impact has been to develop transit planning capabilities. Billings shows strong institutional support for transit. Since 1955 the city has subsidized at least 40 percent of public transportation's operating costs. Transit ridership indicates more nontransit-dependent than captive riders. More than 80 percent of BTS passengers are from families owning at least one automobile. However, BTS's operating deficit, $267,000 in 1976, has increased 508 percent since 1972 and now comprises approximately 20 percent of Billings entire annual budget. It is increasingly difficult for the community to support this deficit. Futhermore, transit planning is subsidized almost exclusively from Federal Highway Administration Planning funds administered by the Montana Department of Highways. Since Montana also provides Billings with an $55,000 annual operating subsidy, the state has substantial potential to influence transit planning.

OMAHA, NEBRASKA

The Omaha-Council Bluffs urbanized area, with a 1970 population of 347,380, is moderately densely settled. It has a comprehensive highway network and little traffic congestion. The 1970 modal split was 8 percent, and household auto ownership was 84 percent. In 1972 a Municipal Transit Authority with taxing power was created to purchase failing private carriers to serve the city of Omaha. Service to Council Bluffs and adjacent communities is provided through service agreements to meet operating costs in excess of fare-box revenue. Between 1946 and 1972, daily trips by transit decreased from 41 to 2 percent. Since 1972 ridership has increased annually by 5 percent and has recently stabilized.

In 1969, the city of Omaha and a consultant began to develop a long-range transit planning element for the area's highway plans. Since then, the Regional Comprehensive Planning Agency has received four more Technical Studies Planning Grants for a total of $297,000, and has conducted long-range planning, passing through approximately 35 percent of these funds tc the transit operator for short-range planning. Both agencies' planning staffs are coordinated and share resources and data bases. As a result, the Transit Authority has received $7,072,000 in Capital Assistance Grants since 1972.

Planning has created institutional and service changes, but there are unresolved questions as to the area's transit goals. The initial Technical Studies Planning Grant provided the momentum to generate institutional changes in 1972 to create a transit authority. The allocation of planning responsibilities and coordination with operators works smoothly because the Regional Planning Agency functions mainly to coordinate planning ideas produced by sub-regional planning and citizen's groups. However, the future role and extent of transit in this area is uncertain, as service goals, except the goal of serving the transit-dependent, are undefined, and there is no apparent immediate need for transit in the area.

MANCHESTER, NEW HAMPSHIRE

The city of Manchester, with a 1970 population of 87,754, experienced a slight decline, 1 percent, during the 1960's while the urbanized area grew 4 percent. The Manchester urbanized area is bounded by a comprehensive highway network that interfaces with a system of main thoroughfares. Travel distances are short, with little traffic congestion; yet neary 25 percent of households do not own an automobile. In 1973 the Manchester Transit Authority (MTA) was established to purchase a failing private carrier whose fleet had an average vehicle age of 28 years. Between 1955 and 1972 ridership declined 62 percent. MTA operates bus service to Manchester and parts of 3 adjacent communities: Bedford, Hooksett, and Londonderry. Since 1973 ridership has increased 20 percent, with 2.5 percent more bus miles traveled. The Southern New Hampshire Planning Commission (SNHPC), the agency responsible for transit planning, has received two Technical Studies Grants totalling $101,000. SNHPC periodically updates short range planning and coordinates continuing planning activities, including technical management data collection. MTA has utilized these planning studies to restructure all 16 bus routes, add 6 new routes, and to annually revise route fleet requirements and change published schedules. Since 1972 two Capital Assistance Grants for $3,100,000 have been received.

Manchester provides a demonstration of a successful public revitalization of failing private transportation system. Clearly shown is that MPO's important role for a small transit system that cannot be expected to develop internal planning capabilities. There is a consistent relationship between community needs, planning and implementation. The MTA's activities indicate the scope of innovative services which a small transit system can implement to meet a community's transit needs. Manchester also shows innovative ways of marketing bus transit to stimulate ridership and maintain active support from the municipal government and the business community.

