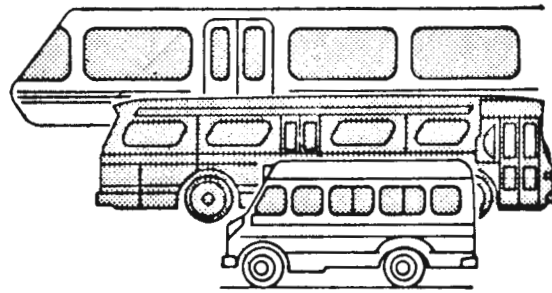


PUBLIC TRANSPORTATION
AN ELEMENT OF
THE URBAN TRANSPORTATION SYSTEM



U.S. DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION ADMINISTRATION
FEDERAL HIGHWAY ADMINISTRATION

TRANSIT TRAINING PROGRAM
 RALEIGH, NORTH CAROLINA
 MAY 15-19, 1978

COURSE SCHEDULE

<u>Day</u>	<u>Time</u>		<u>Session Title</u>
Monday	1230 - 1300		Registration
	1300 - 1330	I	Introduction
	1330 - 1515	II	History
	1515 - 1530		Break
	1530 - 1700	III	Legislation and Regulation
	1700 - 1800		Attitude Adjustment 908
Tuesday	0800 - 0945	IV	Financing
	0945 - 1000		Break
	1000 - 1130	V	Rail Characteristics
	1245 - 1445	VI	Bus Characteristics
	1445 - 1500		Break
	1500 - 1700	VII	Preferential Treatment
	1700 - 1800		Attitude Adjustment
			Informal Discussion - Jorge Cowley, Transit Administrator for the City of Raleigh and Robert Deaton, Mgr. of Raleigh City Coach Lines
Wednesday	0800 - 0945	VIII	Design
	0945 - 1000		Break
	1000 - 1100	XI	Management
	1100 - 1230	X	Rural and Small Areas
	1330 - 1700		Field Trip
	1700 - 1800		Attitude Adjustment
Thursday	0800 - 0900	IX	Elderly & Handicapped
	0900 - 0915		Break
	0915 - 1045	XII	Marketing
	1045 - 1215	XIII	Urban Transportation Planning
	1330 - 1500	XIV	Demand
	1500 - 1515		Break
	1515 - 1700	XV	Evaluation of Alternatives and
		XVI	Decision Making
	1700 - 1730		Attitude Adjustment
	1730 - 1830		Informal Discussion - David C. Robinson, Director of the Public Transportation Div. of the North Carolina DOT
Friday	0800 - 1000	XVII	Political Spectrum
	1000 - 1015		Break
	1015 - 1130	XVIII	The Future
	1130 - 1200		Summary and Evaluation

LIST OF TEAMS

Team 1

Joe Stevens - FHWA, Raleigh
George Shrieves - FHWA, Washington
Mark Ahrendsen - City of
Wilmington
Cindy Rives - City of Durham
Dan Lill - NC DOT Thoroughfare
Planning
Jim Ritchey - NC DOT Public
Transportation Division

Team 2

John Gilbert - FHWA, Raleigh
Linda Hix - City of Greenville
Ted Ballenger - Duke Power Company
Douglas Shearer - City of Durham
Cliff Kelly - NC DOT Public
Transportation

Team 3

Ron Carmichale - FHWA, Raleigh
Bill Callahan - Town of Chapel
Hill
George Vaughan - City of
Fayetteville
Bart Barham - NC DOT Thorough-
fare Planning
Robert A. Eidees - NC DOT
Public Transportation

Team 4

Roger Lewis - FHWA, Raleigh
Rick Hicksen - Cumberland County
Council on Aging
Randy Green - City of Charlotte
Ed Johnson - NC DOT Thoroughfare
Planning
Roger Pratt - NC DOT Public
Transportation

Team 5

Paul Lang - FHWA, South Carolina
Jorge Cowley - City of Raleigh
John Cosby - Kentucky DOT
Scott Leftwich - NC DOT Thorough-
fare Planning
Alex Roman - NC DOT Public
Transportation

PUBLIC TRANSPORTATION
AN ELEMENT OF THE URBAN
PUBLIC TRANSPORTATION SYSTEM

A Training Course

prepared for



Federal Highway Administration
Urban Mass Transportation Administration

prepared by
JHK & Associates

May 1977

SESSION I: INTRODUCTION TO COURSE

Objective of Session I

- . To welcome and orient participants to the course
- . To understand the importance and purpose of the course in the context of public transportation problems and issues
- . To realize the need to actively participate in session activities
- . To define the course evaluation process

Synopsis of Session I

This session is a general orientation period to welcome and acquaint participants to the course and its purpose, with an emphasis on the course's potential benefits. The makeup and schedule of sessions will be described. The participants' note-books will be distributed, and their use will be explained. Work teams will be formed for case-study activities. Procedures used to evaluate the course and individual sessions will be explained. The following responsibilities will be strongly emphasized:

- . active participation in session discussions,
- . on-time review of session notes, and
- . individual contribution within work team activities.

Outline of Session I

<u>Part</u>	<u>Subject</u>
1	Introduction of Training Team
2	Introduction of Attendees
3	Purpose, Organization, and Conduct of the Course
4	Evaluation

Participants' Notebook

This manual is intended for the use of each participant in the training course, Public Transportation, An Element of the Urban Transportation System. This notebook contains the basic materials the participant will need during the 4½ day training period.

Included within this notebook are text material for each of the individual training sessions and additional materials which will be used in a case study manner or to promote discussion and participation on the part of each attendee.

Each of the sessions has been printed so as to allow room in the margin for notes. Participants are urged to review the session materials before, during, and after the session and to make whatever notes or comments are appropriate.

The instructors (during their lectures) follow the materials presented in the Participants' Notebooks. Therefore, the participants can generally follow the lectures through the notebook. In most cases, the lectures will be of fairly short duration to leave ample time for class discussions. Therefore, all material in the text will not be covered in great detail.

The objectives for each session are presented at the beginning of the session. These should be reviewed by the participant to gain further insight as to what the individual should be attaining.

The Manual is presented in a loose leaf format to allow the participant to insert additional pertinent materials. In some cases, updates of items in the Notebook may be provided or obtained by the participant.

A list of selected references for this course is provided below. If you are interested in obtaining copies of any of these items, please check the appropriate box and provide your name and mailing address. The materials will be sent to you in the near future:

- 1. "Preferential Facilities for Carpools and Buses - Seven Reports," FHWA, (HHP-26), U.S. DOT, May 1976, 54 pp.
- 2. "The Oughta Mobile Owner's Manual," Twin Cities Area Metro Transit Commission, Minneapolis, Minn., July 1976, 18 pp.
- 3. Reichart, B. K., "Improving Urban Mobility...Through Better Transportation Management," Urban Planning Div., FHWA, U.S. DOT, May 1975, 30 pp.
- 4. "UMTA," Office of Public Affairs, UMTA, U.S. DOT, 76-AV-5, 5 pp.
- 5. "How to Pool It," FHWA, U.S. DOT, May 1975, 55 pp.
- 6. "Executive Summary," Light Rail Transit," UMTA, U.S. DOT, 1976.
- 7. "An Introduction to Transit Marketing," UMTA, U.S. DOT Nov. 1975, 13 pp.
- 8. "Transit Operating Performance and the Impact of the Section 5 Program," UMTA, U.S. DOT, No. 1976, 82 pp.
- 9. "Innovation in Public Transportation," UMTA, U.S. DOT, 1975, 103 pp.
- 10. "Transportation System Management - A bibliography of Technical Reports," UMTA-FHWA, U.S. DOT, May 1976

NAME: _____

MAILING ADDRESS _____

M E M O R A N D U M

continued

TO: Course Participants

SUBJECT: Reference Materials

During the course, several reference publications have been distributed to you for your use. A list of additional selected references is provided below. These items are available through the Department of Transportation offices in Washington, D.C. If you are interested in obtaining copies of any of the below-listed items, please check the appropriate box and these materials will be sent to you in the near future. Please provide your name and mailing address in the appropriate location.

- 1. "Preferential Facilities for Carpools and Buses - Seven Reports," FHWA, (HHP-26), U.S. DOT, May 1976, 54 pp.
- 2. "The Oughta Mobile Owner's Manual," Twin Cities Area Metro Transit Commission, Minneapolis, Minn., July 1976, 18 pp.
- 3. Reichart, B.K., "Improving Urban Mobility...Through Better Transportation Management," Urban Planning Div., FHWA, U.S. DOT, May 1975, 30 pp.
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- 7. "An Introduction to Transit Marketing," UMTA, U.S. DOT, Nov. 1975, 13 pp.
- 8. "Transit Operating Performance and the Impact of the Section 5 Program," UMTA, U.S. DOT, Nov. 1976, 82 pp.
- 9. "Para-Transit: A Summary Assessment of Experience and Potential," UMTA, U.S. DOT, June 1974, 39 pp.
- 10. "Demand-Responsive Transportation," Transportation Systems Center, U.S. DOT, May 1976.
- 11. "Rural Passenger Transportation," Transportation Systems Center, U.S. DOT, May 1976.
- 12. "Innovation in Public Transportation," UMTA, U.S. DOT, 1975, 103 pp.
- 13. "Transportation and the Elderly and Handicapped: A Literature Capsule," U.S. DOT, Jan. 1977, 83 pp.

Name: _____
Mailing Address: _____

SESSION II: HISTORY OF PUBLIC TRANSPORTATION IN THE UNITED STATES

Objectives of Session II

- . To be aware of the American experience in public transportation
- . To be able to describe general trends in the American transit industry (patronage, revenues, and costs, etc.)
- . To be able to identify basic factors which have affected and will affect the role of public transportation

Synopsis of Session II

This session is an overview of the history of public transportation in the United States. The focus is on mass transit, primarily in urban areas. Significant impact has been made on the development of public transportation to the present by several factors, e.g., environmental and energy concerns, technology, and governmental policy. This session introduces these factors and others which will be covered in detail in later sessions.

Outline for Session II

<u>Part</u>	<u>Subject</u>
1	Introduction
2	The Beginning of Public Transportation (animal power)
3	The Appearance of Rails (Street Railway Service)
4	The Use of the Steam Engine - Cable Cars
5	Electrical Power and the Street Railways
6	Over and Under (Elevated and Subway Systems)
7	The Motor Bus
8	Federal Government Involvement
9	The Depression
10	Public Utility Holding Company Act of 1935
11	New Highway Development
12	World War II
13	Post-War Government Policies
14	Transit Ridership Figures (1902-1975)
15	Summary

SESSION II
HISTORY OF PUBLIC TRANSPORTATION

1. Introduction

An understanding of the role of public transportation in the provision of urban transportation services starts with a knowledge of the history of public transit in the development of the United States. When the Nation was founded in 1776, there were few major urban areas. People who lived in cities got around on foot or if they were wealthy, used horses and horse drawn vehicles. Intercity travel was largely by waterway or horse drawn vehicle. Thus, most of the early cities were situated on navigable bodies of water. Urban areas were generally limited by the distance one could walk in a reasonable period of time. With a limited urban population, this was no real constraint on city size. In 1800, total U.S. population was 5.3 million of which only 6 % resided in urban areas. (See Table II-1.)

Table II-1. U.S. Population 1790-1970
(in thousands)

Year	Total	Urban	% Urban
1790	3,929	202	5.1
1800	5,308	322	6.1
1810	7,240	525	7.3
1820	9,638	693	7.2
1830	12,866	1,127	8.8
1840	17,069	1,845	10.8
1850	23,192	3,544	15.3
1860	31,443	6,217	19.8
1870	39,818	9,902	24.9
1880	50,156	14,130	28.2
1890	62,948	22,106	35.1
1900	75,995	30,160	39.7
1910	91,972	41,999	45.7
1920	105,711	54,158	51.2
1930	122,755	68,955	56.2
1940	131,669	74,424	56.5
1950	151,326	96,847	64.0
1960	179,323	125,269	69.9
1970	203,185	149,281	73.5

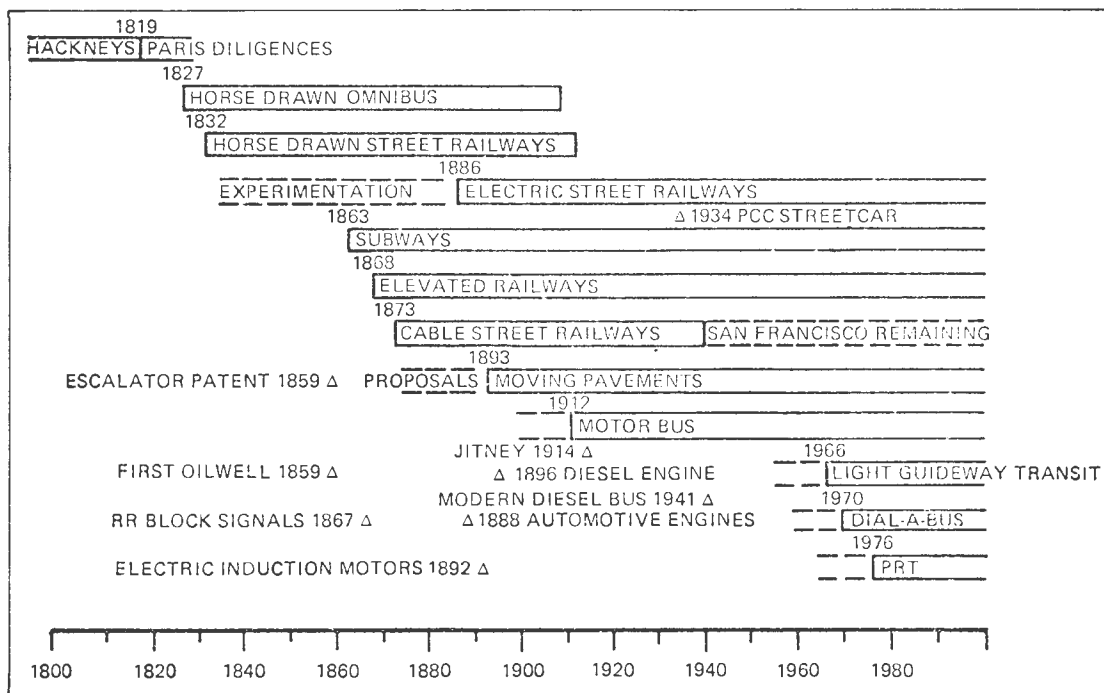
Source: Ref. 3

However, as the Nation grew in the early nineteenth century, there were general population increases and the beginning of a shift from rural areas to urban areas. Major population centers such as New York, Philadelphia, and Boston were growing rapidly in geographic size and density. By 1830 the total U.S. population had more than doubled to 12.9 million, of which 9 percent resided in urban areas. Pedestrian and horse drawn traffic was increasing at a rapid rate in the downtown areas. Most streets were unpaved and sidewalks were narrow or non-existent. Movement in the downtown area was hazardous, inconvenient, and unpleasant.

2. The Beginning of Public Transportation (Animal Power)

Under these conditions, it was not unexpected that an entrepreneur by the name of Abraham Brower would emerge in 1827 in New York City with a 12 passenger horse drawn stagecoach that for one shilling (12½¢) would take you up and down Broadway from the Battery to Bond Street. The vehicle was called the "Accommodation." In 1829 he added a second vehicle called the "Sociable."

The service proved successful and in 1831 Brower brought to this country the first especially designed urban transit vehicle called the "Omnibus." The name derived from a place in France where a merchant by the name of Omnes had a sign over his doorway reading Omnes "Omnibus" or Omnes for all. A French operator of stagecoaches by the name of Baudry was intrigued by the name and immediately renamed his stagecoach l'omnibus. The use of the term spread and was soon adopted throughout France and England. (The chronology of urban transit is shown in Fig. II-1.)



Source: Ref. 8

Figure II-1. Chronology of Urban Transit

A law existed at this time in England which made the picking up of passengers in the city streets illegal, and the driver of the omnibus was subject to arrest. So frequent were these arrests that some of the drivers actually chained themselves to their seats to prevent their being taken into custody. In 1832, however, the Stage Carriage Act was passed, recognizing the new form of service, but requiring the drivers and conductors to take out licenses. Thus was established the principle of public regulation at the very beginning of the business of providing local transportation service. By 1835, New York City had over 100 omnibuses operating on its streets.

3. The Appearance of Rails (Street Railway Service)

Horse drawn vehicles had the advantage of being able to use any existing street in the city. However, the condition of the streets meant that the ride was slow, bumpy, muddy with the possibility of getting mired down. This led to the introduction of iron tracks which reduced the number of horses needed to pull vehicles and made for a faster and smoother ride. New York City again was the first American city to introduce a new mode: the street railway practice. In November, 1832, the New York and Harlem Railroad initiated service using cars built by John Stephenson who went on to become the world's leading manufacturer of street railway cars.

With friction reduced, vehicles could be larger and the total number on the street were reduced. Speeds of seven miles per hour were possible and commuting times were reduced which in turn increased commuting distances. There was opposition to laying tracks in the street from the existing omnibus operators as well as from citizens who thought it would interrupt normal carriage movement and create high speed hazards to pedestrians and other horse drawn vehicles.

New Orleans was the second U.S. city to institute street railway operations in 1834 but almost two decades were to pass before the idea caught on elsewhere. This to some extent was caused by the economic conditions of the late 1830's and 1840's including the depression of 1837.

Boston in 1856, Philadelphia in 1858, and Baltimore, Cincinnati, Pittsburgh and Chicago initiated street railway service in 1859, prior to the beginning of the Civil War.

The cost of the horse used to pull the vehicles was a substantial element of total costs. A good horse could cost over \$100 and since the horses were limited to 4-6 hours of work, several teams were necessary. Often the cost of the horses was more than the cost of the car which averaged around \$750. An early report of the American Street Railway Association indicated that about 40% of the entire investment of a street railway operation was in horses and stables. The stabling of horses in itself became an important function of the transit business since most of the horses' time was spent in the stable and keeping the horse healthy was important.

An interesting sideline to the use of horses was the problem of manure. In addition to that which fell in the streets and was left there, there was a substantial amount generated at the stables. Some enterprising companies turned the problem to their advantage by selling it for fertilizer. The Third Avenue Railroad in New York City realized almost \$14,000 in one year from this source alone.

Mules were also used to pull the street railway cars and though mules ate less food, were cheaper, somewhat stronger, and could withstand heat and cold as well as horses, they had almost no resale value as compared to a horse which was worth almost three fourths its original cost at resale time.

The cost of operating a horse car was approximately 20¢ per mile which seems high according to today's inflated costs. However, most cars required two man crews, and speeds were slow so that labor costs were substantial even one hundred years ago.

Public transportation in its earliest years and, to some extent, as long as 1908 was dependent on animal power. At its height in 1885 there were 100,000 horses and mules pulling 18,000 cars over 3,500 miles of tracks. The use of animal motive power had numerous drawbacks. Their average service life was only four years. They were subject to sickness and disease and in 1872 transit suffered a major setback when an epidemic of disease struck down most of the horses throughout the Nation. This was called the Great Epizootic. Other animals were substituted and in some cases teams of men were used on a temporary basis. In New York City alone over 18,000 horses died from the contagious lung disease. The incident did spur efforts to switch to other more reliable motive powers.

Horse drawn vehicles averaged speeds of 4 to 6 miles per hour, not a great deal faster than walking speeds. Pollution was an obvious problem with each horse generating ten pounds of solid waste each day, much of which ended up in the streets. This made the streets unsightly, unsanitary and odoriferous, and added further impetus to mechanization.

4. The Use of the Steam Engine - Cable Cars

The steam engine had been invented in the late 1700's and by 1807 had been used by Fulton to power his steam-boat. There were early proposals to use steam power in conjunction with public transit but public opposition was strong. The public feared that pollution and safety hazards would be a detriment to users, other vehicles in the street, and adjacent properties.

Steam did become an important motive source, however, when Andrew Hallidie, a San Francisco manufacturer of wire rope came up with the idea of "cable cars". Cables had been previously used in England to pull coal cars and Hallidie saw a way of creating a new market for his product in a city where the hills impeded walking and horse drawn vehicles.

The concept was to have a stationary steam engine power a continuously moving endless cable. The cable would be located below the street in a conduit. The car would ride on rails over the conduit and a gripping device would extend from the car down into the conduit to grasp or release from the cable. The operator of the device was the "gripman." The vehicles were also equipped with standard braking devices.

The cable car was tested in San Francisco in August 1873 and proved highly successful. Other cities soon developed cable car systems with Chicago in 1882 being the most comprehensive. By 1894 Chicago had 86 miles of cable tracks and over 450 grip cars. These early cable cars used grip cars which in turn pulled the trailers where the passengers sat. Each grip car generally had two trailers. The cars averaged 30 seats in capacity and speeds of 6-8 miles an hour in the downtown and 12 miles per hour in the outlying areas. Cable cars were especially effective in snow operations and often were used to clear paths through snow blocked streets.

St. Louis had a 55 mile system, Denver 44 miles with Denver having the distinction of having one cable that was seven miles in length. In its heyday in the 1890's, there were over 500 miles of cable tracks using 5,000 cars and carrying almost 400 million passengers a year. The capacity of the cable car system was tested in Washington one hot August day when a convention of the DAR found 170,000 passengers using the system in a single day.

In 1893 cable car operations were going strong in 29 American cities including Kansas City, Washington, D.C., St. Louis, Philadelphia, Denver, Seattle, and Baltimore. By 1904, most of the cable cars were gone, victims of improved technology. One reason being the inefficiency of the cable technology that used almost 70% of the steam engines power to move the unloaded cable. Chicago was one of the last to abandon its cable lines and did so in 1906 when the State Street line ceased functioning. The advances in electric motive power being the major reason for the rapid demise of cable cars. San Francisco still operates cable cars. Besides being a tourist attraction, the quaint characteristics of the mode is an element in San Francisco's unique environment.

5. Electrical Power and the Street Railways

Electricity as a power source had been experimented with in public transportation as early as 1835 both in this country and in Europe. Batteries which were then the only source of electricity were used to provide the power to small vehicles operating at very slow speeds. In 1851 Professor Charles Page of the U.S. patent office displayed a battery powered car which managed a speed of 19 miles per hour on the B&O track near Washington, D.C. In the 1870's the electric motor was invented and more experiments took place trying to utilize the electric motor as motive power. Thomas Edison was among the first Americans in this vanguard and in 1880 at Menlo Park built and operated an electric railway. It ran so fast it scared the passengers and Edison soon lost interest.

The transportation operators at this time did not take too kindly to electrification. They were generally satisfied with the horse cars and recognized the advantages of cable car operation but were reluctant to shift to electricity. An exception was H.H. Littell, the President of the American Street & Railway, who said in 1883, "I see in the recent subjugation of the subtle and hitherto illusive force of electricity to the needs of man boundless possibilities for the world's three greatest requisites of advancement, heat, light, and motion."

a. Trolleys

In 1884 the East Cleveland Street Railway electrified one of its lines using a third rail underground conduit to supply current to the cars. One year later Leo Daft built a short electric line in Orange, New Jersey which used a system of two overhead wires and a little four wheeled carriage connected to the car by a flexible cable. The carriage was called a troller and from this term the word "Trolley" developed as a general term for electric streetcars which obtained their power from overhead wires.

In 1886 Montgomery, Alabama became the first U.S. city to have a street railway run by electricity. The first cars used in the operation were similar to those previously pulled by horses. Each car had a single motor mounted on the front platform with power transferred to the wheels by means of a steel chain. Power was obtained from an overhead wire through means of a pole from the roof of the car which pressed a rolling contact against the underside of the wire. The initial test line was successful and the system was gradually extended to include 18 cars operating on 15 miles of track. This gave Montgomery the distinction of being the first city in the world to have a city-wide system of electric transportation.

Richmond, Virginia in 1888 demonstrated a commercially successful and mechanically dependable electric trolley system. The system consisted of 30 cars operating on twelve miles of track. It was developed by Frank Sprague, a former associate of Thomas Edison and a Naval Academy graduate who foresaw a big future for electric railways. Sprague solved many of the vexing problems that faced electrification including major advancements of the trolley and better handling of power. Richmond became even more famous than Montgomery in advancing the electrification process.

Electrification spread quickly. All systems were based upon Sprague's Richmond plan. By 1890 there were systems operating in many cities including Atlanta, Cleveland, St. Paul, Minneapolis, St. Louis and Pittsburgh. A total of 1260 miles of track was in operation in that year. Another important breakthrough came in 1894 with the development of long range transmission of alternating current. Prior to that time the length of the rail lines was short because of limitations in transmission of 500 volt direct current.

By 1917 trackage had grown to 45,000 miles with 40,000 cars in operation. The trolleys were so pervasive that in 1912 it was possible to travel between New York and Boston by trolley in twenty hours for \$2.40.

b. Fares

Fares during the latter part of the nineteenth century and the first few decades of the twentieth were universally set at a nickel. It became a standard in the transit industry and was usually incorporated into the franchise agreement. The transit operators liked it in that with relatively fixed operating costs, it guaranteed a favorable profit. It also eliminated price as a competitive factor. It was simple to apply since there was no concern over trip length, or the number of zones that were traversed.

The nickel fare worked well until the economic conditions of World War I began to impact the street railways. With operating costs rapidly escalating, the fixed nickel fare which was designed to protect the operator became his downfall. In many cases, companies went bankrupt before they could get changes in their fare structure. From 1920 on, fares began to increase and the fare structure became more related to distance travelled.

c. Street Railways and Land Values

An interesting phenomenon that occurred when a street railway was constructed was that invariably the property along it went up in value, often severalfold. This fact was not lost on the transit operators who began to buy up large land holdings along and at the end of their lines. They often built housing developments on these lands thereby helping to generate their own demand. Another technique they employed was to build a park or amusement center at the end of a line. This ensured the use of their equipment during summer evenings and on weekends as people rode out to the end of the line to enjoy the recreational facilities. Peak Sunday loads on the lines to the amusement parks often exceeded the workday rush hour volumes and, in addition, the amusement parks were quite profitable. They later became valuable pieces of real estate when the amusement park fad faded. An example of such a park is Glen Echo, in the Washington, D.C. area.

Development of the urban areas in general followed the extension of the transit lines very much like modern development has followed the completion of highway facilities.

d. The Plight of the Street Railways

From 1890 to 1917, street railway companies vastly increased their system mileage and the patrons they served. Revenue passengers grew from 2 billion in 1890 to 11 billion by 1917. During this period, the street railways enjoyed a virtual monopoly and were able to make a profit

on even low volume lines. However, during the period 1910-1915 several factors were beginning to affect this situation. Automobile use was increasing and operating costs were beginning to outstrip transit productivity. The jitney was skimming traffic from the trolleys.

When World War I began, most of the trolley companies were suffering from over-capitalization. They had invested large assets on trackage and rolling stock, much of which was financed by bonds. In return for franchises, they were committed to a fixed fare (normally a nickel). They also provided numerous other municipal service including free maintenance of the streets on which they operated.

With much of their income going to paying off bonds, little was left for improving the comfort and convenience of the passengers. However, as long as profits were coming in, many of the trolley operators simply did not appreciate the need for user satisfaction.

By 1919, however, inflation had overcome profits for many lines, especially those that were poorly managed. At the same time, ridership was levelling off and dropping particularly on many of new low volume suburban lines. Replacement equipment was not being acquired and maintenance was poor. By the end of the War, almost one-third of all street railway companies had gone bankrupt. A commission appointed by President Wilson in 1919 found that the transit industry was over-capitalized, poorly managed, and not meeting the needs of their customers. The industry began the decade of the 1920's in poor financial shape and unable to maintain its share of the ever-growing urban transportation market.

e. The Development of the PCC Car

By the late 1920's with ridership steadily decreasing, the street railway operators sought some type of innovation that would stem the downward trend. The result was the establishment of a committee consisting of the presidents of some 25 street railway companies. The committee became known as the President's Conference Committee (PCC). The committee conducted a great deal of research to determine what features could be incorporated into a completely new car. The result was the PCC car, first tested in the fall of 1934. The cars were coming off the assembly line by 1935 and, over the next two decades almost 5,000 were built for U.S. and the world market. Many of these cars are still in use today in cities like Boston and San Francisco. The car was well received by the public and ridership generally increased on lines on which it was used.

6. Over and Under (Elevated and Subway Systems)

The transit vehicles of the 19th century, regardless of their motive power, had to compete with all other street traffic. This caused accidents, delays, and generally hindered efficient operations. The initial idea in the U.S. for a separate right of way was to go above the grade. This was first attempted in New York in 1868 using cable powered vehicles but never put into practical use. In 1879 steam was used to power elevated

trains in New York and was followed by Chicago in 1892 and Boston in 1899. The lapse of time between New York and other cities in developing the el can be traced to a number of factors including the "wheeler dealer" el owners and charges of noise, vibration, health hazards, structural damage to adjacent buildings, etc. In the 1890's electricity began to replace steam power for the elevated railways. Els were constructed in Philadelphia also but few other cities took this course.

Going underground was not a practical solution for steam powered vehicles because of the ventilation problems. However, as early as 1863 a subway had been built in London but it was not until 1897 that the first operational subway in the U.S. opened in Boston. Its first year of operation saw it carry 50 million passengers. New York City's first subway line opened in October 1904 with speeds of 15 miles per hour on local service and 25 miles per hour on express trains. Before the end of its first year of operation, the subway was carrying 400,000 passengers a day.

New York's subway was soon followed by Philadelphia and Chicago but no other major subways were built in the United States until Cleveland in the 1950's, San Francisco's BART in 1973, and Washington, D.C.'s Metro in 1976.

7. The Motor Bus

The introduction of the automobile in the 1890's and its further development in the early 1900's was a major milestone in transportation history. It was not long before the first of the high occupancy gasoline powered vehicles followed. This honor went to New York City's Fifth Avenue Coach Company, which, in 1905, one year after the opening of the New York City subway, introduced a 24 passenger double deck bus. The use of the motor bus spread slowly, however, in the next decade and was used mainly as a feeder to trolley lines. The open topped double decker was also not very popular except in areas with continuous good weather.

A phenomenon of the 1910 decade was the advent of "jitneys." Jitneys were automobiles operated by private individuals which cruised along heavily used trolley lines picking up people waiting at the stops. The price was a nickel a ride and enterprising persons were soon skimming the cream of the street railway company's ridership and profits.

Transit management responded by demanding regulation of jitneys and by 1920 most jitneys were out of business. However, the advantages of the motor vehicle to move people on constantly improving surface streets was not lost on the transit operators. America's love affair with the motor vehicle had begun and transit operators saw a way to take advantage of this situation. As World War I was ending, most street railway companies were expanding into the bus market.

During the 1920's street railway companies began to use buses as replacement for certain lines or in place of rail extensions. The primary factor was the changing cost picture. Laying new tracks on paved streets was becoming expensive especially where the lines would be

lightly utilized. Streets were more and more being paved to provide all weather surfaces for the growing number of automobiles. The bus could cover a larger service area and routes could be added easily as new development took place. As maintenance needs of the rail system increased and as patronage on lines decreased from the competition of the automobiles, buses found increasing use.

In 1922, fifty transit firms were operating 400 buses. By 1931, the numbers had grown to 390 firms and 13,000 buses. Early buses were little more than truck bodies fitted with a boxlike passenger compartment. In general, the vehicles were underpowered and uncomfortable. It was 1927 before the first true "bus" was built, namely the Fageol Twin Coach. It had a more powerful engine, was built low to the ground with a low entrance step and was vastly superior in comfort and interior appurtenance to that then in use.

An interesting development during this period was the trolley bus. The gasoline motor and transmission still had many problems associated with it while the electric propulsion system had many years of proven use. The overhead catenary power system was in places on many streets or could be installed rather inexpensively compared to the tracks. Thus was born the trolley bus or "trackless trolley" which combined certain of the advantages of the motor bus with the propulsion characteristics of the trolley.

8. Federal Government Involvement

The Federal government's involvement in highway transportation began in earnest in 1916 with the passage of the Federal-Aid Highway Act of 1916. This Act was the forerunner of many following Acts and established the basic principles of the federal-state partnership most of which still prevail today. The Act provided a mere \$5,000,000 for highway purposes but this amount has increased a thousand fold over the years.

Prior to 1916, the Federal government had begun to take a limited interest in motor travel. In 1893 when the auto was first used in this country the Department of Agriculture spent \$10,000 to investigate methods of road construction. By 1897, the Office of Road Inquiry in the Department of Agriculture was building short sections of test road to show good construction methods and the benefits thus derived. In 1912 Congress appropriated a half million dollars to improve postal roads.

The decade between 1921 and 1931 saw a great expansion of the Federal involvement in highway development. The Federal Aid Highway Act of 1921 enlarged upon the earlier act. In particular, each state was required to establish a highway department equipped to carry out its function to the satisfaction of the federal government. Funding levels averaged nearly \$100 million a year during this period. Great emphasis was placed on paving the main rural roads so as to get the farmer out of the mud.

9. The Depression

The Great Depression which was triggered by the stock market crash of 1929 had a negative impact on public transportation. With large numbers of the labor force unemployed, the number of work trips decreased. However, most people could not afford the luxury of the motor car which had the counter effect of increasing the demand for transit. This latter effect outweighed the former and stemmed for the time being the overall decline in transit use. To some extent it lulled the transit operators into believing that all was well in their industry.

Much of the blame for the Depression was aimed at big business and it was in this atmosphere that Congress enacted a law which has had far reaching impact on the transit industry.

10. Public Utility Holding Company Act of 1935

An important event in the history of public transportation took place in 1935 when Congress enacted the Public Utility Holding Company Act. The aim of the Act was to force electric power and petroleum trusts to divest themselves of their financial interests in transit companies. It was viewed at the time as significant anti-trust legislation in the public interest. Its long term affect, however, was to remove from most transit properties sources of both capital and management at a time when they could ill afford it.

The holding companies which, in some cases, owned several transit properties, had been instrumental in the development of the electrification of street railways. As a matter of fact, many of the electric utilities started out as transit properties and turned to selling their excess electric power that was not needed for their transit operations. Very shortly, as electric power became more popular for many residential and industrial uses, the transit portion of the business shrank to a small portion of the company's total operations.

In 1931, the public utility holding companies were estimated to have controlled about 50% of the bus and street-car transit properties that carried over 80% of the revenue passengers. (1)

11. New Highway Development

Between 1933 and 1941, federal highway aid to the states was increased and supplemented with emergency funds which averaged 230 million dollars a year. It was during this period that federal aid funds were first eligible to be used on urban and secondary streets.

The construction of streets and highways has long been used as one way of pumping money into the economy. A moderate program had begun during the latter years of the Depression and plans were underway for a major inter-city program when World War II erupted. The plans were shelved but were revived in the later stages of the war.

12. World War II

The Nation was beginning to emerge from the Depression when World War II began. World War II put a tremendous burden on the transit properties. With severe gas rationing, a halt to automobile production, a vastly expanded labor force working two and three shifts, transit use increased significantly. The industry reponded as best it could. In many cases the rolling stock was in poor condition suffering from undercapitalization during the depression. However, all available equipment was pressed into action and the maintenance facilities worked overtime.

Carpooling also became common during World War II, especially for longer trips where public transit was not available. During the peak of the war, almost 19 billion revenue passengers were carried by public transportation which was nearly double the previous high during World War I. Off-peak transit travel was also higher during the war as the lack of gasoline made discretionary travel by car unpatriotic.

World War II lulled many transit properties into a false sense of security. Price and wage controls imposed during the War had brought their operating costs under control. Extensive use of equipment during both peak and off-peak times enabled most properties to earn a reasonable profit. However, once the War ended and restrictions were lifted, their pre-war problems returned with a vengeance. Wages and prices spiraled. There was a great demand for new cars and the auto industry worked overtime to satisfy the demand.

For a few years after the war, the transit properties continued to do well as demand slowly diminished. But when auto production began to satisfy demand, the decline in transit began to accelerate.

New equipment was bought but even this did not stop the decline. By 1950, five years after the war ended, public transportation carried approximately 15 billion revenue passengers annually and by 1954 the number was down to 10 billion, its pre-war level.

13. Post War Government Policies

When World War II ended the government was faced with pressures for many new programs, some which had been put off by the war and others generated by the War itself. Over 13 million men and women served in the U.S. armed forces and the nation felt it owed them a debt. Legislation was passed to benefit the G.I.'s, including free schooling and reduced rates for housing loans. The American dream of a house in the suburbs on a ¼ acre lot was not to be denied and thus came the developments of Levittown and thousands of other similar developments around the major urban areas. These were low density developments not suited to the traditional service of street railways or motor buses.

In 1944, Congress enacted a Federal Aid Highway Act which, anticipating the post war growth in traffic, created a 40,000 mile Interstate Highway System. The system was based upon studies conducted in 1939 and again during the latter years of the war. Although the concept was approved and routes chosen, no new funds for construction were provided. No specific funds for the Interstate system were authorized until 1952 and then only in modest amounts until 1956. The initial matching basis was 50-50 and then increased to 60-40. The Federal Aid Highway Act of 1956 authorized the 90-10 matching formula and in conjunction with the Highway Revenue Act of 1956 created a Highway Trust Fund to pay for the Interstate and other highway facilities.

In the years following 1956, the major Federal emphasis was on highway improvements, in particular the Interstate Systems. Freeways were built between major cities and in many cases within and around urban areas. Almost no attention was given to public transportation which was continuing to experience severe losses in ridership and greater deficits.

The decade of the 1960's can be identified as the time when many transit properties went from private to public ownership. It was a period of severe financial hardship for most private operations, the result of decreased demand, decreased service, increased fares, an aging fleet, poor maintenance, and general cost cutting moves by private management.

It was a period when government was beginning to awaken to the problems of the urbanized areas and to the need for a viable and responsive public transportation system. A more detailed discussion of this period is found in Session III, Legislation and Regulation.

It was also a period when the primary objective of public transportation management switched from that of profit making to that of providing a service. This transition is still underway today.

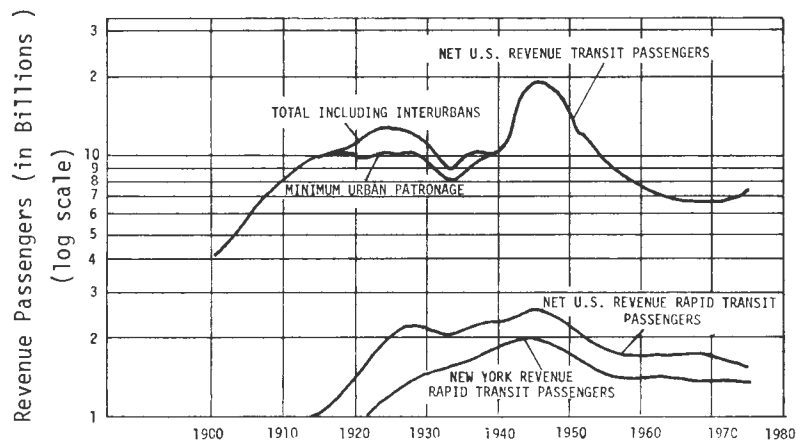
14. Transit Ridership Figures (1909-1975)

Transit ridership figures since the turn of the century are depicted on Figure II-2. The figure is taken from the Saltzman, Solomon Study (Ref. 7). The data is shown on a logarithmic scale. It is well to quote the authors' disclaimer on the data.

"Meaningful data on ridership are difficult to obtain and have been poorly presented in past studies. Intercity patronage and lack of standardized accounting for transfer passengers (the definition apparently changed every 5 years) can make as much as a 10 to 20 percent difference in the number of urban revenue passengers. Furthermore, the accounting practices of many companies are somewhat suspect. Few companies made a deliberate effort to count passengers accurately, and, particularly, those who were experimenting with fare structures used imprecise measures of counting based on a guess from the total daily

revenue. Statistical sampling to determine passenger load and percentage of transfers was practically unheard of. Double counting has continued to the present day, particularly in New York where a large percentage of the national transit data is collected. Several points should be noted about these data:

- . Minor fluctuations should be disregarded because they could have been caused by extraneous accounting inaccuracies as well as actual passenger trends.
- . Data have been plotted on semilogarithmic paper to show relative increases and decreases in traffic. Often, figures are presented that show only a tiny portion of the true picture. Almost always they are presented in a linear fashion, which gives the observer the erroneous impression that drastic changes have occurred.
- . Rapid transit patronage trends have been shown separately because their patterns do not follow precisely total transit ridership trends."



Source: Adapted from Ref. 7

Figure II-2. Trends in Patronage

Figure II-2 shows only revenue passengers. Total passengers are approximately 20-25% higher than revenue passengers. The data show the rapid rise in use between 1900 and World War I and the leveling off and the beginnings of the decline in the 1920's. There were further decreases with the beginnings of the Depression, followed by an increase during the middle of the Depression. Ridership surged during World War II and then plummeted after the War. Finally, a leveling off took place in the 1970's with a small but significant increase occurring in the last couple of years.

Several factors need to be considered in assessing these trends.

- . Between 1900 and 1975, total U.S. population almost tripled from 76 million to 218 million. Urban population quintupled from 30 million to over 160 million.
- . Auto registration went from almost nothing in 1900 to over 100 million today.
- . In 1900, the six day work week was standard. Today the five day work week is the norm.
- . In 1900 only 35 percent of all Americans owned their home. By 1970 this figure had risen to 62 percent.

15. Summary

Public transportation has been a major factor in the development of the United States. For nearly a century, between 1830 and 1930 it was a dominant element in shaping the nation's urbanized areas. In the 1920's as auto transportation swept the nation, public transportation became less and less of a factor on the urban mobility scene. World War II provided a temporary reprieve to the transit industry as gas rationing and other restrictions impacted auto use. After the war, the economic conditions and government policies created severe financial hardships for transit companies with resultant decreases in service and passengers. Many privately owned properties sold out to public agencies. In the 1960's, government policies geared toward the plight of the cities began to provide financial assistance to the publicly owned transit authorities. Government policy toward public transportation is still evolving. Public transportation has come to be recognized as a public service, one vital to the well being of the urban community.

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Session II

History of Public Transportation

The Richmond, Virginia Experience⁽¹⁾

(1) Source: Excerpted from Traffic Quarterly, October 1976.

Richmond was incorporated in 1742, and seven years later became Virginia's capital. By 1800 there were 5,735 people living in the city, and by 1910 this rose to 127,628. In 1888 Richmond distinguished itself by completing the nation's first electric railway—about 9 miles of track running between the eastern suburb of Church Hill and the downtown area. Starting in the 1830s a series of rail lines was built to connect Richmond to other regional centers in the South. As early as 1782 Richmond had roads leading to all 13 colonies, reflecting her role as a regional center. The city has had a long history of growth and, even through periods of variable economic stability, has grown steadily.

The Data and Method of Analysis

Two kinds of data were used to trace Richmond's urban growth: (1) maps showing the roads, railroads, transit lines, and in many cases important buildings, and (2) historical documents that described the city during its various phases of growth.

These data provided a general picture of the spread of urban growth in Richmond from 1742 through 1973. To illustrate this growth, six phases of Richmond's urban development within this time span were selected as the basis for analysis. These phases were identified by their year of occurrence and were selected according to two criteria: (1) the years for which maps and historical documents discussing the major features of the city were published, and (2) the years that important changes took place in the urban development of Richmond.

Thus 1742 was selected as the first phase because Richmond was incorporated that year, and 1742 was also the date of the earliest detailed map of the area.

The year 1859 was selected for the second phase to show the urban development of Richmond before the Civil War. Historical records indicated a considerable shift in the central business district of Richmond after its destruction in the Civil War; the business center moved from Main Street northward to Broad Street.

The years 1877 and 1920 were selected to reflect the city's morphology prior to and during the infancy of automobile use. Finally, 1928 and 1973 were selected because use of the motor vehicle expanded rapidly between these phases to become the predominant mode of transportation.

The last phase of the analysis (1973) brought the study fairly up to date because changes in urban form develop very slowly. However, an outerbelt freeway system did not exist in Richmond at that time.

Identification of the place and limits of the city's growth for each phase was a matter of judgment. It was considered that the location and number of streets, as well as their network limits for a given year (or phase), would indicate the areas and extensions of land development. The city's initial public transit routes and later extensions to the transit route system aided in the detection of more densely populated areas. In addition, clues from the historical documents filled gaps in the information deduced from the maps and helped in making judgment decisions.

Results and Discussion

2

Figure 1 shows the areas and limits of Richmond's urban development for the six phases. The streets and highways shown on the figure are from a 1973 map of Richmond. The concentric

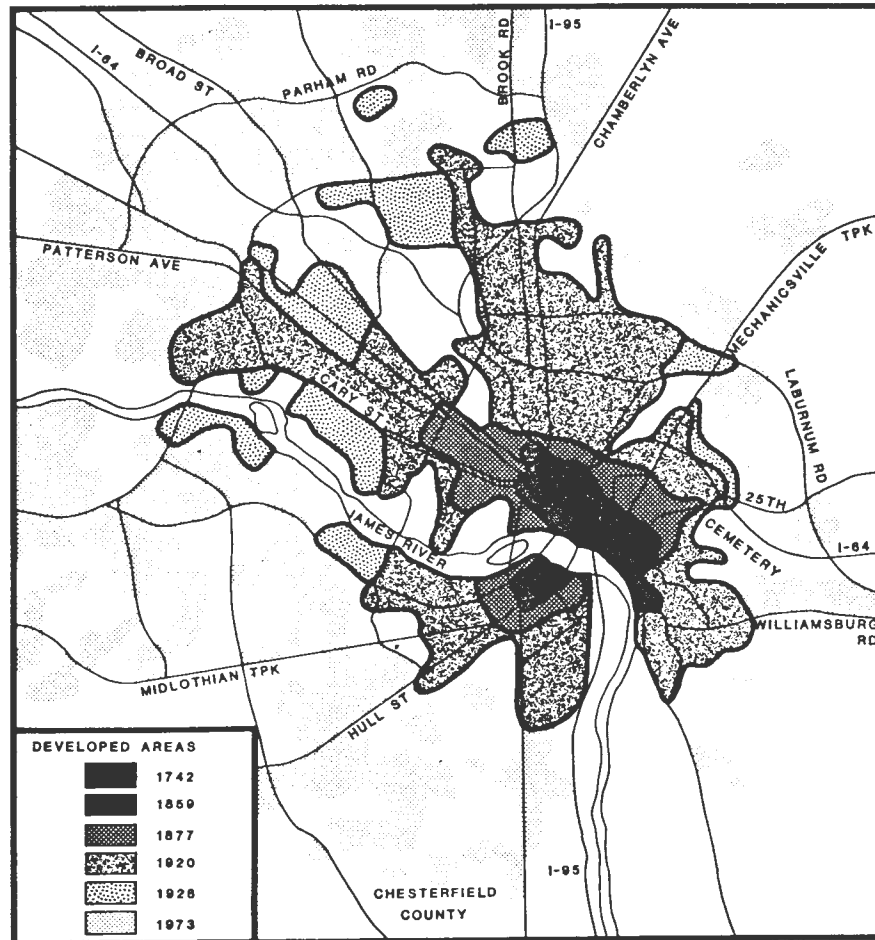


Figure 1. Zones of chronological development for Richmond, Virginia, 1742 to 1973

zones in Figure 1 were drawn so as to contain the areas that were developed previously, except where isolated growth occurred.

In 1742, Richmond's only urbanized development, as indicated, was a small one-half mile square area bounded by Broad Street on the north, the James River on the south, 19th Street on the west, and 25th Street on the east. By 1859 urban growth had extended in an east-west direction about 1 mile in each of these directions and the major streets in the city were the road to Williamsburg to the east, a path to the Indian country to the west, and a trail southward into Chesterfield County. The majority of travel was east-west, stimulating the eastward and westward extension of the city before its development in a north and south direction. Some growth in the northern and southern direction, however, had occurred by 1859, although no single arterial formed a north-south axis at that time.

From 1742 to 1859 the development of Richmond can be characterized as compact. Although most growth occurred in an east-west direction, the total distance from the eastern to the western boundaries of built-up area did not exceed 2 miles. The

southern extension of the city was hampered by poor and interrupted bridge crossings over the James River.

By 1877 urban growth occurred mostly toward the west of the city. The central business district had migrated toward the west and north from its location before the Civil War, making the western and northern parts of the countryside especially accessible to the new downtown area. However, the new downtown area was located to the west of the Shockoe Valley, a sizable barrier to cross in order to reach downtown if one were located in the eastern part of the city. The south axial growth took place along Hull Street and Midlothian Turnpike south of the James River.

Like the eastern development of the city, this southern growth was much more limited than along the western and northern laterals. Access to downtown was still restricted by the low availability of bridges across the James River for those residing in the southern part of the city.

The northern extension of urban development to 1877 was quite restricted, but by 1907 it became a major focus of developmental activity. Most of this new growth took place along Brook Road and Chamberlyn Avenue and until 1920 the northward extension of the city was spearheaded in its outward thrust along these two roads. The western arm stretched outward in a band that was bounded to the north by Broad Street and to the south by Cary Street, the first major street north of the James River.

From 1742 through 1920, Richmond developed into a sizable city. Throughout this period the newly developed areas were primarily extensions of already existing developed areas. Thus, most of the growth extended from the city core outward along major transport corridors or arterials into the countryside—typical of both the compact and lateral growth (stages 1 through 4) shown in Figure 1.

By 1928, however, a new phenomenon occurred: urban growth appeared that was separated from earlier development by open land. For the first time developed areas appeared that were not contiguous to any other developed area of the city. Two of the enclaves were located in the northern section of the city, one on Brook Road, the other farther west, just off Parham Road. Both had direct access into the downtown area. The third was located just across the James River in the western end of the city. By 1940 the pattern of separate, suburban developments became even more pronounced and by 1950 major isolated areas of growth appeared south of the James River. From 1940 through 1966 development occurred in vacant areas between recently developed areas and the older core, especially in the southern area of the city. By 1973 development once again was moving outward, pushing the city farther into the countryside. This trend in growth, however, was not centered on the downtown area since it took place northward, westward, and southward a considerable distance from the city core. Eastern development was noticeably truncated even as late as 1973.