ALBUQUERQUE, NEW MEXICO

Albuquerque, with a 1970 population of 243,751, is New Mexico's largest city. It has relatively low residential density, is very automobile-oriented and has sufficient parking spaces. The only traffic congestion occurs at the regional shopping centers. The 1970 modal split was 3 percent, and household auto ownership was 90 percent. The Municipal Transit System serves principally capitive riders. Following municipal takeover of the private carriers in 1965, ridership continued to decline, but has stabilized since 1972.

The Albuquerque area has had extensive highway and transportation planning. A comprehensive plan developed by a consultant in 1965 is the basis for the area's transportation planning. A minor effort at this time to develop a transit element recommending express bus routes was never implemented. In 1972 the Albuquerque City Transportation Planning Department developed a feasibility study which resulted in the Regional Comprehensive Planning Agency, Middle Rio Grande Council of Governments, applying for and receiving a Technical Studies Grant in 1973. This and subsequent grants totalling $180,000 in federal funds have produced a TDP and subsequent plan refinement. As a result, the area has applied for and received approximately $3.7 million in Capital Assistance Grants for fleet replacement.

Transit planning capabilities have been increased in Albuquerque and at the Regional Comprehensive Planning Agency level. Current efforts are focusing more on the short-range planning and programming. There is much local support for the system, since two general obligation bonds to fund the local share of Capital Assistance Grants have been approved by public referendum. The transit effort is also supported by the city's use of general funds and community development funds to carry out low capital-intensive service improvements.

SYRACUSE, NEW YORK

The Syracuse metropolitan area, with a population of nearly one-half million persons, is a major urban concentration in central upstate New York. It is characterized by a harsh winter climate, a moderately dense and declining central city, and a low density hinterland. Although the central city has declined 9 percent, the urbanized area grew 13 percent from 1960 to 1970. Like most urban areas, Syracuse has become increasingly auto-oriented; its work trip modal split declined from 17 percent in 1960 to 10 percent in 1970. The 1970 household auto ownership was 81 percent. Heavy patronage losses were most evident between 1967 and 1971 when major private carriers experienced 30 to 40 percent decreases in ridership. However, transit ridership has since stabilized and even increased after the creation of a Regional Transit Authority in 1970. Although three private carriers still provide transit service in the area, the RTA provides 95 percent of all transit service in the region.

The Syracuse Metropolitan Transportation Study, an ad hoc organization of locally elected officials, is the designated MPO for Syracuse. Since its creation in 1965, it has sponsored the creation of the area's first comprehensive long range transportation plan, which was completed by New York State DOT staff in 1972. However this plan was highway-oriented and included few specific proposals for transit. Subsequently, a comprehensive transit plan was undertaken by RTA with the aid of a Technical Study Grant for $188,000. This grant was used to hire a consultant who prepared the area's first Transit Development Program. Since May 1974 planning has been done by MTPT, a centralized in-house planning staff which is hired by SMTS on a yearly contractual basis and supported by local, state, and federal funds. With the aid of 2 more Technical Study Grants totaling $519,000, MTPT, the RTA (through coordinated support funds), and outside consultants have conducted corridor studies, a garage feasibility study, and other special studies. Based on this planning, several Capital Grants and a demonstration grant have been awarded to RTA.

The creation of MTPT has greatly improved local planning capability. State planners have played less of a role in planning, with the result that planning emphasis has changed from long range to short range plans and planning has become more attuned to local needs. However, the planning process and coordination of transit service has been beset by a number of significant institutional problems. The RTA, for instance, has openly advocated buying out its chief private competitor despite continued resistance. This has hampered coordinated transit service for years and presently negates the possibility of a joint

cost efficient garage facility for the two operators. RTA and MTPT have also continued to argue over which agency should do operational planning. This resulted in a dissolution of a joint staff arrangement between the two agencies. Friction has also surfaced because of MTPT's contractual status versus SOCPA's (the local agency that houses MTPT) civil service status. Finally, the fact that MPO is not the A-95 agency also causes some friction since the A-95 agency is desirous of the MPO designation. Despite these conflicts, however, transit service has been upgraded considerably in the last 4 years because of an aggressive and progressive RTA and increased local planning capability.