After the Civil War, Richmond's geographical growth was rapid. Beginning in 1877 the city developed along a pronounced east-west axis through the downtown area. A comparison of Figure 1 and 2 reveals the relationship between the growth of the city and its public transit routes. In 1877 the only transit route connected the eastern part of the city to the western side. By 1888 the transit system was fairly extensive, and by 1901 it had major east-west and north-south axes. In 1914 the transit network was extended toward the west of the downtown area. Extensive development appeared in this same area by 1920. Growth in the south of Richmond by 1920 took place along streets that

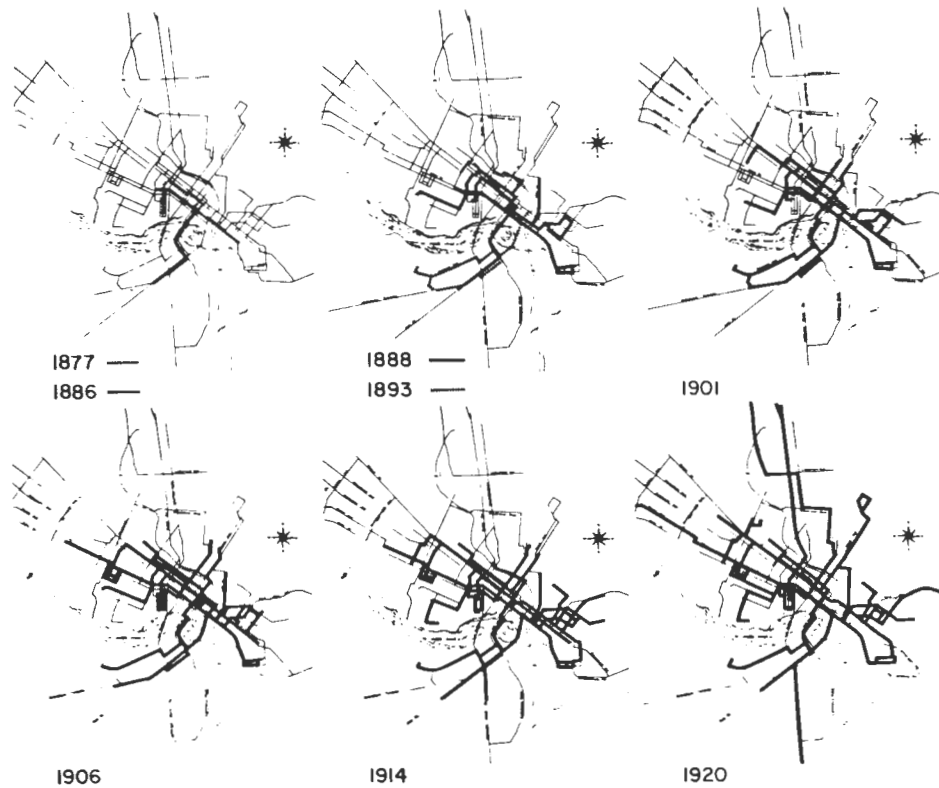


Figure 2. Public transport routes in Richmond

were public transit routes in 1914. Northward extension of the transit network was not well developed in 1914, but by 1920 the total system had broad geographical coverage, including a new route centered on the extensive urban development north of downtown Richmond. In the western sector the public transit route was extended farther by 1920, as considerable urban growth had taken place there. Within the southern and eastern sectors extension of transit service was limited, as was urban development.

After 1920 the growth of the city did not parallel the location of public transit routes. The automobile had begun to mold the growth of the city and the paths of travel became dispersed.

CONCLUSION

5

Richmond's geographical growth and the development of its transport routes have occurred hand-in-hand. This is especially noticeable from 1877 through 1920 when the public transport system was the major form of transportation in the city. Growth during this era took its most explosive form along two major arterials: one north-south and the other running east-west. The crucifix form of urban growth was especially dominant during this time span. Prior growth had been restricted to the central-city area at the intersection of the two major arterial routes. After 1920 the urban growth in Richmond dispersed rapidly, filling in the interstitial areas between the major axes and extending the frontier of the city in all directions. As early as 1928, leap-frogging of areas of development occurred.

Questions - II

1. Was Richmond's growth pattern typical of North American cities?
2. How does the growth pattern differ for western cities?
3. What conclusions does the article make concerning growth and public transport routes?

SESSION III: PUBLIC TRANSPORTATION LEGISLATION AND REGULATION

Objectives of Session III

- . To understand the role of government in public transportation in its right to regulate by legislation
- . To be aware of the types of regulations and the agencies who administer them on the local, state, and federal levels

Synopsis of Session III

This session examines the involvement of local, state, and federal governments in public transportation by a review of past and present regulations and legislation.

Outline for Session III

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Early Regulation
3	Pre-World War II Regulation
4	Related Highway Regulation
5	World War II Period
6	Post-World War II Period
7	Related Legislation
8	Rules and Regulations
9	State and Local Legislation and Regulation
10	Summary

SESSION III
PUBLIC TRANSPORTATION LEGISLATION AND REGULATION

1. Introduction

The regulation of public transit has had and continues to have an important impact on public transportation. A brief discussion of the history of the regulation of passenger and freight transport is presented including the changing philosophy which has brought us to today's legislation.

2. Early Regulation

Transit regulation is as old as the transit industry. When omnibuses first appeared in London, their drivers were subject to arrest for picking up or discharging passengers. This was soon rectified with the passage of the Stage Carriage Act in 1832 which required the drivers and conductors to be licensed. This Act was the forerunner of a continuous stream of transit legislation and regulations.

Most U.S. transit regulation in the 1800's was developed and administered by local jurisdictions. It was in the form of granting franchises to private profit making companies to provide service within a given area. In general, the regulations established fares and areas of operation and was geared to protecting the transit operator from outside competition. There was little or no state or Federal legislation during the first half-century of our urban transit industry.

In the period after the Civil War, the railroads vastly expanded their system. They also instituted many discriminatory and monopolistic practices in their treatment of customers. Small shippers were charged full rates while large shippers could bargain for lower rates. Other abuses took place which forced Congress to take action and resulted in the Interstate Commerce Act of 1887. The Act, which has since been amended numerous times, was largely an anti-monopoly act. It did little to affect urban public transport but it did set a precedent for Federal involvement.

The Hepburn Act of 1906 further strengthened the ICC's authority by making Commission orders binding and providing fines for failure to comply. The Commission was also given the authority to prescribe maximum rates. The act extended jurisdictions to non-rail carriers for the first time, in particular to oil pipelines. It also made it illegal for a railroad to transport products which they produced or had an interest in with the exception of lumber. This anti-trust aspect was to reappear in 1935 with regard to public transport in the Holding Companies Act.

During World War I, the railroads were taken over by the U.S. Government when they were unable to effectively coordinate their own activities in support of the government's war needs. During the period from 1917-1919, the railroads were forced to cooperate, and the government dictated rates and guaranteed a profit. During this period, the government sunk over 1.5 billion dollars into the railroad system to update, integrate and operate the system. This was an early and significant effort in Federal Government transport subsidy.

The Transportation Act of 1920 resulted in the return of the railroads to private ownership. It also marked a change in government philosophy away from a policy of enforced competition to one of positive control. The idea was to increase the financial health and the adequacy of transport services. The ICC was instructed to provide just and reasonable rates which allowed a "fair return on a fair value." Railroads were also allowed to consolidate or acquire other lines for purposes of efficient operations.

3. Pre-World War II Regulation

a. State Regulation

As highways and streets improved, the number of freight shippers using trucks grew. In general, state regulation of motor transport preceded the Federal legislation. All states have a regulatory body with jurisdiction over intra-state carriers. These bodies go under different names and have differing powers in each state. They are often called public utility commissions or public service commissions. For many such bodies, transport regulation is a small part of their responsibility. In general, such bodies have the power to regulate entry, to establish rates and to specify accounting, reporting, safety, and insurance requirements.

Passenger service by bus was regulated shortly after World War I and existed in most states by 1930. Much of this regulation was aimed at protecting the street and urban railway companies from competing modes.

b. Federal Regulation

The Motor Carrier Act of 1935 brought the motor carriers under the ICC. The Act established entry controls, set up provisions for determining rates and other conditions governing operators.

Carriers local in character, such as school buses, taxis and trolley buses were exempted. Additionally, vehicles transporting passengers and property wholly within a municipality, between contiguous municipalities, or within a zone adjacent to and commercially contiguous to a municipality were exempt. This cut down the scope of regulation and gave recognition to the fact that state regulatory procedure was quite highly developed.

The 1935 act recognized the authority of state regulatory bodies by denying ICC jurisdiction over intrastate carriers. It also allowed the establishment of "Joint Boards" in situations that involved three or less states. An example of the latter is the Washington (D.C.) Metropolitan Area Transit Commission (WMATC) which regulates transit in the District of Columbia and surrounding areas of Maryland and Virginia.

c. Holding Company Act of 1935

A major piece of legislation affecting public transportation was enacted in 1935. The Holding Companies Act of that year placed severe restrictions on public utilities or related holding companies from owning and operating public transit services. Many of the public utilities had started as street railway operations and then found it more profitable to sell their excess electric power. By 1935 their public transport operation was a small part of their business and increasingly an unprofitable one.

The legislation was meant to be anti-trust and in the public interest. However, the utilities had been able to provide a reasonable level of transit service because of their overall operation and their ability to easily raise capital. They also were able to bring to bear good management practices. This was soon lost as most utilities quickly sold off their public transit holdings. Less than five utility owned properties currently exist and all should be divested in the next few years. This legislation can be cited as adding to the financial woes and demise of the private transit industry during the last four decades.

4. Related Highway Legislation

The advent of the automobile in the 1890's brought enactment of various laws and regulations governing its use as well as affecting the roads over which it traveled. State laws were establishing licensing and registration procedures and also creating "rules of the road." The Federal government got involved to a very limited extent in the 1890's when Congress approved \$10,000 for the Department of Agriculture to investigate methods of road construction. It resulted in the creation of the "Office of Road Inquiry." Short test sections of road were built in 1897 to display recommended construction procedures. In 1912, Congress appropriated one-half million dollars to assist the states in improving postal routes. This was a pilot program for later federal aid highway legislation.

a. The Federal Aid Highway Act of 1916

The Federal Aid Highway Act of 1916 established the federal aid program and the basic federal-state relationships which exist to this day. The states were given the responsibility of selecting routes for improvement, designing routes, setting priorities and annual programs and operating completed facilities. These responsibilities were subject to Federal approval and control. The Act renamed the Office of Road Inquiry as the Bureau of Public Roads. The Act created a funding formula among the states and established matching ratios.

b. The Federal Aid Highway Act of 1921

This Act added significantly to the earlier legislation. It required each state to establish a highway department to carry out its activities in order to be eligible for Federal Aid. It also limited the size of the system eligible to Federal Aid to 7% of the total state highway mileage and further established a system of main roads eligible for such aid. It changed the matching formula in states having a large amount of Federal land.

c. Federal Aid Legislation 1921-1930

During these years, the main thrust of highway legislation was to increase the amount of Federal Aid available. During this decade the average funding level increased to over \$100 million annually. Most of this money went to rural areas to get farmers "out of the mud."

d. Federal Aid Legislation 1930-1940

Further increases in Federal Aid occurred during the Depression. Annual funding levels averaged 230 million dollars. In 1934, the Highway Act provided that 1½% of the state's annual apportionment could be used for planning. This was later amended to include research, development and safety as well. In 1938, specified urban and secondary roads also became eligible for Federal Aid funds.

In 1939 the Bureau was transferred from the Department of Agriculture to the Federal Works Administration and renamed as the Public Roads Administration.

5. World War II Period

The War put a halt to new highway programs for a five year period of time. However, in 1939 a report had been issued by the Bureau of Public Roads recommending the creation of a nationwide system of interstate highways. By 1944, with the end of the war in sight, new studies by Public Roads and the states reconfirmed this recommendation and resulted in the enactment of the 1944 Federal Aid Highway Act. The Act created a 40,000 mile interstate highway system to be designated by the states with Federal approval. However, no new funds were authorized for construction.

6. Post World War II Period

In 1949 the Public Roads Administration was transferred to the Department of Commerce and once again was known as the Bureau of Public Roads. During the decade after the War, Federal Aid authorization rose rapidly and amounted to \$700 million in 1956.

In 1952, limited funding was specifically earmarked for the interstate system first on a 50-50 matching basis and later on a 60-40 matching ratio.

The Federal Aid Highway Act of 1956 can be considered landmark legislation. Along with the Highway Revenue Act of 1956, it established the basic financial design, and operational practices for the Interstate system. It changed the matching ratio to 90-10 and authorized the funds over a long period. The Acts also created the Highway Trust Fund as a financing mechanism with highway user taxes going into the fund. Two years later in 1958, all highway Federal Aid highway legislation was codified as Title 23 - Highways, U.S. Code.

7. Related Legislation

a. Federal Housing Legislation

A major post-war factor contributing to the decline in transit use was the housing policies of the Federal Government which promoted the exodus from the central cities to the suburbs. Two important pieces of legislation in this regard are:

1) Federal Housing Administration Loan Insurance Program. This program provides insured mortgage financing for the construction, purchase or repair and rehabilitation of

one-to-four family homes. It was designed to help families undertake home ownership on a sound basis.

2) Veterans Administration Loan Guaranty Program. This program provides loan guarantees to assist veterans in obtaining credit on favorable terms for purchase, construction, repair alteration, or improvement of homes. The assistance provided consists of guaranty or insurance of loans made by private lenders to veterans of World War II, the Korean Conflict, and those who served on active duty after January 31, 1955. In rural areas, small cities, and towns, where private credit is not generally available for guaranteed or insured loans, the Veterans Administration may make loans directly to veterans.

Combined with other factors such as the growing decay of the center cities, increased mobility provided by the auto, and an extensive urban highway network (and its support), the legislation increased the opportunities for Americans to live in the suburbs. Person trips to and from the suburbs were made by auto instead of transit. The dominance of auto travel exists today.

b. The Housing and Urban Development Act of 1961

The Housing and Urban Development (HUD) Act of 1961 represented the Federal government's first financial assistance to public transit. Although the Act was primarily oriented towards housing and urban renewal, it did contain several provisions related to transit. These included:

- . 25 million dollars for transit demonstrations
- . Transit planning was required to be a part of federally funded urban planning programs (701 planning funds)
- . 50 million dollars in loans was made available through the Home Finance Administration for mass transportation projects.

This modest program set the stage for more major programs which followed.

c. Federal Aid Highway Act of 1962

The 1962 Act represented evidence of the growing understanding in Congress of the plight of cities concerning transportation. The Act required that urban areas of 50,000 or more initiate a cooperative, comprehensive, and continuous (3C) transportation planning process including public transportation. Projects not complying with this procedure would not be eligible for federal funds after 1965.

In that same year, an Urban Mass Transportation bill was introduced into Congress but lacked the necessary votes for passage. However, the tide was beginning to turn as a coalition of central cities, labor and the transit industry began to flex their collective muscle.

d. The Urban Mass Transportation Act of 1964

This Act created within HUD the Urban Mass Transportation Administration. It signalled a recognition by Congress that the country's transit systems needed help if they were to improve their services and avoid further financial troubles. The Act provided the first capital grants for transit and authorized funding of up to 1.2 billion dollars over a 7 year period. The Act had three major objectives:

- . To preserve and improve existing transit services
- . To improve mobility
- . To assure that transit services support orderly development and improve environmental conditions.

Although a large amount of money was authorized, only a portion was actually obligated. Between 1961 and 1966 approximately \$375 million in federal funds was spent for mass transit while during the same period over \$24 billion went towards highways, waterways, and airports. (1)

e. The Urban Mass Transportation Act of 1966

When President Lyndon Johnson signed the 1966 Act, he was quoted as saying, "When I consider the problems this bill is trying to cope with, I am thankful that I work at home." The 1966 Act amended the 1964 Act and provided funds for first time planning, engineering and design, management training and for new systems studies. The law included strict local planning requirements and labor protective provisions (Section 13 c). The Act also established a research, development, and demonstration program and provided financial assistance for technical studies and training.

The 1966 amendment put the funding program on a sounder basis providing \$150 million dollars annually between 1967 and 1969.

f. High Speed Ground Transportation Act of 1965

This Act authorized a 3 year, 90 million dollar research and development program to investigate the feasibility of high speed ground transportation in densely developed urban corridors such as the Northeast Corridor.

g. Department of Transportation Act of 1966

This Act created the Department of Transportation bringing together a number of modal agencies. Mass transit remained at HUD but a study was initiated to determine where mass transit should be located. In 1968, the President's Reorganization Plan 2 transferred most of the functions and programs of the 1964 UMT Act from HUD to DOT. It also established the Urban Mass Transportation Administration (UMTA) putting it on an equal footing with the Federal Highway Administration. Another aspect of the 1966 act was the establishment of Section 4(f) environmental protection measures.

h. Federal Aid Highway Act of 1968

The Federal Aid Highway Act of 1968 established the Urban Area Traffic Operations Improvement Program (TOPICS) and the fringe parking program. Both programs had important elements related to highway oriented transit improvements. For example, bus bays, bus shelters, and bus hardstands were eligible TOPICS items.

The Fringe Parking Program is contained in Section 137. The approved parking facilities must be located and designed in conjunction with existing or planned public transportation facilities.

i. National Environmental Policy Act of 1969

This Act although not directly related to transit has significantly impacted the development and funding of urban transportation facilities. It requires the preparation of environmental impact statements for all major federally funded projects.

j. The Urban Mass Transportation Assistance Act of 1970

The Urban Mass Transportation Assistance Act of 1970 amended the 1964 act and offered long-term financing for expanded public mass transportation. It outlined a Federal commitment for the expenditure of at least \$10 billion over a 12-year period. It specifically authorized \$3.1 billion for capital grants to states and local governments.

k. Federal Aid Highway Act of 1970

The Federal Aid Highway Act of 1970 established the Federal Aid Urban System. Routes to be placed on this system must be selected on cooperative terms by local officials and State highway departments based on an urban transportation planning process. In the Federal Aid Highway Act of 1970, special provisions were included that permitted funds apportioned to the states from the Highway Trust Fund to be used for public transportation related purposes, such as exclusive or preferential bus lanes, bus stops, loading and unloading facilities, bus shelters, and similar bus ancillary facilities. (Section 142)

The purpose of Section 142 was to encourage the development, improvement, and use of public mass transportation systems operating motor vehicles (other than on rail) on Federal aid highways for the transportation of passengers, so as to increase the traffic capacity of the Federal aid systems for the movement of persons. Eligible items on any Federal aid system include the construction of exclusive or preferential bus lanes, highway traffic control devices, bus passenger loading areas and facilities (including shelters), and fringe and transportation corridor parking facilities to serve bus and other public mass transportation passengers.

In addition, Department of Transportation could, beginning with fiscal year 1975, approve the purchase of buses, and beginning with fiscal year 1976 approve the construction,

reconstruction, and improvement of fixed rail facilities, including the purchase of rolling stock for fixed rail, except that not more than \$200,000,000 of all sums apportioned for the fiscal year ending June 30, 1975, under Section 104(b)(6) shall be available for the payment of the Federal share of projects for the purchase of buses.

l. The Federal Aid Highway Act of 1973

The Federal Aid Highway Act of 1973 represented a major change in policy by permitting certain of the basic program authorizations to be used for the full range of public transportation capital costs, including rail rapid transit. The act, for the first time, combined in one legislative action the enactment of policy and funding levels for both the Federal Aid Highway Program and the Urban Mass Transportation Program. It provided an additional \$3 billion from general funds in increasing the contract authority to \$6.1 billion for the Urban Mass Transportation Capital Grant Program, and it increased the Federal share of net project cost (that cannot be reasonably financed out of revenues) from two-thirds to 80 percent. Furthermore, it authorized \$780 million per year for the Federal Aid Urban System, to be spent on either highway or public mass transportation projects for fiscal year 1974, and \$800 million for each of the next 2 fiscal years. During fiscal year 1975 up to \$200 million of what is spent for the purchase of buses may be paid for out of the Highway Trust Fund, and in fiscal year 1976 any authorized project (bus or rail) may be paid for out of the Highway Trust Fund up to the total of \$800 million for all projects. Finally, the act permits state and local governments, with the concurrence of the Secretary of Transportation, to substitute in an urban area a rail transit project or other transit improvement for a nonessential Interstate Highway project with financing from general revenues.

The Act also established the Rural Highway Public Transportation Demonstration Program (Section 147). The purpose of the Act is to encourage the development, improvement, and use of public mass transportation systems operating vehicles on highways for transportation of passengers within rural areas and small urban areas, and between such areas and urbanized areas, in order to enhance access of rural populations to employment, health care, retail centers, education, and public services. It authorized \$15,000,000 for the fiscal year ending June 30, 1975, and \$60,000,000 for the fiscal year ending June 30, 1976, of which \$50,000,000 shall be out of the Highway Trust Fund. The Act directed Department of Transportation to carry out demonstration projects for public mass transportation on highways in rural areas and small urban areas.

m. The National Mass Transportation Assistance Act of 1974

This is the most important piece of legislation in the public transportation arena. It amended the 1964 UMTA act and authorized for the first time the use of Federal funds for transit operating assistance. Almost \$4 billion of the \$11.8 billion authorized over the next 6 years is allocated to urban areas by a formula based on population and population density. These funds so allocated can be

used for either capital or operating assistance. Of the remaining \$7.8 billion, \$7.3 billion is available for capital assistance at the discretion of the Secretary of Transportation, and \$500 million of that amount is for rural mass transportation.

n. Federal Aid Highway Acts of 1975 and 1976

The 1975 program authorized funds of \$7.8 billion, the largest amount in the history of the federal-state highway program. Similar funding levels were continued for two more years in the 1976 bill. The 1976 act also created a 19 member National Transportation Policy Study Commission to study the nation's transportation needs.

8. Rules and Regulations

In 1975 and 1976, the Department of Transportation issued a number of rules and regulations which established policies related to previous legislation. Several of the more important issuances are summarized below.

a. Charter and School Bus Operations UMTA, April 1, 1976

These regulations were designed to ensure that capital and operating assistance made available under UMTA statutes are not used in support of charter bus operations. The regulations specify that the grantee of UMTA projects will not operate charter service outside the urban area in which it provides regular service.

A second part of these regulations puts limitations on the transportation of school students by federally assisted operators when they are in direct competition with private school bus operators. Both parts of the regulation are aimed at prohibiting unfair competition to the private operator by federally funded public transportation authorities.

b. Joint Regulations, Transportation System Management, 1975

On September 11, 1975, Department of Transportation issued regulations governing urban transportation planning under the FHWA and UMTA. The regulations specified that the urban transportation planning process shall include the development of a transportation system management (TSM) element and a long range element. This is the first time that a formal requirement for a TSM has been included in the urban transportation planning process.

The regulations identified the purpose of the TSM as follows:

- 1) Provide for the short range transportation needs of the urbanized area by making efficient use of existing transportation resources and providing for the movement of people in an efficient manner.

- 2) Identify traffic engineering, public transportation regulatory, pricing, management, operational, and other improvements to the existing urban transportation system not including new transportation facilities or major changes in existing facilities.

The responsibility for developing and coordinating the TSM plan has been assigned to the Metropolitan Planning Organizations (MPO) for each urbanized area. The joint regulations have stimulated much discussion in terms of how they may be carried out and how public transit fits in. The roles of the various urban transportation agencies in the process are still being determined. What is certain is that local transit operators are part of the planning process.

c. Urban Transportation Programming for Elderly and Handicapped, UMTA/FHWA, April 30, 1976

Regulations were issued effective May 31, 1976 concerning project approvals under various UMTA grant programs. The regulations required that the planning process show special efforts in providing facilities and services that can be used by the elderly and handicapped (E & H). The annual element of the TIP must contain projects or project elements for the E & H and specifically, wheelchair users and the semiambulatory. By September 1, 1977, reasonable progress must be shown in implementing previously programmed projects.

Project approval was contingent on acceptable performance on the above items.

d. Major Urban Mass Transportation Investments - UMTA, September 22, 1976

On September 22, 1976, UMTA issued a policy statement concerning transportation investments in major urban areas. The policy recognized the inability of UMTA to fund all capital grant applicants particularly those requesting new fixed guideway systems. The policy stressed the need to consider combinations of transit modes and technologies appropriate to the service requirements of specific corridors. It requires major fixed guideway systems to be implemented incrementally with priority given to the most immediate needs of the locality.

e. Paratransit Services - UMTA, October 20, 1976

A proposed policy was issued by UMTA on October 20, 1976 concerning paratransit services. The thrust of the policy was to provide a mechanism for UMTA to assist the various paratransit services without subjecting paratransit operators to the regulations and provisions normally associated with UMTA grants. In particular Section 3(e), which aims to avoid competing services and Section 13 c which pertains to labor protection would not be applied.

9. State and Local Legislation and Regulation

The basic operations of public transportation agencies is largely governed by state and local legislation and regulations. Each state and local area differ in their specific rules, but a general pattern is common to all.

a. Transit Authorities and Districts

Specific state legislation is usually necessary to establish special purpose districts for various public purposes. This is true for public transportation. The legislation provides the legal framework which permits the creation of transit districts or authorities. It specifies the geographical area covered and the manner of financing and operation. The transit district or authority is the agency which operates the service.

Where two or more states are involved in the creation of a transit system (WMATA in the Washington, D.C. area, Bi-State in St. Louis, PATH, etc.) Congressional action as well as state approvals are required.

b. State and Local Regulation

State and local regulatory bodies are empowered to regulate most aspects of the private transit operation, particularly with regard to fares and service. A typical regulation states that the body has jurisdiction over "services where a motor vehicle and driver are used on a for hire basis in the transportation of persons and baggage over either a fixed or variable route." Publicly owned carriers are not regulated by the state agencies except for vehicle safety and driver licensing.

The areas subject to regulation for the private operator were recently summarized by Wolfington (8) and are as follows:

1) Rates and fares. The regulatory body must protect the public interest and is, therefore, interested in monitoring the (a) amount charged to the public, (b) quality of service, and (c) reasonableness of compensation. The control over the rates and fares is exercised by requiring either the filing of rates and fares for information purposes or the filing of rates and fares by way of application for approval of changes. Normally, the basis of approval or rejection of rates is related to the maintenance of a predetermined rate of return. In most instances, the fares of the carriers also prevail where the rate is determined on a passenger basis rather than on a charter group basis.

2) Insurance. Normally, the regulatory body stipulates a minimum level of insurance coverage in the areas of liability, collision, and property damage and requires some evidence of such coverage. For instance, the California Public Utility Commission sets forth rules requiring that certain carriers of passengers provide adequate protection against liability imposed by law on such carriers for the payment of damages for personal injuries, including death

resulting therefrom, and damage to or destruction of the property. In most instances, private operators will arrange insurance coverage greater than that required by regulatory bodies.

3) Equipment. A basis commonly used by regulatory bodies to distinguish various services and to determine jurisdictional control is the passenger capacity of the vehicle. Often, the passenger capacity is a criterion for classification and as such can trigger a further degree of control related to vehicle specification, safety standards, and color. Vehicle specifications and safety standards may include requirements related to factors such as the number of doors on the vehicle, warning lights, and adherence to federal safety standards.

4) Drivers. The most common element of regulation over drivers is related to driver licensing. In some instances, a driver must pass both a written test and a road test if a specific designation such as chauffeur is required on the license. In most instances, the operator will independently require a physical examination and some record of former employment and drive experience (i.e., accident experience and traffic violations).

5) Routes. Control over routes is generally restricted to the common carriers operating on fixed routes pursuant to a certificate of public convenience and necessity. In that instance, the exercise of control may include a review of the proposed method of operation, proper inspection of the vehicle, a detailed description of the route, and fares related to the movement of persons along that route. In the area of variable routes, control is normally limited to the description of boundaries within which persons can be picked up and discharged at any point.

6) Licensing and taxes. Normally, the public transportation carrier or operator or both must be properly licensed and registered as such with the regulatory body and further must make visible such licensing and registration through a permit, or markings on the vehicle.

7) Fees. It is not uncommon for a public utility commission or regulatory body to impose a fee or tax on public vehicles operating over defined regular routes. In most instances, those public vehicles operating on variable routes are not subject to a joint metropolitan area authority or airport commission.

8) Accounting. A regulatory body that exercises a high level of control will often require that operating and financial statements be filed in a form and format it prescribes. In addition, it retains the right to audit the records of the operating entity. The extent to which there is an accounting requirement is generally proportional to the extent of control of the other areas that are subject to regulation.

9) Entry control. Entry control generally relates to the number of vehicles, financial responsibility and fitness of proposed operator, and monopoly atmosphere with respect to service territory. In most instances, the degree of control exercised is greater with airport commissions and the regulatory bodies of public transportation operators traveling over defined, fixed routes. There is no common

degree of enforcement of such control, and the control over factors such as the number of vehicles is normally exercised at the city and county levels.

A summary of the areas subject to regulation by various state and local regulatory bodies is contained in Table III-1

Table III-1. Jurisdiction of State and Local Regulatory Bodies

Regulatory Body	Areas Subject to Regulation								
	Rates and Fares	Insurance	Equipment	Drivers	Route	Licensing and Taxes	Fees	Accounting	Entry Control
State									
Public utility commission or state corporation commission	x	x	x		x	x	x	x	x
Department of motor vehicles		x	x	x					
Airport commission	x	x	x	x	x		x	x	x
Secretary of state	x	x	x	x	x	x	x	x	x
Department of transportation	x	x	x	x	x	x	x	x	x
County									
Department of motor vehicles		x	x	x		x			
Public utility commission	x	x	x	x	x	x	x	x	
Airport commission	x	x	x	x	x		x	x	x
Department of transportation	x	x	x	x	x	x	x	x	x
City									
Department of motor vehicles		x	x	x		x	x		
Police department			x	x		x			
Taxi commission		x	x	x		x	x		x
Airport commission		x	x		x		x		
Department of transportation	x	x	x	x	x	x	x		
Joint metropolitan commission									
Port authority	x	x	x		x		x	x	x
Area transit commission	x	x	x		x		x		x
Airport commission	x	x	x		x		x		

Note: x indicates the area that is subject to regulation by the regulatory body.

Source: Ref. 8

10. Summary

Legislation and regulation affecting urban public transportation has changed dramatically, especially in the last two decades. The transit industry has gone from one of largely private ownership to one primarily operated by public authorities. This change in ownership has been followed by a change in governmental policy which now recognizes the public service attributes of public transportation. Legislation and regulation to carry out this new philosophy has resulted. It is doubtful that we have reached an equilibrium point. These changes are likely to continue for the next several years as the federal, state, and local governments struggle to reach a satisfactory balance in their transportation policy. However, it appears clear that public transportation will continue to gain credence in becoming a viable alternative to the private automobile in most urban communities.

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No. 5

Senate

(Legislative day of Monday, January 10, 1977)

By Mr. WILLIAMS (for himself and Mr. KENNEDY):

S. 208. A bill to amend the Urban Mass Transportation Act of 1964 to extend the authorization for assistance under such act, and for other purposes; to the Committee on Banking, Housing and Urban Affairs.

NATIONAL MASS TRANSPORTATION ASSISTANCE ACT OF 1977

Mr. WILLIAMS. Mr. President, during the past 5 years, Federal assistance to mass transportation has begun to show positive results on the welfare and vitality of our Nation's urban areas. The Urban Mass Transportation Act, as amended, provides financial assistance for the development of efficient and coordinated mass transportation systems as part of the broad objectives of urban management, development and revitalization.

Public transit has, at last, begun to provide urban areas with transportation alternatives. These alternatives increase the efficient and productive use of the streets and highways, promote energy conservation, add to environmental quality, provides accessibility and tend to knit together the fabric of urban life.

Federal assistance to mass transit has provided the resources to invigorate the quality, and quantity of public transportation by making possible the replacement of obsolete equipment, the rehabilitation of fixed facilities, the construction of new modern transit lines, and the continued improvement of services.

In order to continue this trend of increasing transit improvements and urban benefits and in order to prevent an interruption in the funding of major transit

projects, revisions to the Urban Mass Transportation Act are vitally needed.

New authority for discretionary grants for the acquisition of capital equipment and facilities to purchase new buses and related equipment, to rehabilitate or extend existing rail systems and construct new fixed guideway systems is of the utmost necessity. After years of planning, recent Federal decisions have been made to assist in the continuation of new important mass transit projects in cities such as Atlanta, Detroit, Baltimore, Miami, and in northern New Jersey. These decisions involve multiyear fund commitments of annual obligations toward a total project cost, and are each vital parts of comprehensive urban development and revitalization strategies.

The 1970 amendments to the Urban Mass Transportation Act which created the present capital assistance program at a level of \$3.1 billion, envisioned a review of funding levels by both Congress and the administration on a 2-year basis. However, this envisioned review has never taken place since, on the reporting dates of February 1972 and February 1974, the administration did not submit requests for additional mass transit funding or any review of program needs. During this period, however, the Congress, on its own initiative added an additional \$3 billion in 1973 and \$4.825 in 1974. Although 1976 would have been an appropriate year for a review of the needs of the capital grant program, no action has taken.

The multiyear commitments which permit the initiation of large projects must be based on availability of future obligation authority. Although obligation authority of over \$3 billion is still avail-

able, the capital program is actually more than depleted. Assuming the current rate of bus assistance and rehabilitation projects, and adding the outstanding balance of multiyear commitments already made, the available balance has now dropped to a substantial negative dollar figure.

Unless new authority is provided in 1977—to be available in fiscal year 1978—existing commitments will not be funded and, more importantly, no new commitments will be made. This would jeopardize plans to revitalize several American urban areas and would create a damaging pause in Federal urban transportation assistance.

Authority for a formula apportioned program of transit assistance to all urbanized areas which could be used for operating assistance, as well as, for capital grant assistance, was a landmark section of the 1974 National Mass Transportation Assistance Act. This 6-year program permitted Federal participation in the rapidly escalating local and State efforts to provide operating subsidies. These subsidies have permitted public transportation services to continue and expand with userfares held to reasonable rates in accordance with local decisions on the level of subsidy.

The decision to subsidize mass transit services has had a dramatic impact on public transportation ridership which has risen nationally during the past 4 years. In many areas, ridership increases can be closely tied to public policy decisions on subsidy and fare levels and to the amount of operating expenses devoted to service innovation, expansion, and promotion. The array of success stories includes ridership increases be-

tween 1971 and 1975 of 67 percent in Los Angeles; 0.4 percent in Chicago; 13 percent in San Francisco; 2 percent in Washington, D.C.; 17 percent in Pittsburgh; 24 percent in Minneapolis-St. Paul; 7 percent in Baltimore; 30 percent in Seattle; 18 percent in Miami; 115 percent in San Diego; 31 percent in Atlanta; 27 percent in Cincinnati; 48 percent in Kansas City; 79 percent in Denver; 102 percent in San Jose; 58 percent in Phoenix; 47 percent in Portland, Oreg.; 17 percent in Providence; 23 percent in Norfolk-Portsmouth; 110 percent in Sacramento; 41 percent in Eugene, Oreg.; 44 percent in Madison; and 12 percent in Salt Lake City.

After 3 years of experience, the major deficiency in the formula grant program has been an insufficient amount of funds. This is especially true when we take into consideration the increased participation of local and State government in subsidizing mass transportation. When operating assistance was first debated in the Congress, an overall Federal share of approximately one-third the aggregate subsidized requirement was envisioned. However, the final legislative solutions dropped the Federal share to approximately 18 percent with local and State governments contributing approximately 82 percent of the required subsidies. Therefore, an increase in the total amount of section 5 funds is now called for. This additional Federal participation must be forthcoming if we are to continue to improve public transportation throughout our Nation.

Many of our largest cities, which have made the most important local and State transit commitments are desperately in need of further Federal assistance to

prevent service cutbacks, fare increases, and the loss of passengers. Other areas have the additional complication of subsidizing commuter railroads where necessary funding must be increased due to railroad reorganizations and the threat of abandonment of transit services by private railroad companies. Essential commuter railroad services are a vital, efficient, urban transportation resource which cannot be permitted to disappear. In other areas, additional Federal funds could bring about service innovations, and improvements, and the development of special services to dramatically increase transit passengers.

To provide supplemental resources to assist these high impact areas, the National Mass Transportation Assistance Act of 1977 provides a discretionary fund of \$250 million a year, for the next 5 years. Without these additional funds, we would be permitting the decay of the mass transportation systems which offer the most important opportunities for efficient and productive urban transportation system improvements.

This legislation would also extend the formula grant program from its current expiration date of 1980 to 1982 thus, providing a 5-year Federal commitment to 279 urbanized areas, enabling each area to plan ahead for service, equipment needs, and local financing. A firm 5 year program is essential if we are to stabilize public transportation services and continue to increase ridership.

Mr. President, the National Mass Transportation Assistance Act of 1977 would authorize a 5-year capital grant program of increasing amounts averaging \$2.28 billion per year. The authoriza-

tion would begin at \$1.9 billion in 1978 and increase to \$2.8 billion in 1982, with intermediate amounts of \$2 billion in 1979, \$2.2 billion in 1980 and \$2.5 billion in 1981.

These obligations levels compare with recent levels of \$1.196 billion in fiscal year 1975, \$1.100 billion in fiscal year 1976 and \$1.250 billion authorized in fiscal year 1977.

In addition, in order to stabilize local equipment replacement programs and to secure regular funding for this purpose from the capital grant program for all urbanized areas, a set aside of \$500 million per year for new bus equipment purchases is created.

This set aside is to be administratively apportioned to urbanized areas so that they will not have to compete with large rail construction projects for capital grant funds and to permit each area to make replacement plans based on assured availability of Federal funding.

This legislation would also extend the existing formula grant program through 1982 and thereby continue the predictability of assistance for a 5-year period. Authorizations for 1981 and 1982 rise at a comparable rate as the original 1975-80 levels and are \$1.1 billion and \$1.25 billion respectively. An additional \$125 million is provided for 1980 to replace a like amount which was used for the transition quarter between fiscal year 1976 and fiscal year 1977.

In order to increase the Federal share of aggregate operations subsidy needs and to respond to special impact problems and the need for service innovations. This legislation would provide for a new discretionary fund of \$250 million per year for the next 5 years. These funds

would be made available as supplements to the section 5 formula grant program. The purpose of this new program is to alleviate the effects of the impact on service and transit ridership that have resulted from the initial three years of the formula grant program. It will increase the total availability of Federal funds for operating assistance to about 25 percent of the aggregate subsidy requirements and will assist urbanized areas in providing innovative and specialized services. This new program will also help us to respond to the national problem of maintaining essential commuter railroad services in those areas affected by the recent railroad reorganization and where services are in imminent danger of abandonment.

Also, where urbanized areas are unable to obligate formula grant funds within 2 years after they are apportioned, these funds will be made available to all urbanized areas under the new discretionary section 5 authority. Fiscal year 1975 formula funds remaining after September 30, 1977, will be the first funds to be used in this manner.

In addition, this legislation includes all of the amendments to the Urban Mass Transportation Act of 1964 which were passed by the Senate in September 1975 (S. 662), and on which the House of Representatives failed to act. In 1974, the Congress set aside \$500 million out of the capital grant program to be used in non-urbanized areas.

However, a program of only capital assistance to these areas is insufficient to deal with the pressing need for improved services. Therefore, under this legislation these funds would be authorized for use for operating assistance, as

well as for capital assistance. S. 662 also included provisions providing for accessible mass transportation for the elderly and the handicapped. A loan forgiveness program, fellowship assistance grants, an expanded definition of construction and new reporting, and update requirements which would effectively create the means for the Congress to review the urban mass transportation program every 2 years.

Mr. President, the enactment of the National Mass Transportation Assistance Act of 1977 is of the utmost necessity if we are to continue our progress in providing efficient urban mass transportation throughout our Nation. This is a task which the Congress began in 1961 as a demonstration program and which today has blossomed into a multibillion dollar program.

Modern mass transportation systems are now under construction in Atlanta, Ga. and Washington, D.C. Initial efforts have also been undertaken in Detroit, Mich.; Miami, Fla.; Baltimore, Md.; and northern New Jersey. In addition, cities such as Buffalo, N.Y.; Denver, Colo.; Los Angeles, Calif.; and Dayton, Ohio, have also begun to take the first steps forward. The Federal commitment contained in this proposed legislation will encourage these cities in their endeavors and give impetus to other cities to provide improved urban mass transportation. If we are to reach our goals of alleviating air-pollution, traffic congestion, rebuilding our inner cities and resolving the energy crisis, our Nation's No. 1 priority must be urban mass transportation.

Mr. President, I ask unanimous consent to have printed in the RECORD a short summary of the fiscal impact of the National Mass Transportation Assistance

Act of 1977, together with the bill.

There being no objection, the bill and summary were ordered to be printed in the RECORD, as follows:

S. 208

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Mass Transportation Assistance Act of 1977".

SEC. 2. Section 4(c) of the Urban Mass Transportation Act of 1964 is amended by striking out the second through the fourth sentences thereof and inserting in lieu thereof the following: "None of the amounts authorized under the preceding sentence may be obligated after September 30, 1977. There are authorized to be appropriated such sums as may be necessary to liquidate the obligations incurred under this subsection."

SEC. 3. Section 4 of the Urban Mass Transportation Act of 1964 is amended by adding at the end thereof the following new subsection:

"(e) To finance grants and loans under section 3 of this Act, there are authorized to be appropriated not to exceed \$11,400,000,000 for the period ending on September 30, 1982. The aggregate of the amounts appropriated under this subsection may not exceed \$1,900,000,000 prior to October 1, 1978; \$3,900,000,000 prior to October 1, 1979; \$6,100,000,000 prior to October 1, 1980; and \$8,600,000,000 prior to October 1, 1981. Appropriations pursuant to the authority of this subsection may be made in an appropriation Act for a fiscal year preceding the fiscal year in which the appropriation is to be available for obligation and shall remain available until expended."

SEC. 4. Section 3 of the Urban Mass Transportation Act of 1964 is amended by adding at the end thereof the following new subsection:

"(i) The first \$500,000,000 appropriated and available for obligation under this sec-

tion for each fiscal year beginning after September 30, 1977, shall be available only for grants to assist State and local public bodies in financing the acquisition of equipment for use, by operation, lease, or otherwise, in mass transportation service in urban areas. Grants to eligible applicants in any urbanized area shall not exceed the sums allocated to that area under a formula which the Secretary shall develop and publish not later than June 30, 1977. To permit applicants to develop adequate plans for the utilization of such sums, the Secretary shall advise the appropriate local officials in each urbanized area of the amount that is expected to be available each year not later than 90 days prior to the beginning of the fiscal year in which such sums will be available."

SEC. 5. Section 5 of the Urban Mass Transportation Act of 1964 is amended—

(1) by striking out subsection (c) (2) and inserting in lieu thereof the following:

"(2) There are authorized to be appropriated to finance grants under this section not to exceed \$2,475,000,000 for the period ending on September 30, 1982. The aggregate amount of appropriations pursuant to this paragraph shall not exceed \$125,000,000 prior to October 1, 1980; and \$1,225,000,000 prior to October 1, 1981. Appropriations pursuant to the authority of this paragraph may be made in an appropriation Act for a fiscal year preceding the fiscal year in which the appropriation is to be available for obligation."

(2) by inserting at the end of subsection (c) the following new paragraph:

"(3) Sums apportioned under paragraph (1) of subsection (b) shall be available for obligation by the Governor or designated recipient for a period of two years following the close of the fiscal year for which such sums are apportioned, and any amounts so apportioned remaining unobligated at the end of such period shall be added to the sums available for obligation under subsection (d) for the next succeeding fiscal year."

(3) by redesignating subsections (d)

through (n) as subsections (f) through (p), respectively, and by inserting after subsection (c) the following new subsections:

“(d) To finance additional grants under this section, there are authorized to be appropriated not to exceed \$1,250,000,000 for the period ending on September 30, 1982. Appropriations for such purpose shall not exceed \$250,000,000 in any one year. Sums so appropriated shall remain available until expended. Appropriations under this subsection may be included in an appropriations Act for a fiscal year preceding the fiscal year which the appropriation is to be made available for obligation.

“(e) (1) The Secretary may approve as a project for financing through grants under subsection (d), on such terms and conditions as he may prescribe, (A) the acquisition, construction, or improvement of facilities or equipment for use, by operation or lease or otherwise, in mass transportation service (B) the payment of operating expenses to improve or to continue such service by operation, lease, contract, or otherwise, (C) the payment of capital or operating expenses to carry out new, innovative, or specialized mass transit service, (D) the payment of operating expenses related to regional commuter rail service, or (E) the payment of funds related to operating performance and the achievement of operating results under criteria established by the Secretary.

“(2) The Secretary shall issue such regulations as he deems necessary to administer this subsection.”;

(4) by striking out “under this section” in the first sentence of subsection (h), as redesignated, and inserting in lieu thereof “under subsection (c)”;

SEC. 6. The last sentence of section 4(c) of the Urban Mass Transportation Act of 1964 is amended by inserting before the period at the end thereof a comma and the following: “and such \$500,000,000 may be used in such areas for the payment of the cost of construction projects or for the payment of subsidies for operating expenses. Grants for as-

istance in other than urbanized areas shall be subject to such terms, conditions, requirements, and provisions (similar as may be appropriate to those applicable to grants under section 5) as the Secretary may determine to be necessary or appropriate for other than urbanized areas”.

SEC. 7. Section 10 of the Urban Mass Transportation Act of 1964 is amended to read as follows:

“GRANTS FOR TRAINING PROGRAMS

“SEC. 10. The Secretary is authorized to make grants to States, local public bodies, and agencies thereof and private mass transportation operators to provide fellowships for training of personnel employed in managerial, technical, and professional positions in the urban mass transportation fields. Fellowships shall be for not more than one year of training in public or private training institutions offering programs having application in the urban mass transportation industry. The recipient of a fellowship under this section shall be selected on the basis of demonstrated ability and for the contribution which he can reasonably be expected to make to an efficient mass transportation operation. The assistance under this section toward each fellowship shall not exceed the lesser of \$12,000 or 75 per centum of the sum of (1) tuition and other charges to the fellowship recipient, (2) any additional costs incurred by the educational institution in connection with the fellowship and billed to the grant recipient, and (3) the regular salary of the fellowship recipient for the period the fellowship (to the extent that salary is actually paid or reimbursed by the grant recipient).”

SEC. 8. Section 12(c) of the Urban Mass Transportation Act of 1964 is amended—

(1) by striking out “and” at the end of clause (4);

(2) by striking out the period at the end of clause (5) and inserting in lieu thereof “; and”; and

(3) by adding at the end thereof the following:

“(6) the term ‘construction’ means the supervising, inspecting, actual building, and all expenses incidental to the construction, reconstruction, or acquisition of facilities and equipment for use in public mass transportation, including designing, engineering, location surveying, mapping acquisition of right-of-way, relocation assistance, acquisition of replacement housing sites, acquisition and rehabilitation, relocation, and construction of replacement housing.”

SEC. 9. (a) The Secretary of Transportation shall convert equipment and facilitate loans heretofore made under section 3(a) of the Urban Mass Transportation Act of 1964 or title II of the Housing Amendments of 1955 (42 U.S.C. 1497) to grants under the conditions set forth below. A grant agreement for the acquisition, construction, reconstruction, or improvement of facilities and equipment under section 3(a) of the Urban Mass Transportation Act of 1964 shall provide for forgiveness of principal and interest on a loan previously made in lieu of a cash grant in the amount forgiven. Such grant shall be subject to such terms and conditions as the Secretary may deem necessary and appropriate, taking into account the degree of completion of the project financed with the loan.

(b) In lieu of the local matching share otherwise required, the grant agreement may provide that State or local funds shall be committed to mass transportation projects in the urbanized area, on a schedule acceptable to the Secretary of Transportation, in an amount equal to the local share that would have been required had the amount of principal and interest forgiven been the Federal share of a capital grant made when the original loan was made. The State or local funds contributed under the terms of the preceding sentence shall be made available for projects eligible for funding under section 3(a), and may not be used to satisfy the local matching requirements for any other grant project.

SEC. 10. Section 4(c) of the Urban Mass Transportation Act of 1964 is amended by

adding at the end thereof the following: “To assure orderly planning and program development under section 3, the Secretary shall report to Congress on or before February 1, 1980, a detailed estimate of the cost of grants to be made under section 3 for providing public mass transportation service in urban areas for each fiscal year within the period beginning with fiscal year 1980 and ending with fiscal year 1984. On or before February 1, 1982, the Secretary shall report to Congress a detailed estimate of the cost of grants to be made under section 3 for providing public mass transportation service in urban areas for each fiscal year within the period beginning with fiscal year 1978 and ending with fiscal year 1986.”

SEC. 11. Section 16 of the Urban Mass Transportation Act of 1964 is amended to read as follows:

“MASS TRANSPORTATION FACILITIES AND EQUIPMENT TO MEET THE NEEDS OF ELDERLY AND HANDICAPPED PERSONS

“SEC. 16. (a) It is hereby declared to be the national policy that—

“(1) elderly and handicapped persons have the same right as other persons to utilize mass transportation facilities and services;

“(2) special efforts shall be made in the planning, design, construction, and operation of mass transportation facilities and services so that the availability to elderly and handicapped persons of mass transportation which they can effectively utilize will be assured; and

“(3) all Federal programs offering assistance for mass transportation (including the programs under this Act) should effectively implement this policy.

“(b) The Secretary shall require that projects receiving Federal financing assistance under this Act shall be planned, designed, constructed, and operated to allow effective utilization of mass transportation services by elderly and handicapped persons who are unable without special facilities or special planning or design to utilize such facilities and services effectively. The Secretary shall

not approve any program or project under this Act unless he finds that the program or project complies with the requirements mandated by this section. The Secretary shall, as part of carrying out this section, require the following:

"(1) Effective immediately, any new vehicle, station, building, or other structure for any new rapid rail system or for any new extension to an existing rapid rail system if the extension forms a usable segment, and any other new vehicle integrated with such a system when feasible shall be subject to accessibility standards issued by the Secretary. Standards issued under this paragraph shall insure accessibility by elderly and handicapped persons.

"(2) The Secretary shall require that mobility for elderly and handicapped persons is available in each urbanized area requesting a grant or loan under this Act. The Secretary shall determine that this requirement is being met if the applicant demonstrates detailed plans for meeting this requirement either by the provision of a wheelchair accessible regular fixed route system within a reasonable time period or in the alternative provision of a substitute service that provides comparable coverage and service levels as is provided by the regular fixed route system. In order to assure such effective mobility, the Secretary shall prescribe the use of all or such portion of such grants or loans as are necessary to be utilized for the purchase of wheelchair accessible buses or other step entry vehicles.

"(c) In addition to the grants and loans otherwise provided for under this Act, the Secretary is authorized to make grants and loans—

"(1) to States and local public bodies and agencies thereof for the specific purpose of assisting them in providing mass transportation services which are planned, designed, and carried out so as to meet the special needs of elderly and handicapped persons, with such grants and loans being subject to such terms, conditions, requirements, and

provisions as are applicable to grants and loans made under section 3(a), and for the purposes of all other laws, any grant or loan under this subsection shall be deemed to have been made under such section; and

"(2) to private nonprofit corporations and associations for the purpose of assisting them in providing transportation services meeting the special needs of elderly and handicapped persons for whom mass transportation and handicapped persons for whom mass transportation services planned, designed, and carried out under paragraph (1) are unavailable, insufficient, or inappropriate, with such grants and loans being subject to such terms, conditions, requirements, and provisions (similar insofar as may be appropriate to those applicable to grants and loans under paragraph (1)), as the Secretary may determine to be necessary or appropriate for purposes of this paragraph.

Of the total amount of the obligations which the Secretary is authorized to incur on behalf of the United States under the first sentence of section 4(c), 2 per centum may be set aside and used exclusively to finance the programs and activities authorized by this subsection (including administrative costs).

"(d) Of any amounts made available to finance research, development and demonstration projects under section 6, after the date of the enactment of this section, 1½ per centum may be set aside and used exclusively to increase the information and technology which is available to provide improved transportation facilities and services planned and designed to meet the special needs of elderly and handicapped persons.

"(e) For the purposes of this section, the term 'elderly and handicapped persons' means any individual who, by reason of illness, injury, age, congenital malfunction, or other permanent or temporary incapacity or disability, including any individual who is nonambulatory wheelchair bound or who has semiambulatory capabilities, is unable without special facilities or special planning or design to utilize such facilities and serv-

ices effectively.

"(f) (1) Effective immediately, a local advisory committee (at least half of the members of which shall be elderly or handicapped persons) shall be established for each geographical area in which assistance under section 3 or 5 is being furnished. The committee shall be utilized in drawing up a detailed timetable for compliance with this subsection and in carrying out provisions of this subsection. A project agreement for assistance under either such section shall specify the time, not to exceed ninety days from the grant of assistance, for implementation of the timetable.