CLEVELAND, OHIO

Cleveland, Ohio's largest city, with a 1970 population of 751,046, is located on Lake Erie in Cuyahoga County. The trend in recent years has been for population and industry to leave the city, locating in the surrounding suburbs. Cuyahoga County is now almost totally urbanized. The central city's population declined 14 percent while the urbanized area grew 10 percent between 1960 and 1970. During the 1960's new circumferential highways were constructed, making auto travel easier. The 1970 modal split was 14 percent, and household auto ownership was 83 percent. Transit ridership has continually declined in recent years.

Transit service for the city has been provided since 1942 by the Cleveland Transit Service (CTS). CTS's charter contained a break-even provision, which was met until 1971 when the system lost money. In 1974 the state legislature responded by authorizing a countywide transit authority. In 1975 Cuyahoga County voters approved a 1 percent sales tax to support the newly formed Greater Cleveland Regional Transit Authority (GCRTA). GCRTA, a combination of the former CTS and the Shaker Heights Rapid Transit System (SHRT), now includes bus, light rail and heavy rail transit.

The regional planning authority for the Cleveland area is the Northeast Ohio Areawide Coordinating Agency (NOACA), which serves as the HUD-701 and A-95 review agency. Since 1969 NOACA has been the areawide transportation planning agency as well and currently is the MPO for the Cleveland area. In 1973 NOACA used its first Technical Studies Grant to employ a consultant to develop a TDP. The study recommended a countywide transit authority, based on CTS and SHRT, coordinating other county transit operators through service contracts. In addition, a marketing and a crime prevention program were recommended. All of the TDP's recommendations have been implemented, along with minimum service coverage and service frequency requirements set forth in GCRTA's charter. Other service improvements include free off-peak service for the elderly and a planned demand responsive service for elderly and handicapped.

NOACA's staff has expanded from 7 to 25 persons since the receipt of the first Technical Studies Grant, making the agency less dependent on outside consultants. Subequent Technical Studies Grants have been used by NOACA for ongoing transit planning. NOACA has coordinated transit service in the five-county Cleveland urbanized area through the creation of the Transit Operators Council, on which sit representatives of the four major operators in the region. The council coordinates areawide transit and provides input for NOACA's short-range transit planning.

The Cleveland experience demonstrates the successful combination of a strong MPO, a favorable political climate, and Technical Studies Grants to transform a failing city transit system into a successful regional transit system, coordinating public transit over an entire metropolitan area.

ERIE, PENNSYLVANIA

Erie is located in Pennsylvania's northwesternmost corner. Population is concentrated in the city of Erie, the surrounding area being largely rural. During the 1960's the city's population decreased 7 percent while the urbanized area grew 5 percent. Auto congestion in Erie is not a major problem. The 1970 work trip modal split was 4 percent, and household auto ownership was 84 percent. Bus service in Erie was provided by Erie Coach Company from 1925 to 1966. At that time the Erie Metropolitan Transit Authority (EMTA) was formed, and Erie Coach was bought out. Since the public takeover, transit service, which had been declining, improved substantially.

Transportation planning began in 1964 with the formation of the Erie Area Transportation Study (EATS). EATS, the acting MPO, has four committees: a policy committee, a technical committee, a local advisory committee (composed of local officials), and a citizens' advisory committeee. The regional planning agency, EMPD, which acts as "701" and "A-95" review agency, is distinct from EATS, although EMPD and the state department of transportation, PennDOT, provide EATS with professional assistance in carrying out its evaluations of transportation proposals. Short-range and operational planning are carried out by EMTA. To date, consultants have performed all short-range planning necessary for EMTA. Although EATS does long range highway-oriented planning, there currently is no long range transit plan for Erie. EMPD and PennDOT are scheduled to develop such a plan during the next year. All Capital, Operating, and Technical Studies Grants to Erie are jointly funded by the federal, state, county, and city governments. This dispersion of financial burden creates a stable funding source for Erie. Erie has received 4 Capital Grants to date, allowing the purchase of 69 buses. Since November 1974, EMTA has also received federal operating assistance.