"(2) Effective immediately, the service proposed to be provided for elderly and handicapped persons shall be presented at the public hearing required as part of the application process for assistance under section 3 of this Act.

"(g) Technical study grants made under section 9 of this Act in support of local transportation planning (including grants made for the fiscal year 1977 planning program) shall include work elements necessary to produce by July 1, 1978, a comprehensive local plan and implementation schedule for developing public transportation service for elderly and handicapped persons within the planning area.

"(h) The Secretary shall establish a National Advisory Council on Mass Transportation for Elderly and Handicapped at least 50 per centum of the members of which shall be elderly or handicapped persons. The Advisory Council shall advise and consult with the Secretary of Health, Education, and Welfare and the Secretary of Transportation on all matters relating to mass transportation for elderly and handicapped persons.

"(i) On or before October 1, 1978, the Secretary shall prepare and submit to the Congress a comprehensive report on the mass transportation needs of elderly and handicapped persons, including information generated under technical study grants subject to the requirements of subsection (g) of this section; research, development, and demonstration activities undertaken in furtherance of the national policy set forth in subsection (a); the progress made in assuring the effective utilization by elderly and handicapped persons of mass transportation services and facilities assisted under this Act, and additional measures to assure such effective utilization; and a determination of the economic impact of regulations adopted under this section as measured in production, productivity, employment, prices, and incomes or other economic indicators as the Secretary may deem appropriate, and a determination of the benefits resulting from such regulations relative to the costs associated with implementing them."

SUMMARY OF FISCAL IMPACT OF NATIONAL MASS TRANSPORTATION ASSISTANCE ACT OF 1977

Section 3 authorizes the following amounts:

\$1.9 billion for fiscal year 1978, \$2.0 billion for fiscal year 1979, \$2.2 billion for fiscal year 1980, \$2.5 billion for fiscal year 1981, \$2.8 billion for fiscal year 1982.

For the capital grant program, \$3,798 billion is still unobligated so that total new authorizations under the Act would amount to \$7.702 billion.

For the formula grant program, money has already been authorized for the years 1978, 1979, and 1980. These sums are not included in this bill, except for \$125 million for 1980. This \$125 million was used during this year's transition quarter for the formula grant program and was taken out of 1980 funds and is thus, being replaced.

For fiscal year, 1981, the formula grant program would be funded at a \$1.1 billion level and for fiscal year 1982 at a \$1.25 billion level. Thus, an additional \$2.475 billion in new authorizations would be necessary to fund the Section 5 program plus an additional \$1.25 billion for the new discretionary

fund program which would be used to supplement Section 5 formula grants.

Total new authorizations under the 1977 Act would thus, come to \$11.427 billion for the full 5 year period through 1982 (Budget impact for 1978 would amount to \$250 million and \$550 million for 1979).

January 25, 1978

HIGHWAY AND PUBLIC TRANSPORTATION
LEGISLATION

SUMMARY OF RECOMMENDATIONS

Planning

1. FHWA and UMTA planning funds will be consolidated and distributed as a single planning grant by a formula to be determined by the Secretary.
2. Planning grants will be made directly to designated MPO's in urbanized areas over 1 million population and to States for all other areas. For areas between 200,000 and 1 million, the funds would be earmarked for MPO's. For areas between 50,000 and 200,000 the State would allocate funds to MPO's on a fair and equitable basis. For non-urbanized areas, the planning process would be carried on by the State with involvement by local officials.
3. The funds will be eligible for all transportation planning activities.
4. State-wide planning process will be required after October 1, 1980.
5. Transportation planning for all areas will be required to consider long-range land use plans, development objectives and overall social, economic, environmental, system performance and energy conservation goals and objectives. Transportation plans of urbanized areas with a population of one million or above will be reviewed by the Secretary to ensure that air quality, energy conservation, environmental quality, accessibility to employment, effect on minorities, housing, land use and future development have been reasonably addressed.

Interstate

1. Fifty percent of the apportionment formula will be based on the cost to complete the essential gaps and fifty percent on the cost to complete the total system. Funds apportioned on the basis of gaps in a State for fiscal years 1980 through 1990 must be used for essential gaps in that State. Funds not so used will be reallocated by the Secretary to other States giving priority to ready-to-build essential gap projects.
2. States will be permitted to borrow from their following year's apportionment for an Interstate project if they have obligated their current Interstate apportionments.
3. Apportioned Interstate funds would be available for 2 years after the date of apportionment. Funds not obligated at the end of that period would then be available on a discretionary basis for ready-to-build Interstate projects, with preference given to essential gap projects.
4. No State will receive less than one-half of one percent of each year's total Interstate apportionment.
5. Interstate substitute projects, both highway and transit, will be eligible for a 90% Federal share.
6. Highway projects substituted after an Interstate withdrawal will be funded from a State's Interstate apportionment, and substitute mass transit projects will be funded from the General Fund.
7. The Interstate Resurfacing, Restoration and Rehabilitation program for Interstates in use more than 5 years will be established as a permanent program and the Federal share will be 80%. Funds will be apportioned based on lane miles in use for more than 5 years, and vehicle miles traveled on those lane miles.
8. States will be required to have completed the EIS process for or to have withdrawn all uncompleted segments of the Interstate by September 30, 1982. Segments which have not met either requirement will be removed from the System.

9. All incomplete Interstate segments must be under contract for construction and initial construction must have commenced by September 30, 1986. Segments not meeting this requirement will be removed from the System. Projects substituted for withdrawn Interstate segments must be approved by September 30, 1984.

Federal-Aid Primary

1. Seven highway categories will be consolidated into a single Primary program.
2. Funds will be apportioned by formula and the Federal share will be 80%.
3. Up to fifty percent of a State's primary system funds may be transferred to the urban highway or the small urban and rural transportation program.

Urban Formula Programs

1. Two compatible programs will be established, one for highways and one for transit, for all urbanized areas with a population of 50,000 or more.
2. The highway program will consolidate five categorical programs and all urban roads not on the Interstate or primary systems will be eligible for assistance.
3. The transit program will provide assistance for the acquisition, construction and improvement of facilities and equipment for use in public transportation services and the payment of operating expenses, including commuter rail operating expenses.
4. Funds will be apportioned by formula and the Federal share for capital projects will be 80%. The highway formula will be based on urbanized area population. The transit formula will be based on the following factors: population, population weighted by a factor of density, commuter rail train miles, fixed guideway system route miles, bus seat miles and a factor for the replacement of buses.

5. Only those transit funds apportioned on the factors of population, population density and a part of commuter train miles will be eligible for operating expenses. In addition, in lieu of existing local match and maintenance of effort requirements, Federal participation shall not exceed 33-1/3 percent of an area's total operating costs.
6. Up to fifty percent of the transit funds may be used for highway projects. Highway funds will continue to be eligible for transit capital projects.
7. Up to fifty percent of the urban highway funds may be transferred to the Primary program or the small urban and rural program.
8. Beginning October 1, 1979, Governors and local officials will be required to designate a recipient or recipients for urban highway funds in urbanized areas with a population of one million or more. All other urban highway funds will go to the State, with funds for areas between 200,000 and one million earmarked on a population basis and funds for areas between 200,000 and 50,000 available for those areas on a fair and equitable basis. Transit funds will continue to go to designated recipients in all urbanized areas over 200,000 and to the Governor for urbanized areas of less than 200,000 for distribution in a fair and equitable manner.

Urban Discretionary Grant

1. This transit grant program will be restricted primarily to major bus fleet expansion and new fixed guideway projects, including extensions of existing systems, and joint development projects.
2. The Governor, local officials and transit operators will jointly designate a single recipient for each project to receive and dispense funds for the construction of a new or extension of an existing fixed guideway system.

Small Urban and Rural Formula Program

1. A consolidated assistance program for highways and transit will be established for all areas with a population below 50,000, with the State as the recipient.
2. Funds will be apportioned by formula and the Federal share for capital projects will be 80%. The formula will be based on the following factors: area, population and postal route mileage.
3. Nine categorical highway programs will be consolidated into the new program and all public roads not on the Interstate or primary systems will be eligible for assistance.
4. The new program will provide assistance for both capital and operating expenses for public transportation in small urban and rural communities.
5. At least 10 percent of each State's apportioned funds must be spent on public transportation projects, unless this requirement is waived by the Secretary.
6. Transit assistance for operating expenses will be limited to 33-1/3% of the total operating costs.
7. Up to fifty percent of the small urban and rural funds may be transferred to the Primary program or the urban highway program.
8. Authorization for this program would come out of the Highway Trust Fund, but the Trust Fund would be reimbursed out of the General Fund for transit operating expenses.

Safety Program

1. Six highway safety programs will be consolidated into a single safety grant to States, with the Federal share at 80%.
2. At least 30% of the funds must be used on roads off the Federal-aid systems and at least 5% must be used to implement section 402 highway-related safety requirements and guidelines issued by the Secretary.

Bridge Program

1. States will be able to use increased funds for rehabilitation as well as replacement and the Federal share will be 80%.
2. Up to 30% of the funds will be available for bridges not on the Federal-aid highway systems.

Authorizations

1. The Highway Trust Fund will be extended an additional 4 years.
2. The formula grant programs will be authorized for a 4-year period.
3. The Urban Discretionary Grant will be authorized for a five-year period to provide for long term planning.

Proposed Authorization Levels
(In millions of dollars)

	<u>Fiscal Years</u>					<u>5-Year Total</u>
	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	
Interstate	3,500	3,500	3,500	3,500	3,500	14,000
Interstate 3R	175	175	275	275		900
Primary	1,500	1,500	1,625	1,625		6,250
Urban Highways	700	700	750	750		2,900
Small Urban and Rural	786	796	856	866		3,304
Safety	500	500	525	525		2,050
Bridges	450	450	500	500		1,900
Misc. (FHWA)	<u>189</u>	<u>189</u>	<u>189</u>	<u>189</u>		<u>756</u>
Subtotal(FHWA)	7,800	7,810	8,220	8,230	3,500	<u>35,560</u>
Discretionary Grants	640	690	740	790	840	3,700
Interstate Transfers (transit projects)	675	675	725	725	725	3,525
Urban Transit Formula Grants	1,735	1,785	1,835	1,885		7,240
Misc. (UMTA)	<u>90</u>	<u>95</u>	<u>100</u>	<u>105</u>		<u>390</u>
Subtotal(UMTA)	3,140	3,245	3,400	3,505	1,565	<u>14,855</u>
TOTAL	10,940	11,055	11,620	11,735	5,065	50,415

APTA Reaction to Administration's Proposed Transportation Legislation

Adopted by the APTA Board of Directors

February 12, 1978

The American Public Transit Association calls on Congress to authorize a \$21 billion, 5 year transit assistance program for Fiscal Years 1979-1983. APTA believes the proposed Administration transit and highway legislation provides an inadequate level of funds to finance critically needed bus fleet replacement and expansion, modernization of existing rail transit systems and construction of new fixed guideways and extensions. In addition, the Administration's proposal does not address the need for additional federal operating assistance to maintain the local, state and federal partnership established in 1974 to improve and continue public transportation services.

APTA regards the Administration's legislative proposal as a welcomed starting point to reform the existing transit assistance program and to redress the imbalance between federal assistance for highway and transit improvements.

APTA believes, however, that certain proposed modifications to the existing program should not be enacted and that certain additions should be made. APTA proposes that;

- funds for rail modernization projects should remain discretionary;
- most funds for bus replacement projects should be handled by a simple formula based on the size of the bus fleet, however, discretionary funds should still be available for all bus projects;
- formula transit funds should not be made available for highway improvement projects;
- small and medium size areas should not be immediately subject to the limit of one-third for federal assistance toward total operating costs;
- direct funding of transit planning to all urbanized areas should be continued;
- small urban and rural transit assistance should be separately authorized in the Urban Mass Transportation Act;
- major capital projects should not be subject to a recipient designation process;
- annual appropriations for interstate transfer projects should not be subject to a statutory ceiling; and
- a training and development purpose should be added to the proposed innovative techniques and methods set aside and the amount set aside should be increased to 2%.

In addition to increasing the proposed authorizations for UMTA capital assistance, APTA believes that Congress must enact additional authority for operating assistance. A second tier approach that would be directed at the nation's largest cities where the greatest need exists is preferred.

Session III

Legislation and Regulation

The Knoxville Transportation
Brokerage Experience (1)

(1) Source: Excerpt from "Evolution of the Knoxville Transportation Brokerage System," C.A.C.I., July 1976.

The Knoxville Transportation Brokerage System (KTBS) Demonstration Project seeks to coordinate a wide range of transportation modes into an efficient integrated, regional network. The "brokerage system" is essentially an institutional mechanism in Knoxville, Tennessee that matches transportation demand and supply across a wide range of users, providers, and modes.

The KTBS has implications on issues of national concern, such as vehicle productivity levels, public transportation coverage, and service for the transit dependent.

Perhaps the most unique aspect of the KTBS demonstration project is that it encompasses private sector, as well as public sector.

The Knoxville SMSA falls into the category of a "smaller urban area," with a 1975 population of 417,000 and the city itself having a population of 174,000.

TRANSPORTATION BROKERAGE SYSTEM CONCEPT

A transportation brokerage system performs the following functions:¹

(1) Determination of transportation demand:

Identification of travel demands of commuters, employers, social service agencies, and other individuals or groups.

(2) Determination of transportation supply:

Identification of potential providers of transportation services, including public sector institutions (e.g., transit authority) and private sector institutions (e.g., tour bus companies, taxi companies); the gamut of vehicle types, including those under public sector ownership (e.g., transit buses, city-owned vans) and private sector ownership (e.g., private cars, vans, taxis); and fixed-route and demand-responsive operations.

(3) Matching transportation demand and supply:

Coordinating existing transportation facilities to meet expressed travel demands in the most effective, efficient manner.

The implementation of a transportation brokerage system can assume many forms, based on a specific area's transportation "demand," "supply," and regulatory characteristics.

¹Paraphrased from "Evaluation Framework for the Knoxville Service and Methods Demonstration Project," Carla Heaton, TSC, November 19, 1975, p.2.

Administrators of the transportation brokerage system in Knoxville stress a "commodities" approach to transportation. The following factors seem to set this approach apart from transportation planning philosophies that emphasize fixed-route, single mode service:

- (1) Perception of transportation as a flexible commodity that is able to adapt to the diverse demands of a wide range of users.
- (2) Emphasis on marketing new transportation services.
- (3) Willingness to modify existing statutes discouraging para-transit operations in order to enable potential transportation providers to meet the full complement of expressed transportation demand in a situation closely approximating a free market. (Regulatory considerations constitute a key issue of potential national significance and are discussed next.

REGULATORY AND INSTITUTIONAL DEVELOPMENTS

Since the KTBS is a regional system, regulatory and institutional considerations on both local and state levels had bearing on the project's implementation.

Local Level

Transportation policies in Tennessee fall under the jurisdiction of incorporated cities, the state, or special authorities. The influence of an incorporated city over transportation policies extends a uniform distance beyond city lines, creating an amoebic "ring" corresponding to the city's shape within which local rather than state ordinances take precedence. Ring width varies in proportion to the incorporated city's population; Knoxville's influence, for example, extends seven miles beyond its city limits. Outside the ring surrounding Knoxville, state regulations or those of other incorporated cities come into play.

A city, or for that matter any jurisdictional entity in Tennessee, can create a transportation "authority" providing that local agencies deem it a suitable means of providing for equitable transportation. In Knoxville, such an authority exists: the Knoxville Transit Authority (KTA), which governs local transit policy and acts as transit's representative in general transportation policy planning. To date, the City of Knoxville -- and the KTA -- have provided almost unequivocal support to the transportation brokerage system concept's demonstration in Knoxville.

For most of the project's formative months, the City of Knoxville was under the highly centralized leadership of Mayor Kyle Testerman. His administration strongly advocated progressive public transportation, assuming a guarded posture only toward the possibility that the city's influence and priority in transit operations might be dissipated somewhat through the regional orientation of the KTBS.

In spite of this concern, the Knoxville City Council unanimously confirmed its support of the brokerage system December 9, 1975. Since the Knoxville mayorship changed hands to Randy Tyree January 1, 1976, strong legislative support for KTBS continued in City Hall.

The KTC is, as are virtually all metropolitan transit operations, unionized. Though unions often oppose public transportation innovations, fearing that anything but the status quo might adversely affect transit employees' job security, such was not the case in Knoxville. The union was assured through a 13(c) agreement (on which SMD project implementation is predicated) that the KTBS did not represent a threat to transit workers' jobs. As a further demonstration of continued reliance on transit workers, a contract stipulated that the KTC was to perform maintenance functions (with the exception of warranty items) on all city-owned vans.

State Level

State regulations concerning shared-ride transportation assume three forms:

- (1) economic regulation through the Tennessee Public Service Commission (PSC);
- (2) taxing and subsidizing policies; and
- (3) insurance/liability policies.

Economic regulation stems primarily from the assumption that public transportation is a natural monopoly charged with maintaining equal (nonprejudicial and nondiscriminatory) transportation opportunity, regardless of specific demands. Competition in this framework is perceived as a threat to the strength of the existing "egalitarian" transportation provider. The PSC acts in accordance with existing state legislation to limit competition to the existing carrier's service through licensing, franchising, and other economic means. In the event that the existing carrier does not adequately meet a particular transportation demand, the following alternatives remained, prior to KTBS implementation:

- (1) not travel at all;
- (2) travel privately, i.e., by automobile; or
- (3) go through the process of obtaining appropriate licenses, franchises, certificates of convenience and necessity, etc. from the PSC.

Obviously, the third alternative would be time consuming, inflexible in meeting evolving transportation demands, and virtually unconsidered by the private sector in the absence of a transportation advisor.

Some state public service (or utilities) commissions are stricter than others in interpreting existing legislation. And a growing

number of states, including California and Connecticut, had already effectively "deregulated" worktrip ridesharing arrangements through legislative change (generally limited to vehicles with passenger capacities up to and including that of vans -- usually fifteen).

Taxing and subsidizing policies date from early years and hence do not take into account contemporary transportation demand patterns. Taxes and fees have been imposed on private common carriers since the days that this form of transportation was much more profitable than today, based on the existence of large private sector transportation suppliers with full-time operations, but without the requirement of full-time, across-the-board staffing. In the last two decades, public transportation became unprofitable for private companies and they were taken over by public bodies. Subsidies were introduced to offset revenue losses, and special legislation exempted them from normal common carrier taxation. (These burdens were not removed from those private sector carriers which still remained.)

Vehicles used for business purposes (e.g., hauling commuters) are taxed more heavily than those used for private purposes, further discouraging private transportation entrepreneurship. And finally, insurance/liability policies discriminate against private sector transportation providers by requiring special insurance which is much more expensive than similar policies for private vehicular use.

KTBS administrators identified two alternative approaches to dealing with economic regulations and taxing policies such that there would exist a state-level regulatory climate compatible with the free-market brokerage system concept: (1) establishment of a regional transportation authority and (2) state level legislative modification. Both alternatives were pursued simultaneously, though the latter was clearly preferable. In either case, the PSC would regard ridesharing arrangements, such as van pools, in the same manner as current ad-hoc car pools.

Establishment of a Regional Transportation Authority

Special "authorities" and "districts" override other policy-making bodies within clearly defined spheres of governmental influence (usually dealing with technical matters outside the scope of general political expertise). They differ in that special districts are granted the power to levy taxes, while authorities are not.

Since the KTBS is a regional system, brokerage system administrators favored establishment of a regional transportation authority (RTA), under which would fall all decision-making processes in the area of transportation -- particularly shared-ride transportation. In mid-January 1976, the Knoxville City Council approved the city's participation in such an authority, should it come to be. Jurisdictional entities on any level could participate in the RTA, provided participation served the best interests of local citizens; thus, KTBS administrators simultaneously sought the support of both cities and counties in the KTBS service area. The RTA would ideally serve the

sixteen-county brokerage service area, provided all counties wanted to participate. In the event that some jurisdictions in the service area chose not to participate, the brokerage service area would be amended accordingly.

Through this strategy, the person holding highest elected office in each county, typically a county judge, would be contacted by brokerage administrators. Benefits of the regional transportation authority concept would be spelled out, and two vital facets of RTA participation would be stressed:

- (1) Participation in the RTA would have no financial impact, other than on individual commuters; no county institution would be committed financially to an institution in any other participating county.
- (2) Participation in the RTA could be withdrawn at any time; there would be no time commitment either to the RTA or to the KTBS.

The spokesperson would then present the RTA concept to appropriate county legislative committees, from which a decision regarding participation would be forthcoming, often in a matter of weeks.

State Level Legislative Modification

Based on the examples set by California and Connecticut, it was felt that state level legislative modification to permit ridesharing without economic sanctions was preferable to the establishment of an RTA, if for no other reason that considerably less "footwork" in selling the brokerage system concept was required. Legislative modifications could take one of two forms: (1) limited-time exemption from PSC sanctions for the KTBS demonstration project or (2) deregulation, as in California and Connecticut. In either case, appropriate resolutions had to be ratified by both houses of the Tennessee State Legislature.

KTBS administrators sought the support of two new state agencies, the Bureau of Area Mass Transit and the Legislative Subcommittee on Mass Transit (founded in mid-1973 and early 1974, respectively). Members of the Bureau of Area Mass Transit were appointed by the Tennessee Department of Highways (part of the Tennessee Department of Transportation) and had been instrumental in reinterpreting existing statutes to permit operation of express buses and car pools in the original UT ridersharing research project (described in the previous section). The State Legislature established the Subcommittee on Mass Transit to conduct hearings and appropriate capital funds, often in the role of matching funds to UMTA grants, for mass transit projects. Since both of these agencies had been influential in the past in promoting progressive regulatory reforms for Federally approved projects, it was felt that their support would be especially helpful in obtaining a KTBS demonstration project exemption from state regulations.

At the same time, the KTBS launched a major direct lobbying effort, advocating deregulation of worktrip ridesharing arrangements, toward members of the State Legislature. The efforts proved successful. The Tennessee State Legislature passed, and the governor signed into law March 28, 1976, legislation permanently exempting commuter vehicles with passenger capacities fifteen or fewer from regulation by the PSC.

Two amendments were added to the bill: (1) the PSC was permitted to levy a nominal (five dollar) annual fee for commuter pool vehicle inspection and (2) one county -- not in the KTBS service area -- was exempted from the bill, as per its request. Thus, the KTBS totally achieved its aims in bringing about legislative reforms allowing the full complement of KTBS services, notably van pools, to function legally.

Insurance/liability considerations remain somewhat of a question mark. Through competitive "shopping," the City of Knoxville was able to obtain reasonably priced coverage for Federally-funded vans, but the issue of subleasing these vehicles, for example, to social service agencies, has not been resolved. KTBS administrators are currently seeking insurance industry reforms in this area.

Questions - III

1. What advantages do you see for a "transit brokerage system" over the traditional transit organization? Are there any disadvantages?
2. Comment on the role of the state public service commission concerning transportation brokers in Tennessee.
3. The state legislature took quick action concerning the KTBS in Knoxville, Tennessee. Are you aware of similar actions or laws in other states?

SESSION IV: PUBLIC TRANSPORTATION FINANCING

Objectives of Session IV

- . To be aware of the types of public transportation funding programs made available on the local, state, and federal levels
- . To understand the basic economic differences between public and private transport systems
- . To be able to indicate areas where government financing is generally applicable

Synopsis of Session IV

A review will be made of various types of financing made available for public transportation. Local, state, and federal funding programs will be discussed. System generated revenue is also defined.

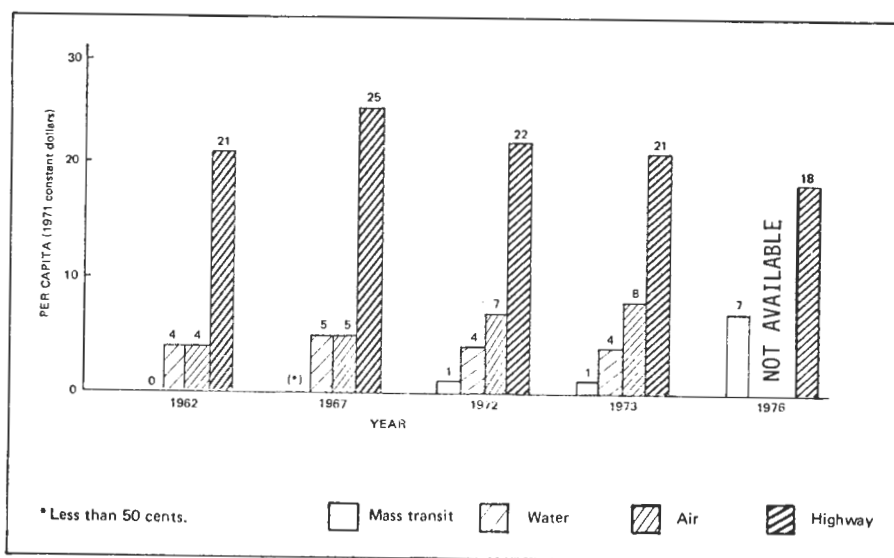
Outline for Session IV

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Urban Mass Transportation (UMTA) Programs
3	Federal Highway Administration (FHWA) Programs
4	State and Local Programs
5	Service-Related Revenues
6	Summary

SESSION IV
PUBLIC TRANSPORTATION FINANCING

1. Introduction

The Federal Government is the primary source for a variety of funds available to the U.S. public transit industry. The major funding source is the Urban Mass Transportation Administration of the Department of Transportation and, to a lesser extent, the Federal Highway Administration. Funds are available for capital expenditures, operating subsidies, planning and evaluation, research and demonstration, and miscellaneous programs.



Source: Ref. 5, JHK & Associates estimated 1976 figures.

Figure IV-1. Per Capita Expenditures on Federal Transportation Programs by Mode, Fiscal Years 1962, 1967, 1973 and 1976

Figure IV-1 depicts Federal transportation expenditures over the last 15 years for various modes of transportation. Federal transit funding has gone from a negligible amount in 1962 to an estimated \$7 per capita in 1976. Transit funding has shown the most dramatic changes in federal spending as compared to the other modes. It is still less than half of the highway expenditures. However, almost all transit expenditures are in urban areas while over half of the highway expenditures are in rural areas.

2. Urban Mass Transportation Administration (UMTA) Programs

a. Capital Grants

Section 3 of the UMTA Act of 1964 established a discretionary improvement grant program. These grants are

awarded to public transportation operating agencies in urban areas. They are used to cover 80% of the cost of new buses, fixed guideway equipment vehicles, or other transit equipment. The funds may also be used to cover 80% of the cost of new construction or modernization of transit facilities such as bus garages and maintenance facilities.

UMTA's capital grant program has supported transit improvements in more than 300 cities. Nearly 30,000 new buses, 4,000 rapid and commuter rail cars, passenger shelters, maintenance facilities and other support equipment have been purchased under this program. Total UMTA capital funding in 1976 stood at nearly \$6 billion.

In fiscal year 1976, UMTA awarded \$601 million in capital grants to Washington, D.C., Atlanta, and Baltimore to aid in the construction of new rapid rail systems. An additional \$503 million was awarded to six cities to finance rail modernization and line extension of existing rail systems. Another \$361 million was allocated to bus systems in more than 120 communities and \$13 million went for ferry boats and other more unusual transit modes.

Ninety-three percent of the capital grants went to urban areas with populations of one million or more.

In 1977, UMTA expects to initiate new projects that will be funded under this program -- the Downtown People Mover Project and new light rail systems in several cities. Los Angeles, Houston, St. Paul and Cleveland have been chosen to test the feasibility of using fully automated people movers in urban centers. Buffalo, N.Y. has already received a \$269 million commitment in principle to fund a light rail system in that city.

b. The National Mass Transportation Assistance Act of 1974 and the Section 5 Program

Section 5 of the Urban Mass Transportation Act of 1964, as amended (the Act) provides a six year mass transportation assistance program for urbanized areas apportioned on the basis of a statutory formula. Urbanized areas may use Section 5 funds by developing specific capital assistance and/or operating assistance projects under the statutory requirements of the Act. Apportioned funds are made available subject to required UMTA approvals. Funds apportioned in each year of the program are available for project approval through the end of the second fiscal year following the fiscal year in which they are apportioned.

The Act authorized the expenditure of \$11.854 billion for the period 1975 through 1980: \$11.3 billion for urban mass transportation and \$500 million for rural mass transit. The \$11.3 billion of urban money is divided two ways. The distribution of \$3.975 billion among cities of 50,000 population or more is to be used for either capital investments or to pay transit operating subsidies. Federal-local matching provisions are up to 80-20 for capital projects and up to 50-50 if grants are used for operating costs. The

other \$7.325 billion made available by the transit program is allocated to capital projects subject to approval by the Secretary of Transportation. The Act provides for federal matching of up to 80 percent of the cost of these capital projects.

The distribution of the nearly \$4 billion of either capital or operating assistance is based on a formula that gives equal weight to urban population size and to population density. These formula funds were made available at the rate of \$300 million in fiscal 1975, and the amount will increase each year thereafter to a level of \$900 million by 1980.

Table IV-1 provides a summary of a sample of Section 5 grants through June 30, 1976.

Table IV-1. Analysis of Operating Assistance Grants Financing Totals

Urbanized Areas (number of grants analyzed)	Operating Expenses (thousands)	Operating Revenues (thousands)	Section 5 Approvals (thousands)	Local Share (thousands)
*25 of 25 UA's over 1,000,000 population (55 grants)	\$4,756,309	\$2,233,850	\$409,262	\$1,692,074
15 of 22 UA's of 500,000 to 1,000,000 population (21 grants)	154,837	77,455	26,188	49,354
21 of 59 UA's of 200,000 to 500,000 popula- tion (24 grants)	58,056	28,709	11,990	17,022
19 of 173 UA's of 50,000 to 200,000 popula- tion (20 grants)	9,999	4,452	2,383	3,637
TOTAL SAMPLE 80 of 279 UA's (120 grants)	\$4,979,201	\$2,344,466	\$449,823	\$1,762,087
* All operating assistance grants to these UA's during the review period (11/26/74 to 6/30/76) are included here, although not all operating expenses in these UA's are the basis for grants. Note that Section 5 approvals, revenues, and local shares do not add up to operating expenses because financing for all expenses is not known by some applicants at the time of application.				

Source: ref. 6

The Act requires that projects be developed through a continuing, cooperative, and comprehensive urban transportation planning process, resulting in plans and programs for a unified or officially coordinated urban transportation system consistent with the planned development of the urban area. UMTA makes an annual determination that these planning requirements are met prior to making Section 5 approvals.

The Governor, responsible local officials and publicly owned operators of mass transportation services will designate recipients for funds under Section 5 for urbanized areas of 200,000 or more population. In any case, however, in which a statewide or regional agency is responsible under state laws for the financing, construction, and operation -- directly, by lease, contract or otherwise -- of public transportation services, they must include such agency as a designated recipient. In urbanized areas of under 200,000 population, the Governor, or his designee, is the recipient. The recipient will receive the dispensed Section 5 funds and must have legal capacity to enter into project agreements with UMTA.

The Act requires the submission of a program of projects to UMTA for use of Section 5 funds. The annual program of Section 5 projects must be consistent with the current approved Transit Development Program and the comprehensive planning process. The amount of Federal assistance requested under Section 5 cannot exceed the apportioned funds available to the area. Section 5 requires that the program of projects results from the planning process undertaken cooperatively by the State, responsible local officials, and local transit operators. The submission of the program of projects by Section 5 recipients will be through the Metropolitan Planning Organization which must endorse the program.

As of June 30, 1976, UMTA had provided formula assistance grants for 162 of the 279 urbanized areas in the U.S. Fifty-eight percent of all urbanized areas received such a grant. Approximately \$390 million was awarded during fiscal 1976.

c. Section 6 - Research, Development and Demonstrations

Section 6 of the Urban Mass Transportation Act of 1964, as amended, provides for research, development, and demonstration projects in all phases of urban mass transportation including the development, testing and demonstration of new facilities, equipment, techniques, and methods to improve public transportation. The Urban Mass Transportation Administrator approves grants under this section on a project-by-project basis. Anticipated nationwide funding for Section 6 for FY 76 is \$67.3 million.

d. Section 9 - Planning and Technical Study Funds

Section 9 of the Urban Mass Transportation Act of 1964, as amended, makes funds available for public transportation planning and other technical studies. The Urban Mass Transportation Administration apportions grant funds directly to cities with a population over 200,000. Funds are made available on a discretionary basis to cities with a population of less than 200,000. Activities assisted under this section may include (1) studies relating to management, operations, capital requirements, and economic feasibility; (2) preparation of engineering and architectural surveys, plans and specifications; (3) evaluation of previously funded projects; and (4) other activities. Funding is available for projects under this section on an 80% federal, 20% local match.

e. Section 16b - Elderly and Handicapped Funds

Section 16b(2) of the Urban Mass Transportation Act of 1964, as amended, provides grants to provide for the transportation needs of the elderly and handicapped. Only private non-profit organizations are eligible to apply for these capital expenditures (the 20% matching funds must be furnished by the applicant from non-federal sources). Private non-profit organizations applying for capital assistance must provide service within a recognized "urban area" (a municipality having a population of not less than 5,000 persons according to the 1970 census). This does not preclude operation in a rural area as long as the origin and/or destination of the service is in an urban area.

3. Federal Highway Administration (FHWA) Programs

a. Section 142 - Public Transportation

Policy and implementing guidance for undertaking public transportation projects is provided in Section 142 Title 23 U.S.C. - the basic law. Section 142 of Title 23 addresses two categories of public transportation projects which are eligible for Federal funding. The first category, covered in 142(a)(1), deals with highway public transportation projects and special use highway facilities. The second category, covered in 142(a)(2), deals with nonhighway public mass transportation projects.

Highway public transportation projects and special use highway facilities are defined in the implementing directive as: "projects which encourage the development, improvement and use of public mass transportation systems operating motor vehicles (other than on rail) so as to increase the traffic capacity of the Federal-aid systems for the movement of persons." In other words, highway related projects which will further the use of bus mass transportation systems.

There are four classes of eligible highway public mass transportation projects under this section. These include:

- Projects for construction or implementation of exclusive or preferential bus lanes on a Federal-aid system.
- Projects for the installation of highway traffic control devices on a Federal-aid system.
- Projects which provide for bus passengers loading areas and facilities that are on or serve a Federal-aid system, and
- Projects which provide for fringe and transportation corridor parking facilities on or proximate to a Federal-aid system which serve bus and other public mass transportation passengers.

Exclusive or preferential bus lanes can be one or more than one lane of a highway facility or can include the entire highway facility where buses are given priority over some or all other vehicles at all times or at certain regularly scheduled times.

Eligible highway traffic control devices are signs and other devices as permitted by the manual on uniform traffic control devices to facilitate and serve bus public transportation systems.

Bus passenger loading areas and facilities are areas located at or near passenger loading points for the safety, protection, comfort or convenience of bus passengers. Eligible items of participation include right-of-way (ROW), access roads, buildings and structures, such as bus shelters, equipment, and related improvements.

Fringe and transportation corridor parking facilities are parking facilities located on or proximate to a Federal-aid route in areas outside the core Central Business District (CBD), and are intended for the temporary storage of vehicles. The parking facilities are to be located and designed to facilitate the safe and convenient transfer of persons traveling in vehicles to and from existing or planned public transportation facilities.

Eligible items of participation include acquisition of land proximate to the ROW of a Federal-aid highway, access roads, buildings and structures, such as passenger stations for transferring of parking facility users to the mass transit system, and equipment and related improvements.

Highway public transportation projects are considered highway projects for all purposes of Title 23, U.S.C. and subject to all regulations of Title 23, CFR. Eligible highway public transportation projects may be approved and funded on any Federal-aid highway system. Federal participation in a highway public transportation project will be at the same ratio as a regular highway project for the Federal-aid highway system on which it is located or serves.

The second category under Section 142 of public transportation projects eligible for Federal-aid participation are the non-highway public mass transit projects. These are defined in broad terms as: "projects which develop or improve public mass transit facilities or equipment." Eligible non-highway public mass transit projects must be included in and related to a program for the development or improvement of an urban public mass transit system which includes either or both:

- . The construction of fixed rail facilities,
- . The purchase of passenger equipment or both.

A non-highway public mass transit project need not be physically located or operated on a route designated as part of the Federal-aid urban system but fixed facilities must be located within established urban area boundaries. Eligible projects may include the construction of fixed rail facilities and the purchase of passenger equipment such as buses, fixed rail rolling stock and other transportation equipment.

The construction of bus garages and bus maintenance and repair facilities may be an eligible project if a part of an overall program of planned transit development which provides for the purchase of buses or other passenger rolling stock. Eligible non-highway public mass transit projects may be approved and funded with apportioned urban system funds. The Federal participation ratio will be at the same ratio as a regular highway project on the Federal-aid urban system. The Urban Mass Transportation Administration is the Federal agency with responsibility for approving non-highway mass transit projects.

b. Section 147 - Rural Public Transportation

Rural Public Transportation Funds. Section 147 of the Federal-Aid Highway Act is a demonstration grant program which provides funds to encourage the development, improvement, and use of public transportation systems within rural areas, in order to enhance access of rural population to employment, health care, retail centers, education, and public services. Projects may be funded 100% by the Federal Highway Administration; however, no more than 33-1/3% of program funding may be used for operating expenses. The Washington office of the Department of Transportation will make a final selection of projects to be funded from available appropriations. Available funding under this program was \$9.65 million nationwide for FY75 and \$15 million for FY 76.

c. Urban Interstate and Transit Substitution

The 1973 Federal Aid Highway Act contained a clause now included as Section 103 of Title 23, U.S.C. which pertains to Interstate Transfers. States may substitute mass transportation projects for controversial or unwanted Interstate sections in urbanized areas over 50,000. The mass transportation project eligibility includes rail rapid transit and rolling stock for rail transit or buses.

Determination to withdraw an Interstate segment must be made jointly by the Governor and local governments in the urbanized area. Such substitution must be in accordance with the Section 134 comprehensive urban transportation

planning process. Funds for any approved transit project substituted for an Interstate segment must come from the general fund rather than the Highway Trust Fund. The Federal share of a substituted transit project becomes 80 percent just as with UMTA projects. Funds obligated for substituted transit projects are supplementary to and not in substitution for funds in the regular UMTA program.

By March of 1977, almost \$2.4 billion in planned Interstate roads had been eliminated and funds are beginning to flow for new rail cars, upgrading of existing transit lines and new construction. Boston has been the biggest beneficiary with almost one billion dollars followed by Washington, D.C., with almost \$400 million dollars. In addition, Portland, Philadelphia, Hartford, and the Maryland suburbs of the District of Columbia will each receive \$200 to \$300 million dollars for transit projects.

d. Non-DOT Federal Programs

Funds for special transportation purposes are available for planning, operating, and capital improvements from the Departments of Health, Education and Welfare (HEW), the Department of Housing and Urban Development (HUD), and the Department of Labor (DOL). HEW funds are usually in association with another program such as assistance to aging Americans or various social welfare and educational programs. The U.S. Department of Labor (DOL), through its Manpower Administration and the Office of Economic Opportunity, can provide services, purchase services or reimburse individuals or agencies for services that are associated with a DOL program.

HUD funds are generally in association with the development or redevelopment of urban areas and assist in providing the necessary transportation infrastructure. HUD 701 planning funds and block grants are the primary funding source.

A more detailed description of these so-called Human Service Agency support funds is provided in Section X, Small Area and Rural Public Transportation. Revenue sharing funds have been used to a limited extent to finance public transportation.

4. State and Local Programs

During the last decade many states and local units of government have established programs to assist in providing public transportation services. The trend is to greater state and local involvement in the provision of public transportation services and new legislation creating or enlarging funding programs are continuously being adopted. Thus, any figures shown in this section are likely to be soon outdated.

In 1975, state and local operating assistance accounted for almost one-third of transit industry revenue.

a. State Programs

A majority of states now have laws to support public transit. The majority of state laws are of the enabling type that permits local governments to create transit authorities or districts, impose taxes, issue bonds, and acquire or enter into agreement with local systems. In addition, the legislation usually contains provisions granting tax relief to the local transit units and sometimes contains provisions offering fare subsidies and grants for capital and operating expenditures. Table IV-2 lists the states that provide aid to local public transit systems.

Connecticut	Ohio
Delaware	Oregon
Florida	Pennsylvania
Georgia	Tennessee
Idaho	Utah
Illinois	Virginia
Kentucky	Washington
Maryland	Wisconsin
Massachusetts	Hawaii
Michigan	Missouri
Minnesota	Montana
New Hampshire	Nebraska
New Jersey	New Mexico
New York	Oklahoma
North Carolina	Rhode Island
North Dakota	

Source: Ref. 3

Table IV-2. States Which Have Legal Capacity to Provide Funds to Local Areas for Transit Purposes

Reimbursement for reduced senior citizen and/or school fares is provided by some states. At least one state (Minnesota) supports the transportation of the elderly. Illinois' program for pupil transportation, which began in 1965, subsidizes only publicly owned systems and pays the difference between the reduced fare and the regular fare (to a maximum of 50 percent of the regular fare). In 1972, the subsidy from this source to the Chicago Transit Authority was more than \$6 million.

Several states have direct subsidy programs for capital improvements and operating costs. In 1972, California enacted the Transportation Development Act which increased sales tax income by adding gasoline to the sales tax base. Counties were to impose a sales tax at the rate of 1½ percent, rather than 1 percent, and to deposit all of the income over 1 percent in a newly established local transportation fund. In this way, about \$150 million annually is potentially available for transportation capital and operating expenditures. However, the amounts available for operating expenses are subject to limitations.

Also in 1972, Illinois authorized grants for acquisition, construction, extension, or improvement of mass transportation facilities. These grants are intended to match Federal UMTA funds; to facilitate movement of persons who because of physical or economic circumstances, are unable to drive; and to contribute to an improved environment.

Massachusetts assists transit authorities by paying 90 percent of the annual debt service on bonds authorized to finance mass transportation equipment or facilities.

Michigan, under a 1969 Act, authorizes grants for planning, engineering, and design of urban mass transportation projects. In 1972 part of a motor fuel tax increase was made available for public transit as advances or loans for a period of two and one-half years, after which a referendum is to determine further use of the funds.

In Pennsylvania, New York, Massachusetts, Illinois, and Florida, the state will fund from one-half to two-thirds of the amount needed for the local contribution required under Federal matching provisions for capital projects. Under Pennsylvania's Urban Mass Transportation Act of 1967, the state will underwrite two-thirds of an incurred operating deficit, provided the remaining one-third is contributed by local sources. Recently Rhode Island began to provide operating funds to the Rhode Island Public Transit Authority.

An analysis of state aid to public transportation (usually administered through state DOT's) reveals substantial variation among state programs arising, on the one hand, from marked regional differences in physical geography, economic base, administrative structure, and degree of urbanization, and, on the other hand, from the current stage of development of various state programs. The data show a range from small scale, fledgling efforts to large well established programs which have been in operation for years. As is to be expected the more highly developed programs tend to be found in the more populous, urbanized states; the smaller programs in the less populous, rural states.

The older well established DOT's tend to be found in East Coast, industrialized states such as New York, New Jersey and Pennsylvania, and in Midwestern or Western states such as Wisconsin, Michigan, Oregon and California, which, historically, have responded positively to social and cultural change. The more recent DOT's, and those now in the process of creation, tend to be located in Southern or Western less urbanized states as exemplified by Arizona, Idaho, Kansas, New Mexico, and Texas.

The primary involvement of some smaller states has been in the area of special transportation for the elderly and handicapped. The states often assist localities in applying for Section 16(b)2 and Section 147 aid, in purchasing vehicles and in administering the program. Many states which are contemplating the establishment of an aid program are putting the major emphasis on coordinating the many systems which now serve the elderly and handicapped and other specialized groups in their states.

A report prepared by the North Carolina DOT found that 30 states have a section or division of Mass Transit in the State DOT or Highway Department, and 31 have a legal capacity to provide funds to localities for public transit purposes. (See Table IV-2.)

Most states which provide financial aid to public transit provide financial aid to small as well as large cities. Several states provide capital funds to projects lacking federal grants. Some of these programs are aimed primarily at small cities. Two states which provide operating assistance do so only to match UMTA operating grants. Because cities under 50,000 are not eligible for Section 5 grants, they can not receive state operating aid in these states. The remaining states which match UMTA operating grants, however, do provide operating assistance to cities under 50,000. Some states provide additional operating aid as a part of state funded projects. Michigan, for example, provides 100% less \$1000 of the operating deficit of its dial-a-ride projects in the first year. Texas reserves 40% of its operating aid for cities under 200,000 which it allocates on a first come, first served basis.

In most cases, state aid to public transit is funded from general revenues. Some state programs, however, are financed through the highway fund. In some states public transit is allocated certain percentages of gasoline taxes, sales taxes or property taxes.

The type and method of state funding may strongly influence the development and stability of public transit in the states. In the first instance, state capital assistance programs tend to precede the provision of operating assistance programs. In the second instance, many more states use general revenue funds rather than dedicated taxes as a source for transit aid. Reliance upon general revenue funds forces the transit agency annually to compete for funds before the legislature. This introduces uncertainty into transit funding and increases the potential for political decisions. A recent example of this difficulty is the state of Indiana, where the State Budget Committee failed to include matching funds for transit for the 1978 fiscal year. During the previous year 2.5 million dollars were included for transit purposes.

b. Local Programs

As the number of publicly owned transit systems has increased, so has the number of cities and counties providing assistance to transit. Since the immediate problems of these areas are usually those of keeping transit running, operating subsidies are the largest part of local transit support.

The number of states that authorize cities and other local units of government to institute new taxes for transit operating costs is growing. Local financing sources include general funds, sales taxes, property taxes, revenue sharing, payroll taxes, parking meter revenues, gasoline taxes, surpluses from toll facilities, local vehicle license taxes, and borrowing. Of these sources, property taxes contribute the largest portion of assistance, and transfers of surpluses from toll facilities the next largest.

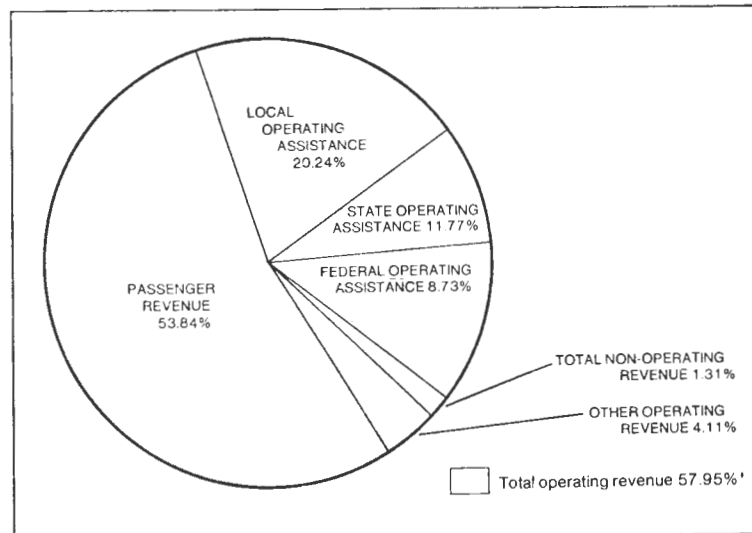
In the state of Washington, municipalities can levy a tax of not more than \$1 per household per month for the support of public transit systems. They can also place a tax on business firms. Additionally, a maximum of 50 percent of the state's 2 percent motor vehicle excise tax collected in any city with a publicly owned transit system may be used for the system if matched by local funds.

In summary, there appears to be a strong trend toward public support of urban mass transportation throughout the United States.

5. Service Related Revenues

a. Fares

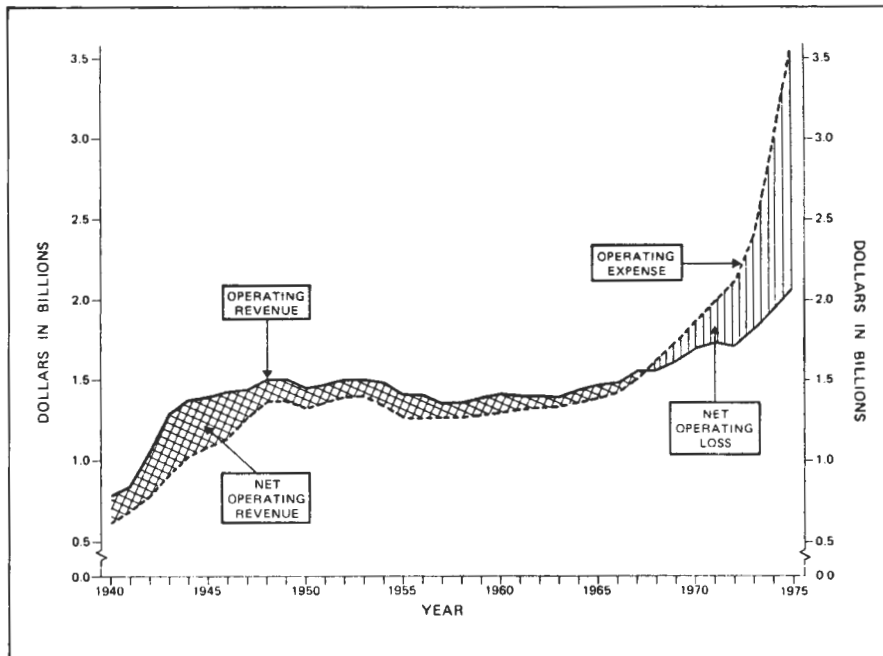
In 1975 over half of the revenue generated by the transit industry was derived from passenger revenues. Figure IV-2 depicts the source of transit industry revenue for 1975. In addition to the 54% which comes through the fare box, 20% is derived from local operating assistance and another 12% from state operating assistance. In 1975 federal operating assistance accounted for less than 9% of the total. This may be expected to increase substantially as the Section 5 program becomes more widespread.



Source: Ref. 1

Figure IV-2. 1975 Revenue of U.S. Transit Properties

The revenue derived from passenger fares as a percentage of total operating revenues has changed dramatically during the last several decades as shown in Figure IV-3. In the period before 1950 the fare box accounted for 100% or more of operating expenses which permitted a profit on private investment. As fare box revenues decreased, private transit properties ceased to function and were replaced by public authorities. The trend to less reliance on the fare box continues today with many transit properties generating only one-fourth to one-half of their revenue from this source.



Source: Ref. 1

Figure IV-3. History of Operating Expenses and Revenue

The Section 5 program providing operating assistance along with similar state and local programs has contributed to this situation. This is coupled with the change in governmental philosophy which stresses the public service aspects of public transportation funded by general revenues rather than only the users. In many communities this philosophy has resulted in substantial lowering of fares and even tests of free service.

b. Charters

Charters provide a significant revenue source for transit authorities. As an example, AC Transit in 1975 obtained 4 % of its operating revenues from charter operations. Revenues from charters are particularly desirable in that charter operations are normally conducted at a profit to the transit property. They often are conducted during weekend and off-peak periods when equipment and manpower are not being fully utilized.

c. Advertising

Revenues from advertising provide an additional source of funds for many transit properties. However, the amounts are not a significant item in most transit authorities' budgets (1% for AC Transit) and problems related to esthetics, standards, and content frequently occur.