Erie's transit service has improved considerably since the public takeover and the receipt of Section 9 funds, as evidenced by a steadily increasing ridership. EMTA has made good use of community institutions to expand its service while at the same time meeting local needs. Examples of this approach are the new school/regular service routes, the workers' commuting service, and the downtown Erie shoppers' promotionals. Goals of expanded service and cost efficiency have been successfully combined. Service improvements have occurred despite the lack of transit planning expertise at either the EMTA or the regional planning agency. The strong role played by PennDOT is seen as problematic by the UMTA regional office. It has led to relatively less developed regional planning bodies, necessitating local transit authorities to assume more planning functions. The strong state role has also acted as a communication barrier between the UMTA regional office and local agencies. Citizens do participate in the planning process in Erie through the EATS's citizens' advisory committee. Recent controversy over a citizen-initiated proposal for light rail service has generated considerable friction between citizens and planners.

RHODE ISLAND

Rhode Island's principal metropolitan area, Providence, with a 1970 population of 179,233, accounts for 83 percent of the state's population. Highway networks are extensive around Providence. The 1970 modal split was 6 percent, and household auto ownership was 83 percent.

Because of the close correspondence between the state of Rhode Island and the Providence metropolitan area, regional planning is done on a statewide basis by the Rhode Island Statewide Planning Program (RISPP). Likewise public transit is administered on a statewide basis by the Rhode Island Public Tranit Authority (RIPTA). RIPTA is the major transit operator in the state carrying 95 percent of all fixed route passengers. RIPTA was established in 1965 to take over the operations of a failing private operator in Providence. During the 1970's RIPTA bought out more failing private operators and moved toward becoming a statewide system. RIPTA employs the National City Management Company to operate the system. RIPTA does not have a planner on their staff and is not engaged in transit planning.

RISPP, in addition to its MPO function, is the HUD 701 and the A-95 review agency. RISPP is guided by the State Planning Council, on which sit local, state and federal representatives, 80 percent of whom are appointed to the committee by the governor. The committee prepares the State Guide Plan, coordinating all transportation projects for the state. RISPP has in the past been responsible for long and short range transportation planning functions. Since 1975 the Rhode Island Department of Transportation (RIDOT) has also done short range planning. Currently RISPP and RIDOT coordinate their planning processes.

Section 9 grants were awarded to RISPP in 1973, 1974, 1975, and 1976 and to RIDOT in 1975 and 1976. RISPP has used its grants for a 1973 TDP and subsequent updating, along with various other special studies. RIDOT has used its section 9 funding for a variety of special transit-related studies. Many of the recommendations of the 1973 TDP have since been implemented using UMTA section 3 and 5 grants. Since its first technical studies grant, RISPP's transportation planning staff has expanded from 3 to 11.

The state of Rhode Island provides a good deal of financial assistance to RIPTA in the form of operating assistance; reduced fares for elderly, handicapped, and students; and summer express buses to the beach. The combination of large state subsidies, the governor's control, through appointment, of the State Planning Council, and the concentration of all planning functions in the state agencies creates a tremendous amount of state control. Whether this dominance will adversely affect the planning process in the future is something that bares watching.

The clear delineation of planning responsibilities between the state and the operator with RISPP and RIDOT handling all planning functions and RIDOT responsible for day-to-day operations has led to a lack of conflicts over planning. On the other hand, it raises questions as to whether there is sufficient integration between planning and implementation.