6. Private or Quasi Private Properties

Despite the trend to public ownership in the transit industry there were over 600 privately owned systems operating in the United States as of January 1, 1976. Although these private firms account for 65% of the total transit systems they carry only about ten percent of the revenue passengers. The private properties tend to be small catering to a particular market segment in large urban areas or small firms providing a variety of services in small urban areas.

Private transit systems are fully regulated by state and local public utility or public service bodies and in general are treated like any private profit making organization.

7. Utility Related Firms

The Holding Company Act of 1935 forced public utility firms to divest themselves of wholly owned transit services. The provisions of the Act did permit certain utility firms to retain their transit arm for a period of time but the number of utility owned transit agencies is down to less than five and will probably be fully eliminated in the next five years. As of June 1976 only Duke Power Company in North and South Carolina and the New Orleans Public Service Company in New Orleans were among the last remaining public utilities providing transit service.

8. Community/Agency Sponsored.

A recent trend in public transportation is the creation of community or agency sponsored services. Most of these cater to a specific market and rely on non-union and/or volunteer efforts to operate. Examples of such services are the Reston, Virginia Community and numerous college and university operated services.

9. Associated Services

Many private profit making companies provide public transportation services in association with their primary activity. For example, major hotels and motels usually provide free service to and from airports for their guests. Car rental firms and fringe parking operators often provide similar services.

Another interesting development may be found in the San Francisco Bay Area where a large apartment complex provides free feeder bus service to and from the Daley City BART station.

Summary

Public transportation systems are funded from a number of sources with the Urban Mass Transportation Administration being the primary government source. During the last decade, government funds available to transit properties have increased substantially. In 1974, UMTA Section 5 funds first became available for operating assistance. The Federal Highway Administration has increased substantially its funding of public transportation both directly and by supporting services. In many cases, FHWA funds are available to be used for transit purposes at the discretion of state and local authorities. At the same time, state and local governments have initiated many programs to aid public transportation systems with both capital and operating aid.

In 1975 there were over 600 privately owned transit carriers which accounted for 10% of all passenger revenue. Their operations are financed mainly from fares, charters, advertising, and limited government aid. Operating revenue for publicly owned systems covered only 40 - 60 percent of operating expenses in 1975. The current trend is for even a lesser ratio.

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Session IV

Public Transportation Financing

A Proposed Role for
States in Mass Transit (1)

- (1) Source: A position paper, developed by the Pennsylvania DOT, on behalf of over 20 state transportation agencies and submitted to the American Association of State Highway and Transportation officials.

ROLE OF STATES IN MASS TRANSIT:
A FEDERAL-STATE PARTNERSHIP

During the past several years, state governments have played an increasing role in providing financial and technical assistance for mass transit. Many states, especially those that have established departments of transportation, offer programs ranging from technical services provided by professional staff to grant assistance in excess of \$100 million annually.

The varying responses of the states to public transportation assistance have been largely a function of state legislative policy, the decisions made on a local or regional level regarding the organization and funding of mass transit systems, and the general political and economic philosophies governing the perceived roles of the state, local and federal governments in supporting publicly financed programs. The policies, financial support, and other activities performed by the U. S. Department of Transportation have had a major influence in determining the financial role of the states in both highways and mass transit.

In reviewing the respective roles of these three levels of government, one important point is clear: State governments offer a valuable resource in the administration and funding of mass transit which could be greater utilized to significantly benefit the transit industry, the general public and taxpayers through the establishment of a clearly defined partnership arrangement with the U. S. Department of Transportation.

The basis for making this supposition lies with the existing policies and decision making processes of the U. S. Department of Transportation, especially the Urban Mass Transportation Administration (UMTA). Observing this federal program from the state perspective, the following problems are identified:

- (1) The current procedure used for the delivery of mass transit grants from UMTA is cumbersome, time consuming, redundant and expensive from the standpoint of the grantee.
- (2) The same procedures and requirements apply within categories of grants no matter whether they directly apply or not. Generally, the type or amount of the grant does not influence the grant process.
- (3) Due to limited UMTA staff, it appears the major concentration is on the end result of the grant application process meeting the statutory requirements and relying on the local or regional planning process and studies to justify the awarding of a federal mass transit grant. This is especially true of Section 5 and Section 3 grants other than major new system improvements or starts.
- (4) Little or no consideration is given to the grant application process performed by the grantee in efforts to seek either state or local government financial support for the projects. In many cases, a transit authority is required to submit the same or very similar information and data to both the U. S. and state departments of transportation.

- (5) The present grant process deals almost exclusively through the applicant transit agency and offers very little opportunity for a meaningful input from or coordination with those states providing financial and technical assistance for transit development.
- (6) Due to the lack of involvement in the local transportation planning process and the lack of clear understanding of the transportation problems and issues in the local area, the development of mass transportation is not always best served by funding and policy decisions made at the federal level. In many cases, the states are not offered an opportunity to participate effectively in this decision making process. Consequently, the overall program has become difficult to manage, redundant and financially debilitating.
- (7) In certain instances, the federal program imposes certain prerequisite fund requirements but does not provide adequate financial assistance to cover the legally allowable portion of such costs. These costs end up being covered by state and/or local governments.

In order to improve the administration and funding of mass transportation assistance programs, the following changes are recommended:

- (1) Consolidate and streamline the federal grant procedural and assurance processes. The states support UMTA's current effort to do this through the revision of its External Operating Manual. However, concern over the lack of a state role in these procedures and decision making process must be expressed.

- (2) For routine capital projects, especially the replacement of old and worn out rolling stock, UMTA should consider adopting a policy that would allocate annual block grants to the states, simplify the grant procedure to accelerate the replacement process and permit State discretion in the use of these funds. Discretionary grants for major mass transit capital system improvements or new starts would continue to be administered by UMTA.
- (3) In cases where states already have well established operating assistance grant programs, UMTA should consider delegating the states a role in the administration of the Section 5 formula grant program. By doing so, both state and UMTA programs can be better coordinated and the application process combined to provide a more efficient delivery system.

As part of this increased State role, it is recommended that UMTA authorize states ^{to participate} in the reapportionment of Section 5 funds where the urbanized area(s) cannot or chooses not to use the total formula grant apportionment.
- (4) More delegation of decision making should be given to the UMTA Regional Offices. Section 5, 9 and routine Section 3 grants could, with adequate staffing, be more effectively and efficiently administered by these offices.
- (5) Conscientiously consider the role of the states in the administration of the mass transportation assistance programs and in the formulation of mass transit policy.
- (6) U. S. DOT is encouraged to support the establishment of an operating assistance program for nonurbanized areas with the funds allocated to and administered by the states. Such state involvement would be conditioned

upon the expressed willingness and capability of the states to perform these program functions.

- (7) UMTA is urged to make substantial revisions in the Section 16(b)(2) program and take those steps necessary to incorporate it under the Section 3 program.

As mentioned previously in this paper, various roles in mass transit are presently being assumed by state departments of transportation, including:

- (a) The administration of operating assistance programs in urbanized and nonurbanized areas.
- (b) Providing matching grants for a wide range of UMTA programs.
- (c) Conducting technical studies, services and administering Section 9 grants.
- (d) Administering Section 16(b)(2) and Section 147 programs for the U. S. Department of Transportation.
- (e) Collecting and analyzing mass transit operating and financial data.
- (f) Operating mass transit systems.
- (g) Undertaking a wide range of transit related activities and programs not under the sponsorship of or funding by the U. S. Department of Transportation.

As the federal program further develops and the demands for mass transit assistance increase states clearly have become an important resource agency. While a certain degree of working relationship has been established between certain states and the U. S. Department of Transportation, the administration of the mass transportation assistance programs would be enhanced by

the establishment of a concise but flexible federal policy of state involvement in this program.

By the nature of the problems and the position held between federal and local governments, states offer a unique cost effective solution to the federal government in the transit field. . . Cooperative decision making, problem solving, financial assistance, data collection and analysis, technical and managerial services, policy development, program administration and planning are some of the functions that can be performed by the states.

However, for this role to be properly developed, flexibility must be built into the process for all states will not necessarily want to or are capable of assuming certain transportation functions. The federal government should clearly recognize this situation and formulate a partnership plan that will enable states to respond as they may determine appropriate to do so. Thus a major objective would be to provide Federal assistance to help states succeed in reaching their goals and not be an impediment to such a process.

Questions - IV

1. The paper makes seven recommendations for changes in present policy. Do you agree or disagree with each of these changes and why?

Session IV

Public Transportation Financing

Application For
Federal Financial Operating Assistance

The Harrisburg, Penn. Section V Application⁽¹⁾

(1) Source: Excerpt from Cumberland-Dauphin-Harrisburg Transit Authority, For Fiscal Year 1977, August 1976

APPLICATION FOR
FEDERAL FINANCIAL OPERATING ASSISTANCE
UNDER SECTION 5
URBAN MASS TRANSPORTATION ACT OF 1964, AS AMENDED

PREPARED BY
CUMBERLAND-DAUPHIN-HARRISBURG TRANSIT AUTHORITY
FOR FISCAL YEAR 1977

AUGUST, 1976

EXHIBIT A: PROJECT DESCRIPTION

Amendments to the Urban Mass Transportation Act of 1964 provide Federal financial assistance for eligible operating expenditures. The Cumberland-Dauphin-Harrisburg Transit Authority operates on a fiscal year budget from July 1 to June 30. It is the intention of the Cumberland-Dauphin Harrisburg Transit Authority, therefore, to apply for financial assistance for eligible expenditures incurred between July 1, 1976 and June 30, 1977.

Net eligible expenditures for the period are anticipated to be \$2,606,800. In accordance with the provisions of Section 5 of the Urban Mass Transportation Act, the Cumberland-Dauphin-Harrisburg Transit Authority hereby applies for Federal aid to assist in the financing of these projected expenditures in the amount of \$793,000.

A more comprehensive project description is provided in the following schedules:

1. Net Project Cost FY 1976-77

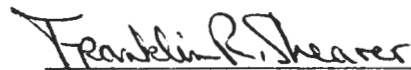
Total Operating Expenditures - 7/1/76 to 6/30/77)

Maintenance	\$	581,300
Transportation		1,585,800
Traffic, Solicitation, Advertising		85,000
Insurance & Safety		266,900
Administrative & General		448,300
Other		200,300
Total Operating Expenses-Local Urban Bus		3,167,600
Less Ineligible Operating Expenses		
Outside Maintenance Repair		36,300
Charter & Contract		566,500
Total Ineligible Operating Expenses		602,800
Less Interest Income		-0-
Purchase of Service-Capitol Bus Company (6 mths)		42,000
Net Project Cost		2,606,800

Reconciliation of Net Operating Expenses to Net Project Cost for the Year Ending
June 30, 1977.

Operating Expenses	
Total operating expenses (7/1/76 to 6/30/77)	\$ 3,167,600
Operating Expenses (7/1/76 to 6/30/77)-Local Urban Bus	
Maintenance	581,300
Transportation	1,585,300
Traffic Solicitation, Advertising	85,000
Insurance & Safety	266,900
Administrative & General	448,300
Other	200,300
Total Operating Expenses-Local Urban Bus	3,167,600
Ineligible Operating Expenses Included Above	602,800
Outside Maintenance Repair	36,300
Charter & Contract Services	566,500
Total Ineligible Operating Expenses (7/1/76 to 6/30/77)	602,800
Eligible Operating Expenses-Local Urban Bus	2,564,800
Less Interest Income	
Purchase of Service-Capitol Bus Company (6 mths)	42,000
Net Project Cost	2,606,800

The above reconciliation fairly presents the estimated operating expenses in conformity with generally accepted accounting principles consistently applied and reconciled to eligible operating expenses and such eligible expenses are believed properly itemized for the year ending June 30, 1977.


 Franklin R. Shearer
 Director of Finance

The effects of inflation on the cost of goods and services has weighed heavily on the operating budget of the Authority. For those categories with projected budget increases over 10% the following should be noted:

Traffic, Solicitation and Advertising - The Authority is in the process of developing new marketing strategies in an effort to attract new riders, increase farebox revenues and decrease operating deficits. The Authority will continue to augment its in-house marketing staff with consultant services.

Insurance and Safety - The cost for operating Liability Insurance to the Authority has risen from \$2.7448 to \$6.82 to \$10.01 per \$100.00 of revenue. Additionally, these steep increases have necessitated the staffing of a full-time position as system Safety Manager.

Administrative and General - The increases to employee pension and medical programs have resulted in small increases to this category. Additionally, employee compensation is under adjustment in an effort to establish position salaries comparable with private industry.

ANALYSIS OF PROJECTED BUDGET INCREASES
CUMBERLAND-DAUPHIN-HARRISBURG TRANSIT AUTHORITY

FY 1977

Category	FY 1976 Actual	FY 1977 Projected	Percentage Change
Maintenance	\$ 523,037	\$ 581,300	11.1
Transportation	1,441,874	1,585,800	10.0
Traffic, Solicitation and Advertising	77,226	85,000	10.1
Insurance and Safety	202,789	266,900	31.6
Administrative and General	361,334	448,300	24.1
Other (Includes Trailways)	197,070	242,300	23.0
Total Operating Expenses	2,803,330	3,209,600	14.5

EXHIBIT B: PUBLIC TRANSPORTATION SYSTEM

The principle urban mass transportation carrier in the Harrisburg Urbanized Area is the Cumberland-Dauphin-Harrisburg Transit Authority. The Transportation Authority provides services to the metropolitan area including the City of Harrisburg with extensions into the Counties of Perry and York.

The Cumberland-Dauphin-Harrisburg Transit Authority was formed in April of 1973 and assumed the operation of transit service in the Harrisburg area on July 1, 1973. Day to day management of the transit operation is handled by in-house staff working in conjunction with the transportation authority members.

In April of 1975, the Authority received delivery of 55 new air-conditioned 41-passenger transit coaches as a result of its UMTA Capital Grant Project number PA-03-0047

Transit service is provided on 19 major routes that operate in a radial pattern from the Harrisburg Central Business District (CBD). Service is presently being provided from 4:40 A.M. to 12:30 A.M. on weekdays and Saturdays, and from 6:05 A.M. to 9:15 P.M. on Sundays. Consult Exhibit N for greater detail.

The fare structure in the transit system is as follows:

Basic Zone Fare	35¢
Additional Zone Charge	10¢
Transfer Charge	05¢
Downtown Shuttle	15¢
Premium Express Charge	05¢

Senior Citizens may ride the system during the off-peaks at no charge. Handicapped persons are provided off-peak transportation at one half (½) the normal peak-hour fare

A 40-ride ticket costing \$10.00 is available. This reduces the basic zone fare from .35¢ to .25¢. A 10-ride ticket is also available, reducing the basic zone fare to .30¢.

For the past several years, transit ridership in the Harrisburg area has been declining. In 1973, following transfer of ownership to the public authority, there was an increase in ridership - the first in many years. The following table describes ridership, fleetsize, and transit miles of the system since 1968:

YEAR	ANNUAL RIDERSHIP	TRANSIT VEHICLES	FIXED ROUTE BUS MILES
1968	5,200,206	69	1,594,354
1969	4,902,680	72	1,549,262
1970	4,880,381	104*	1,728,706
1971	4,277,191	100*	1,733,406
1972	3,686,570	95*	1,549,295
1973	4,052,901	92**	1,666,419
1974	4,467,687	92**	1,687,990
1975	4,480,256	112**	1,956,583

1968 to 1972 - Private ownership under Harrisburg Railways

1973 to 1975 - Public ownership under Cumberland-Dauphin-Harrisburg
Transit Authority

*includes 20 school buses

**includes 22 school buses

The Cumberland-Dauphin-Harrisburg Transit Authority presently provides limited school and charter transportation services within its service area boundaries. The Authority has complied with all United States Department of Transportation and Urban Mass Transportation Administration guidelines concerning these types of service in the past and hereby certifies that it will continue to comply with existing regulations during the term of this project.

2. Financial Arrangements Between the Cumberland-Dauphin-Harrisburg Transit Authority and Other Non-Federal Agencies:

a. The Transit Authority receives two-thirds (2/3) of its operating subsidy from the Pennsylvania Department of Transportation through a Purchase of Service Agreement. Penn DOT also provides 10% of capital expenditures through a capital grant program.

b. The three (3) contributing local political jurisdictions of the service area will provide the operating subsidy and capital costs not provided by other sources. The articles of incorporation state that the financing of the Authority will be shared between the participants according to the following percentages:

Cumberland County	25%
City of Harrisburg	30%
Dauphin County	45%

c. The Transit Authority has entered into agreement with Penn DOT for a grant to cover the fares of Senior Citizens using the transit system. The "Free Transportation Program for Senior Citizens" was implemented on July 1, 1973.

4. History of Transit in the Area:

The Harrisburg Area was once served by a fairly extensive system of trolley lines and intra-regional passenger railroad service. The trolley system was eventually replaced by bus service and the passenger rail service has been reduced to a few trips on one line (Middletown). The East Shore (Dauphin County) bus service was provided by the Harrisburg Railways Company and the West Shore (Cumberland and Perry Counties) bus service was provided by Valley Transportation Company. The route franchises of Valley Transportation were purchased by Harrisburg Railways in 1969.

A significant decline in the extent of the service area, the annual riderships, revenue, and most other aspects of transit service has occurred over the past twenty years.

The Harrisburg Railways Company, in its January 29, 1973 application to the Pennsylvania Public Utilities Commission, expressed a desire to abandon and discontinue all scheduled route service stating that "there is no reasonable probability that after July 1, 1973, the operation can be made economically feasible under private ownership".

In April, 1973, the Cumberland-Dauphin-Harrisburg Transit Authority was formed by the Counties of Cumberland and Dauphin and the City of Harrisburg, under the Pennsylvania Municipality Authorities Act of 1945.

EXHIBIT C: PROJECT JUSTIFICATION

The Cumberland-Dauphin-Harrisburg Transit Authority also known as Capitol Area Transit or CAT, assumed the operations of Harrisburg Railways, Inc. on July 1, 1973. At that time, CAT inherited a fleet and route structure which had been deteriorating substantially. In the past three (3) years, CAT has reversed these trends by providing more efficient and reliable transit service in the Harrisburg Urbanized Area.

These improvements in transit service have required substantial public financial assistance. Principal financial contributors to CAT over the past three (3) years have been the Pennsylvania Department of Transportation, the City of Harrisburg, and the Counties of Cumberland and Dauphin. While these several contributors can continue their current level of support, it is evident that any additional support required by CAT would place a financial burden on the state, the city and counties.

Therefore, CAT is applying for \$793,000 in Federal assistance in accord with Section 5 of the Urban Mass Transportation Act of 1964, as amended. This project will have substantial benefits to the entire Harrisburg Urbanized Area. Several of the more obvious benefits include:

Benefits to Users:

Implementation of the proposed project will permit continuation of the current levels of service. Approximately 16,000 daily riders will be assured of the transit service they depend upon. Ridership is increasing and CAT expects that these trends will continue, provided that current service levels are maintained and improved.

Benefits to the Cumberland-Dauphin-Harrisburg Transit Authority:

The funds provided by this project will permit full financing of actual and anticipated expenditures in FY 1976-77. Federal funds, though not used in substitution for local funds, will certainly reduce the overall growing tax burden on constituents of the City of Harrisburg and Cumberland and Dauphin Counties.

Benefits to the Urban Area:

The provision of efficient and reliable mass transportation service offers substantial benefits to the entire urbanized area. Such service permits the reduction of air pollution and the minimization of traffic congestion. More importantly, mobility is provided to those in the urbanized area who do not own or operate an automobile. The objectives of the Cumberland-Dauphin-Harrisburg Transit Authority are geared toward increasing this mobility in the Harrisburg Area.

EXHIBIT D: PROJECT FINANCING AND MAINTENANCE OF EFFORT

1. Computation of Federal Operating Assistance Grant for FY 1976-77

a. CAT's share of apportioned funds for the Harrisburg Area	\$1,136,074
b. Maintenance of Effort for Fiscal Year 1977	\$ 611,907
c. Computation	
Total Operating Expenditure for Local Urban Bus for FY 1977	\$3,167,600
Total Purchase of Service - Capitol Bus Company (6 months)	\$ 42,000
Total Operating Expenditure for FY 1977	\$3,209,600
Less:	
Non-transit expenditure (7/1/76 to 6/30/77)	
Charter and Contract Service	\$ 566,500
Outside Maintenance Repair	\$ 36,300
Gross Project Cost	\$2,606,800
Less:	
Interest income on working capital (7/1/76 to 6/30/77)	NONE
Net Project Cost	\$2,606,800
Less:	
Farebox Revenues - Local Urban Bus	\$1,020,800
Total Project Cost	\$1,586,000
Federal Operating Assistance Ratio	.50
TOTAL	\$ 793,000
TOTAL minus "a" listed above - non-requisitioned funds	\$ 343,074
Federal Operating Assistance Grant for FY 1977	\$ 793,000
Local Share	\$ 793,000

Source of Local Share for Eligible Period

Penn DOT Subsidy	\$ 408,667
City of Harrisburg	\$ 61,300
County of Cumberland	\$ 51,083
County of Dauphin	\$ 91,950
Advertising	\$ 12,000
Penn DOT Senior Citizen Subsidy	\$ 168,000

2. State and Local Funds Contributed to the Cumberland-Dauphin-Harrisburg Transit Authority in FY 1977:

Verification of Maintenance of Effort

a. Maintenance of Effort required	\$ 611,907
b. State and Local Funds counted as Maintenance of Effort	
Penn DOT Senior Citizen Subsidy	\$ 168,000
Penn DOT Subsidy	\$ 408,667
Advertising	\$ 12,000
City of Harrisburg	\$ 61,300
County of Cumberland	\$ 51,083
County of Dauphin	\$ 91,950
Total Maintenance of Effort Funds	\$ 793,000

PART III - BUDGET INFORMATION

Page 1

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SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Catalog No. (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. Operating Assistance	20.507	\$	\$	\$ 793,000	\$ 793,000	\$ 1,586,000
2.						
3.						
4.						
5. TOTALS		\$	\$	\$ 793,000	\$ 793,000	\$ 1,586,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	(1)	(2)	(3)	(4)	
a. Maintenance	\$ 581,300	\$	\$	\$	\$ 581,300
b. Transportation	1,585,800				1,585,800
c. Traffic and Advertising	85,000				85,000
d. Insurance and Safety	266,900				266,900
e. Administrative and General	448,300				448,300
f. Other	200,300				200,300
g.					
h. Purchase of Service-Bus		42,000			42,000
i. Total Direct Charges	3,167,600	42,000			3,209,600
j. Indirect Charges					
k. TOTALS	\$ 3,167,600	\$ 42,000	\$	\$	\$ 3,209,600
7. Program Income (Farebox) (Revenues)	\$ 1,020,800	\$	\$	\$	\$ 1,020,800

PART III – BUDGET INFORMATION

Page 2

OMB NO. 5010-0046

SECTION C – NON-FEDERAL RESOURCES

(a) GRANT PROGRAM	(b) APPLICANT	(c) STATE	(d) OTHER SOURCES	(e) TOTALS
8. Operating Assistance	\$ 204,333	\$ 408,667	\$ 180,000	\$ 793,000
9.				
10.				
11.				
12. TOTALS	\$ 204,333	\$ 408,667	\$ 180,000	\$ 793,000

SECTION D – FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	\$ 793,000	\$ 198,250	\$ 198,250	\$ 198,250	\$ 198,250
14. Non-Federal	793,000	198,250	198,250	198,250	198,250
15. TOTAL	\$ 1,586,000	\$ 396,500	\$ 396,500	\$ 396,500	\$ 396,500

SECTION E – BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) GRANT PROGRAM	FUTURE FUNDING PERIODS (YEARS)			
	(b) FIRST	(c) SECOND	(d) THIRD	(e) FOURTH
16.	\$	\$	\$	\$
17.				
18.				
19.				
20. TOTALS	\$	\$	\$	\$

SECTION F – OTHER BUDGET INFORMATION
(Attach additional Sheets if Necessary)

21. Direct Charges:

22. Indirect Charges:

23. Remarks:

Questions - IV

1. What options are available to CAT should UMTA not approve the Section V application?
2. Do you think that the State of Pennsylvania is contributing enough funds to the system? Compare Pennsylvania's contribution to those of your own state or other states.
3. Do you believe that the revenue from passenger fares is a large enough portion of the total operating budget?

SESSION V: PUBLIC TRANSPORTATION SYSTEMS AND
CHARACTERISTICS - RAIL

Objectives of Session V

- . To be able to define basic types of rail transit systems
- . To be aware of the trade-off situations in the selection of a particular type of system
- . To be aware of the necessity to coordinate and integrate new transit systems into the public transportation system

Synopsis of Session V

General descriptions of each type of system are given by delineating their characteristics of equipment, capabilities, cost, service, and application.

Outline for Session V

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Rail Rapid Transit (RRT) Systems
3	Light Rail Transit (LRT) Systems
4	Summary

SESSION V: PUBLIC TRANSPORTATION SYSTEMS
AND CHARACTERISTICS - RAIL

1. Introduction

An urban area's public transportation system refers to, in part, the various modal systems serving the area. In the U.S. in 1975, there were 947 transit properties. The modal distribution by area size of these properties is presented in Table V-1. The bus clearly predominates all modes of transit systems. Presently, much attention is being given to new rail systems such as BART, Washington METRO, and Buffalo's future light rail system.

Table V-1. U.S. Transit Systems Classified by
by Vehicle Type and Population Group (1975)

POPULATION OF URBANIZED AREA	ALL-RAIL SYSTEMS (a)	MULTI-MODE SYSTEMS (b)	ALL-BUS SYSTEMS	TOTAL SYSTEMS
500,000 and greater	5	12	367	384
250,000 to 500,000	0	0	60	60
100,000 to 250,000	0	1	114	115
50,000 to 100,000	0	0	69	69
Less than 50,000 (c)	1	0	318	319
TOTAL TRANSIT SYSTEMS	6	13	928	947

(a) Includes transit systems operating one of the following modes exclusively: heavy rail, light rail, or personal rapid transit (PRT).