DALLAS-FORT WORTH, TEXAS

The Dallas and Fort Worth urbanized areas experienced substantial growth during the 1960's, with a joint population increase of 41 percent. Their combined 1970 population was approximately 1.2 million. The Dallas and Fort Worth urbanized areas have similar road networks characterized by district beltways with radial expressways to the CBD. With low population density travel distances are long, but there is little traffic congestion. The 1970 modal split was 6 percent, and household auto ownership was 89 percent. In 1964 the city-operated Dallas Transit System (DTS) was established when it was recognized that a private carrier could not continue to provide service at a profit. Under similar circumstances Fort Worth established the City Transit Company, CITRAN, in 1972. DTS with 75 routes and 442 vehicles and CITRAN with 28 routes and 115 vehicles operate service throughout their respective communities. Since Technical Studies Grant planning began in 1972, DST's ridership has decreased 20 percent, but CITRAN's has increased 9 percent. The North Central Texas Council of Governments (NCTCOG) has developed an organizational structure for transit planning that involves federal, state, and local elected officals as well as community transportation planners and extensive citizen participation. NCTCOG works closely with local officials so that planning directly incorporates each communities' defined goals for public transportation.

Within this framework of separate development, the MPO has assumed leadership in advocating the establishment of a Regional Public Transportation Authority. To date, five Technical Studies Grants totalling $3.2 million have been received. Through NCTCOG's detailed planning efforts, Dallas and Forth Worth have received Capital Assistance Grants totalling $17 million. communities also receive annual Operating Assistance Grants.

The case study demonstrates an MPO's potential role to effectively coordinate transit planning and develop various detailed capabilities for continuing planning activities. Particularly noteworthy are NCTCOG's annual update of short range planning, periodically bringing long range planning into a 5-year perspective, and programs which assist communities with operational planning. DTS and CITRAN indicate very different institutional climates. Fort Worth has demonstrated more innovation and has developed a more need-responsive public transportation system than Dallas. However, Dallas shows substantially more support for transit from municipal officials and the public than does Fort Worth.

SALT LAKE CITY, UTAH

Salt Lake City and Ogden are part of the same planning area. Their combined 1970 population was close to one-quarter million. Although the central cities have declined, the urbanized areas have grown 34 percent between 1960 and 1970. The Salt Lake-Ogden area is auto-oriented with broad avenues laid out in a grid pattern. An efficient highway system with many interchanges connects Salt Lake with Ogden and other areas. Many of the major employers are located outside of the two cities. Transit ridership declined during the 1960's, falling 62 percent between 1962 and 1970. In 1970 the modal split was 2 percent household, and auto ownership was 89 percent.

In 1970 the state legislature created the Utah Transit Authority (UTA), which subsequently assumed operation of transit services in Salt Lake County, buying out Salt Lake City Lines. Two years later UTA expanded service into Davis and Weber Counties, which includes Ogden, by buying out the private operators, Ogden Bus Lines and its subsidiaries.

The MPO for the Salt Lake-Ogden area is the Wasatch Front Regional Council (WFRC), which is also the HUD-701 and A-95 review agency. The first transit planning document produced was the 1970 TIP completed by a consultant, followed in 1972 by a Section 9 funded TDP, also done by consultants. Since that time all short and long range planning, consisting primarily of TDP implementation and updating, has been done by WFRC's staff. A number of TDP proposals have been implemented or are in the process of implementation. Capital Grants totalling approximately $24 million have been awarded to UTA, including grants for the purchase of over 300 new buses.

Public acceptance of transit in the area is high. All three counties have voted for 1/4¢ sales tax to subsidize low-fare transit. This revenue source has allowed UTA to establish one of the lowest fares in the county, 15¢. In response to low fares and expanded service, ridership has increased almost 130 percent since 1972. Political support for transit is also high. Local officials constitute the policy committee of WFRC and oversee all major transit decisions. Interagency cooperation has been relatively successful with WFRC assuming the role of lead agency and passing through small amounts of Section 9 funding to UTA and UDOT (the state Department of Transportation) for specific planning tasks. There is contention between WFRC and UDOT as to provision of service to the elderly/handicapped with both agencies competing to provide these services. Between WFRC and UTA there is some mutual dissatisfaction with the present division of labor regarding operational planning. However, overall agency coordination

functions smoothly. The future of public transit looks good in the area because of strong institutional support. However, the basic auto-oriented nature of the city and concomittant land use patterns will probably put a ceiling on the growth of transit usage in the future.

CHARLOTTESVILLE, VIRGINIA

Charlottesville is characterized by short trip distances and a lack of traffic congestion. Two major highways running north-south and east-west intersect near the CBD to interface with a grid network of wide urban streets. The 1970 modal split was 5 percent, and household ownership was 81 percent. Although most families own at least one automobile, the community has a substantial transit-dependent population. In September 1975 the city purchased a failing private carrier and established Charlottesville Transit Service (CTS) as the first step in TDP implementation. CTS operates six bus routes throughout Charlottesville. Patronage has stabilized compared to a 60 percent decline experienced during the previous 5 years.

Charlottesville, with a 1970 population of 38,880, is neither an SMSA nor an urbanized area. The city's Department of Community Development, which is responsible for transit planning, received one Technical Studies Grant for $45,000 in 1973. A Capital Assistance Grant for $727,000 in 1975 was employed to purchase eight 12-passenger mini-buses and four 33-passenger buses for regular route service. Charlottesville is currently revising a Transit Development Program prepared by a consultant and plans to implement seven new bus routes, reduce headways, extend service hours, and develop demand-responsive transit for the elderly and handicapped.

Charlottesville provides a demonstration of small community endeavoring to maintain a public transportation system. Despite an increasing operating deficit that was 52 percent of fiscal 1976's $266,000 budget, the community is strongly committed to expanding transit services. However, the city has not developed adequate transit planning capabilities. Portions of UMTA grant applications have been rejected as a result of poor preparation by city personnel. Furthermore, CTS lacks an adequate administrative staff. The Director of the Department of Public Works spends 10 percent of his time directing CTS operations. The one other staff member is responsible for all administrative duties, including counting each day's revenue, financial record keeping, filing UMTA grant applications, providing needed secretarial services, and answering information calls about bus service.

SEATTLE, WASHINGTON

The Seattle Transit Planning Region, which contains both the Seattle-Everett and Tacoma SMSA's, has declining density due to population and employment growth outside the major cities and decline within these cities. These growth patterns are straining the ability of the transit system to provide service. In 1970 the modal split stood at 8 percent, and household auto ownership at 86 percent. In 1973, a referendum was approved establishing a county-wide sales tax to support operation of a public transit system, Metro. Metro ridership has increased 13 percent since takeover of the private operators in 1973. Metro provides transit service to 60 percent of the population and 67 percent of the work force within this region.

In 1966, the Regional Transit Plan was developed by the Puget Sound Governmental Conference in recognition of employment and population projections. This effort paralleled earlier ongoing highway planning efforts. Since 1966, this region has received eight Technical Studies Grants totaling $2.38 million and, since 1971, Capital Assistance Grants totaling more than $50 million. One Technical Studies Grant received in 1971 produced the studies used as the basis for planning the public takeover of the private transit operators. Beginning in 1973, Technical Studies Grants were administered by Integrated Grant Application Process. Since that time, approximately 20 percent of the Technical Studies Grants funding has been passed through by the MPO to local operators and jurisdictional agencies for subregional transit planning through the Coordinated Support Program. Since Metro has an independent funding basis through the sales tax, it has conducted much operational planning.

The Seattle region is characterized by a complex division of planning effort intc long- and short-range planning and policy and operational planning. The MPO, the Puget Sound Council of Governments, is responsible for the region's long-range planning and also carries out the pass-through arrangement of allowing short-range planning by the CSP. Currently, the MPO's primary difficulty is reconciling all viewpoints into a regional format, since all but one of the counties have withdrawn from the PSCOG. These counties represent the region's rural interests, which feel their concerns are not represented by the planning proposed by the PSCOG.

In addition to current disagreement as to the inclusiveness of the region, as currently defined, there is a disagreement as to whether the planning should be in the direction of reinforcing the CBD in light of desired land use. It is felt that the recent emergence of the CSP orientation to subregional planning should be expanded so as

to insure all regional viewpoints in the effort to conduct regional long-range planning.

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