(b) Includes transit systems operating two or more of the following modes: heavy rail, light rail, trolley coach, motor bus, cable car, inclined plane, and ferry boat.

(c) Population of urban place with less than 50,000 population outside an urbanized area.

Source: Ref. 1

2. Rail Rapid Transit (RRT) Systems

At present, there are nine United States regions which have rail rapid transit systems in operation or under construction: San Francisco, Chicago, Cleveland, Philadelphia, New York, Boston, Washington, Atlanta, and Baltimore. These systems carry (or will carry) the bulk of mass transit passengers in those regions. Together with commuter railroads, rail rapid transit systems carry over two billion passengers annually, or one-third of all mass transit riders. There is only a widespread and growing interest in upgrading and extending rapid rail systems, and several cities are planning new systems.

a. Definition

Rail rapid transit refers to trains operating on completely controlled grade-separated right of way. The term "METRO" is being widely used for rail rapid systems.

b. Physical and Operating Characteristics

A summary of RRT characteristics is presented in Table V-2. The fully-controlled feature of RRT fixed facilities (right-of-way and stations) provides for rapid boarding and high capacity passenger operations. Power is electricity typically supplied by a third rail.

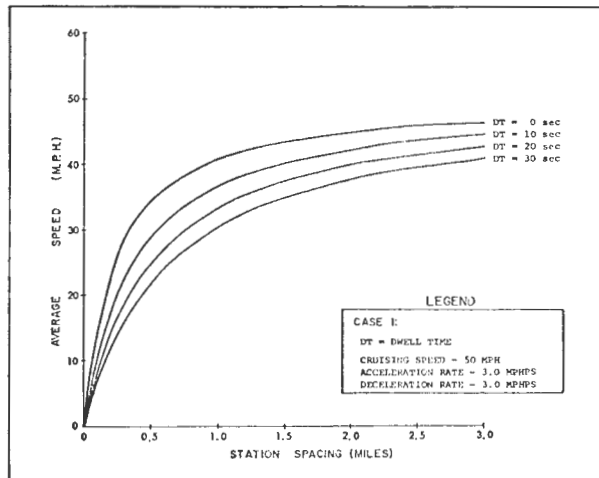
Table V-3. Typical Rapid Speeds

Average Station Spacing (miles)	Range of Average Speeds ⁽¹⁾ (mph)
0-1	20-25
1-2	35-40
2-3	45-50
over 3	50-55

(1) These speeds are representative of current or expected rail rapid technology; they include estimates of typical dwell times.

Source: Ref. 3

Other variables which affect average operating speed are cruising speed, acceleration, deceleration, and station dwell time. Theoretical relationships between average speed, station spacing, and dwell times for sample values of cruising speed, acceleration, and deceleration are given in Figure V-1. As dwell time at a station decreases, higher average speeds can be attained.



Source: Ref. 3

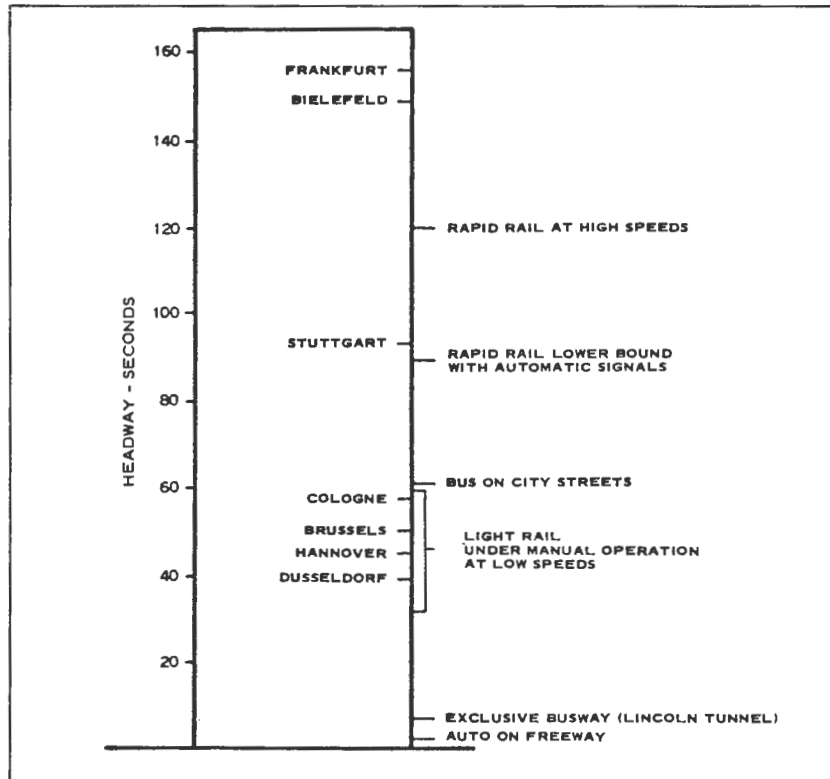
Figure V-1. Rail Rapid Speeds and Station Spacing

Table V-2. Characteristics of Urban RRT and LRT Systems

	Rail Rapid Transit	Light Rail Transit
Fixed Facilities		
Right-of-way category	Exclusive	Exclusive, semi-exclusive or shared
Control	Signal	Visual/signal
Fare collection	At station	On board/at station
Power supply	Overhead/third rail	Overhead/third rail
Stations: Platform height	High level	Low or high level
Access control	Fully controlled	May be controlled
Station spacing (ft/m)	1600-11,000/500-3400	800-2500/250-800
Vehicle/Train Characteristics		
Minimum operational unit	1-2	1
Typical number of vehicles	2-10	2-4
Vehicle length (ft/m)	49-75/15-23	46-108/14-33
Vehicle capacity (seats/vehicle)	32-86	22-93
Vehicle capacity (total/vehicle) (for 2.7 ft. ² (0.25 m) per standee)	100-300	74-200
Operational Characteristics		
Operating speed (mph/kph)	15-50/25-80	10-30/15-45
Typical frequency peak hour, (per hour)	Up to 30	Up to 60
Capacity (passengers/hour)	Up to 50,000	Up to 20,000
Reliability	High	Moderate to high
System Aspects		
Network and area coverage	Predominantly radial, some CBD coverage	Good CBD coverage, branching capability
Average trip length	Medium to long	Short to long
Interface with other modes	Auto, pedestrian and bus feeders; can also feed other transit modes	Auto, pedestrian and bus feeders, can also feed other transit modes

Source: Adapted from Ref. 2

Capacity can be as high as 40,000 passengers per hour but most RRT systems are designed for 8,000 to 25,000 passengers per hour. Capacity is a function of several variables such as average speed, train headways and size, and passenger occupancy capacity. Headways are in the order of 90 to 120 seconds with automatic signal equipment as shown in Figure V-2. Shorter headways are possible under manual control at lower operating speeds. Minimum headways are a function of safety considerations.



Source: Ref. 2

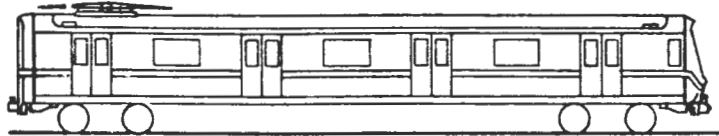
Figure V-2. Observed Minimum Headways on Different Transit Systems and Modes

Average operating noise for RRT systems are in the range of 63-80 decibels (car interior) and 78-90 decibels (exterior, 50' from track).

RRT cars are 8-10.5 feet wide seating 32 to 86 persons. Total capacity is much higher ranging from 100 to 300 persons. Cars are typically on steel wheels with four axles and have a 30 year average life.

Funded by UMTA, two new State-of-the-Art Cars (SOAC) have been built. These cars incorporate the best in existing technology and are being tested and evaluated in New York, Boston, Cleveland, Chicago, and Philadelphia. The primary goals set for these cars are passenger convenience and operating efficiency.

The SOAC is a standard four axle rail rapid transit car available as a self-sufficient car, or in married pairs. One operator only is required per train. The vehicle is designed for fast loading and disembarking permitting high volume-high frequency operation. Power pickup is available via third rail or overhead pantograph, and the vehicle is designed to operate on exclusive right-of-way, with high platform loading.



Overall length	75.0 feet	Total passenger carrying capacity per car	150
Overall width	9.75 feet	Empty weight	90,000 lbs.
Floor to ceiling height	7.36 feet	Nominal weight	112,500 lbs.
Number of doors per side	4	Interior noise level	63 dBA
Door opening width	4.17 feet	Exterior noise level 50 feet from vehicle	73 dBA
Door opening height	6.30 feet		
Number of seats per car	62		

Source: Ref. 5

Figure V-3. State of the Art Car (SOAC)

As a long-range goal, an Advanced Concept Train (ACT) is being produced. The demonstration and evaluation of the ACT vehicles on operating transit systems will lead to the upgrading and replacement of existing obsolete rail vehicles. The cars are capable of operating over the same transit lines as the SOAC cars.

- c. RRT Costs. Average construction costs are given in Table V-4.

Table V-4. RRT Construction Costs (1975)

<u>Construction Type</u>	<u>Cost/Mile (millions)</u>
Ground Level	\$14
Elevated	22
Cut & Cover (CBD)	73
Cut & Cover (other areas)	43
Tunnel	95

Average cost of an RRT car is over \$400,000. The average operating cost per vehicle-mile for RRT systems is about \$2. A breakdown of the operating cost variables are given in Table V-5. One reference (3) found that the operating cost per car mile could be estimated by the formula:

Operating cost per car-mile =

$$[\$0.535 - 4 \times 10^{-6} (\text{Annual car-miles} \div \text{Fleet size})] \times \text{local wage rate (in dollars per hour)}$$

Table V-5. Rail Rapid Transit Operating Costs - 1973
(per car-mile)

Items	VALUE	
	Typical	Range
Maintenance of Ways and Structure	\$0.26	\$0.06 - \$0.50
Maintenance of Vehicles	\$0.23	\$0.15 - \$0.31
Power	\$0.19	\$0.10 - \$0.30
Transportation	\$0.64	\$0.60 - \$0.95
General and Administrative	\$0.33	\$0.10 - \$0.73
TOTAL	\$1.65	\$1.01 - \$2.79

Note: Based on data collected from six U.S. rail rapid transit systems for the period 1971-72, and adjusted to reflect 1973 prices; the systems included: PATH, MTA, CTA, CTS, SEPTA, and PATCO.

Source: Ref. 3

d. Capabilities/Constraints.

RRT is predominantly suburban radial service for medium to long trips (line-haul) with some CBD coverage. Transfer from auto, pedestrian, bus feeder systems is possible through intermodal transfer terminals.

High capital costs are a major drawback to RRT systems. However, the relatively high service quality has a greater potential for attracting ridership.

Vuchic (4) states that the need for RRT in a specific urban area depends on travel patterns, topographical constraints, and size and character of the city. Most RRT systems serve areas with populations larger than one million.

RRT system operations can vary widely. Train lengths (number of cars per train) is mainly constrained by station platform length for passenger boarding and alighting. In the U.S. RRT systems have one or two persons on-board (four at Boston) and station personnel. Serving Philadelphia, the Lindenwold line has remote closed-circuit television in stations to replace station personnel.

Technology for automatic train operation (BART, Metro, and Lindenwold) is available but not in widespread use in the U.S. Single-person crews are on-board as attendants

for monitoring vehicle performance, closing doors, communicating with central control, and responding to emergency situations.

3. Light Rail Transit (LRT) Systems

a. Definition.

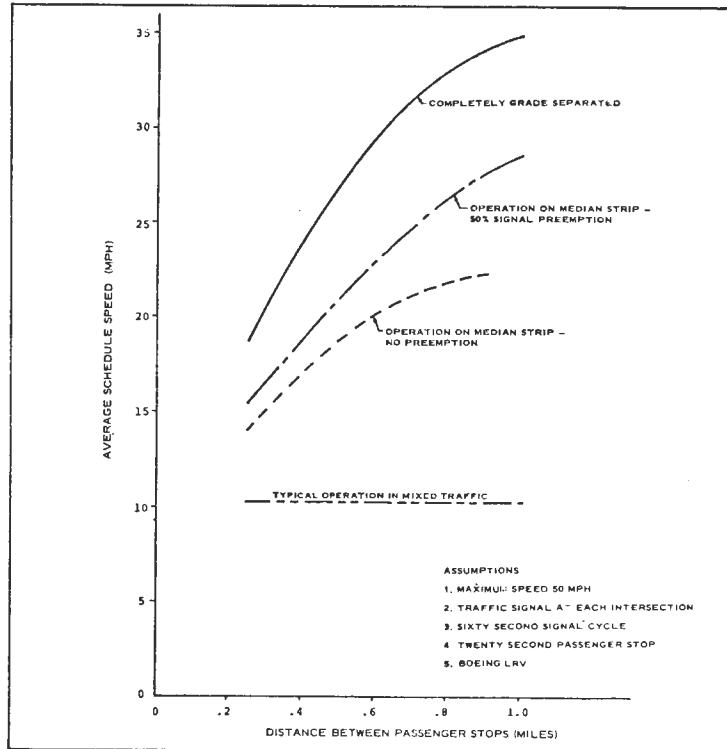
LRT refers to an urban electric railway having private but not necessarily exclusive right-of-way.

b. Physical and Operating Characteristics.

A summary of LRT characteristics are presented in Table V-2. LRT has vehicle technology similar to that of street cars, but can operate on exclusive, semi-exclusive, or shared right-of-way. Its distinguishing feature is a capability to operate safely and effectively through at-grade inter-sections, providing high flexibility in different urban settings. Any rail transit system can be classified as light rail if its technology and operation make it capable of operating at grade.

Two characteristics of LRT provide this high degree of flexibility: the overhead power distribution system, and its ability to handle passengers at platform or street level loading.

The typical range of average operating speed of LRT is about 10-30 mph. This is due largely to its type of operation with frequent stops and mixed traffic service. The relationship between average schedule speed and station spacing is presented in Figure V-4. Note the increase in attainable schedule speeds as distance between stops increases (less frequent stopping) and at higher levels of treatment for right-of-way.



Source: Ref. 2

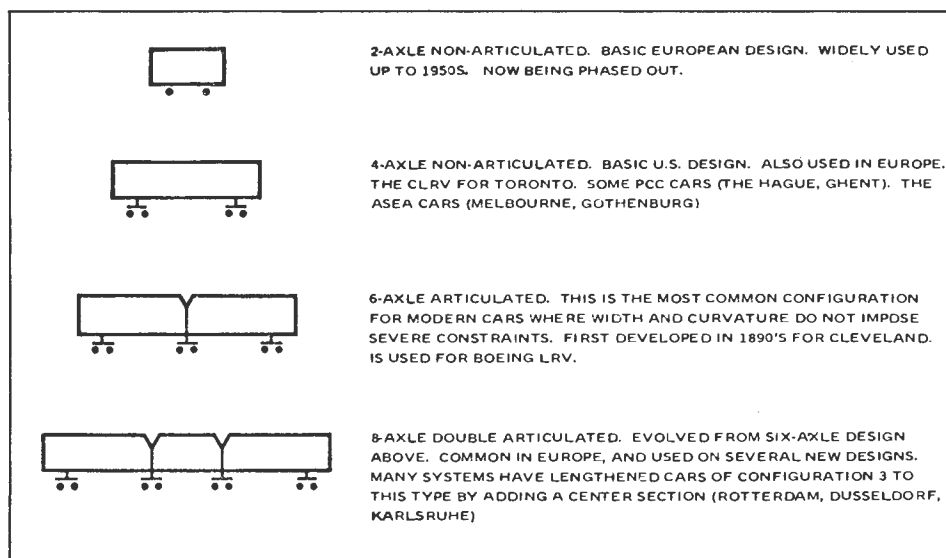
Figure V-4. LRT Average Schedule Speeds

LRT capacities are about half that of RRT, despite twice as high typical train frequencies given in Table V-2. However, LRT serves areas of heavier passenger demand as the CBD where more frequent stopping and smaller vehicle capacities constrain the maximum expected number of passengers. As in RRT, LRT capacity depends on vehicle size, train length, and headway.

Capacity also depends on local conditions such as right-of-way. Train length is constrained by platform length and distance between at-grade intersections.

General minimum LRT headways are shown in Figure V-3. At 60 second headways, single Boeing Light Rail Vehicle (LRV) units have a capacity of 4,000 seated and 13,000 total passengers per hour.

LRT cars are typically 8-10 feet wide and 50 to 70 feet in length. The Boeing LRV, shown in Figure V-5, is single-articulated with six axles. Typical LRV configurations are shown in Figure V-6. Seating capacity varies with configuration and car size and can range from 22-93 seats per vehicle. Total car capacity is higher at 74-200 passengers per car. Car costs are about \$400,000 to \$600,000. Average car life is about 25 to 30 years.



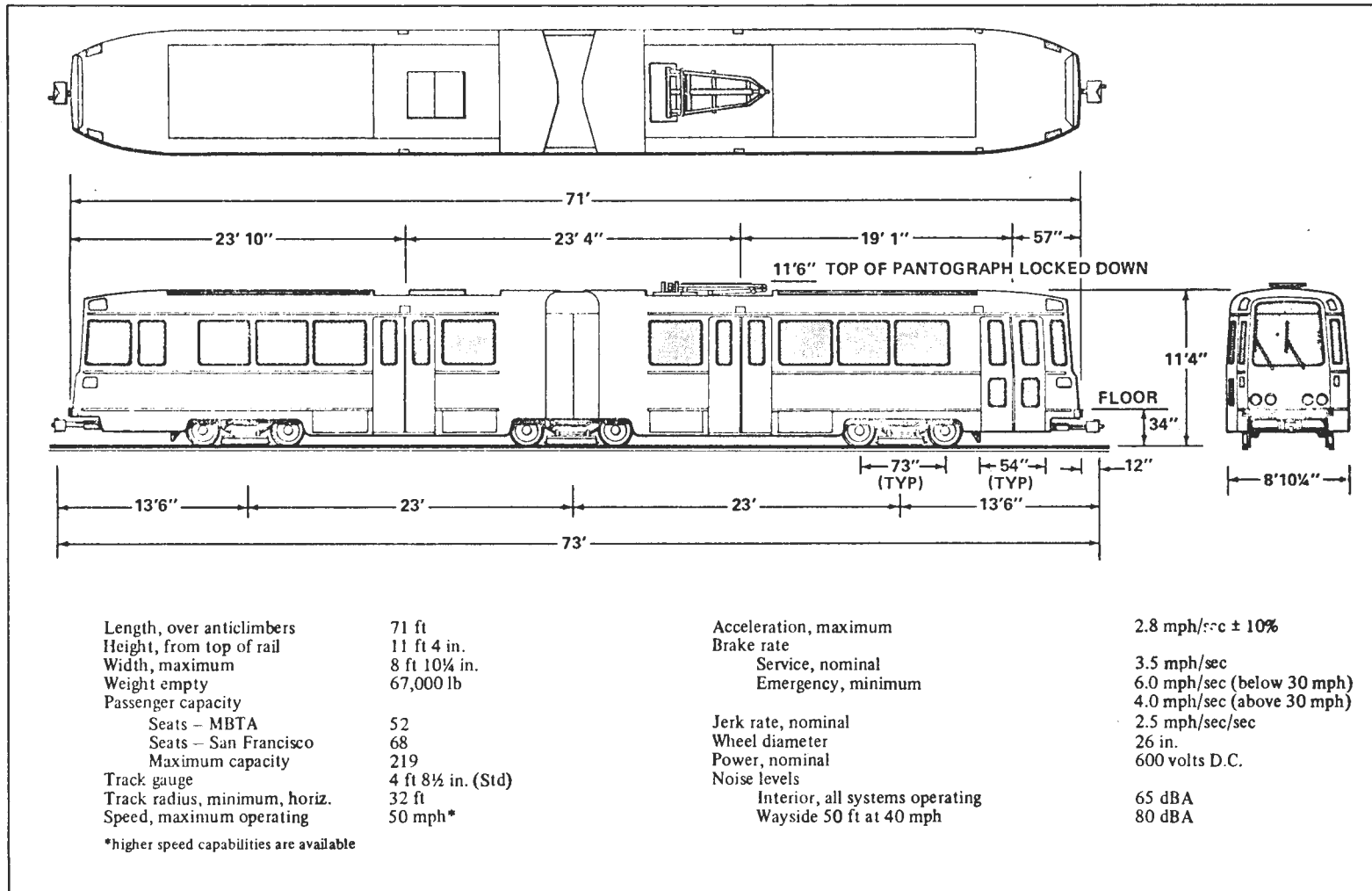
Source: Adapted from Ref. 2

Figure V-6. Basic Light Rail Vehicle Configurations

LRV interior noise levels in the order of 70 decibels are attainable. This is comparable to interior noise levels of many automobiles at high speed. Exterior noise levels at 50 feet from the track are about 70-80 decibels for modern, noise-engineered systems.

c. LRT Costs.

Average construction costs for LRT systems are given in Table V-6.



Source: Ref. 2

Figure V-5. Boeing LRV

Table V-6. LRT Construction Costs (1975)

<u>Construction Type</u>	<u>Cost/Mile (millions)</u>
Ground Level	\$6-14
Elevated	20
Cut & Cover (CBD)	71
Cut & Cover (other)	41
Tunnel	93

Costs vary significantly for LRT systems in the U.S. and Europe. Major cost variations are due to energy and wage labor rates. An average operating cost is approximately \$2 per vehicle mile.

Representative operating and maintenance unit costs are given in Table V-7. (These are provided for comparison among the cost variables and should not be used for actual analysis.)

Table V-7. Operating & Maintenance Costs (1975)

<u>Element</u>	<u>Unit Cost (per year)</u>
Track maintenance	34¢ per VMT *
Shelter maintenance	\$500 per shelter
Yards and support maintenance	\$1000 per peak hour vehicle
Electrical maintenance	4¢ per VMT
Communications and control maintenance	\$2500 per track mile
Vehicle maintenance	24¢ per VMT
Vehicle energy consumption	14¢ per VMT
Maintenance facility energy consumption	\$50 per peak hour vehicle
Vehicle storage energy consumption	\$400 per peak hour vehicle
Operator's wages	\$12,000 per year + \$4,000 benefits, 1.5 drivers per peak hour vehicle
Other transportation	17¢ per VMT
General and administrative	15% of other costs
* Vehicle miles travelled	

Source: Ref. 2

d. Capabilities/Constraints

No new LRT lines have been built in recent years in the U.S., with the result that extensive capital and operating data on modern LRT technology is not available. However, LRT is viewed as a serious alternative to buses and rapid transit in some metropolitan areas. Boston and San Francisco have acquired new LRT vehicles while Buffalo and other cities are actively planning new LRT systems or line extensions.

The features that distinguish LRT most strongly from conventional rapid transit are the flexibility with which it can be adapted to a variety of urban settings, and its potentially lower cost. In congested downtown areas, light rail transit can be operated in underground subways. In lower density areas, it can be operated at grade in existing roadway medians, reserved freeway lanes, and in abandoned rail and other exclusive rights-of-way. At heavily traveled intersections and in busy arterials grade separation can be achieved through underpasses or elevated structures. With preemptive signals and barriers, surface grade crossings and operation in mixed traffic might be tolerated in some situations. Because much of the track can be built at surface level, the need for costly tunneling and elevated guideways can be minimized and substantial economies in capital expenditure can potentially be achieved.

LRT is a technologically proven concept that requires no costly development program. It can be introduced into a community with a minimum of disruption and can be operated with minimum intrusion in residential areas. It may offer a capability for conversion to higher capacity service, thus allowing a city to match its initial investment to existing and near-term demand and to stage subsequent investment as required.

LRT applications are shown in Figure V-7.

- . Basic transit mode - most commonly occurs in medium-size cities.
- . Urban line haul routes - appropriate along certain heavily travelled corridors in low density, medium and small cities. These can be radial (terminating at CBD) as in San Francisco or diametrical (continuing through the CBD to an outlying area) as in Philadelphia.
- . CBD circulation - for CBD application, a high speed and performance system incorporates grade separation (e.g. tunneling) and preferential treatment.
- . Feeder applications - where suitable low cost alignments are available, LRT can provide a collection/distribution system for its own or line-haul routes. Boston's Green Line network is an example.

4. Summary

Two basic types of urban rail systems are rail rapid (RRT) and light rail (LRT) transit. Primary characteristics of each is type of right-of-way. Rail rapid has exclusive right-of-way while light rail systems can have any type. Thus, RRT systems have higher capital costs for construction of aerial or subway sections. LRT has potential for lower overall cost because of its flexibility in operating under various land use conditions.

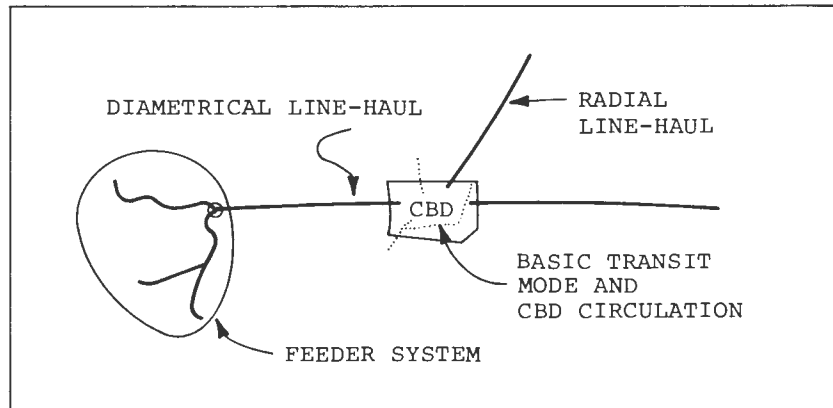


Figure V-7. LRT Applications

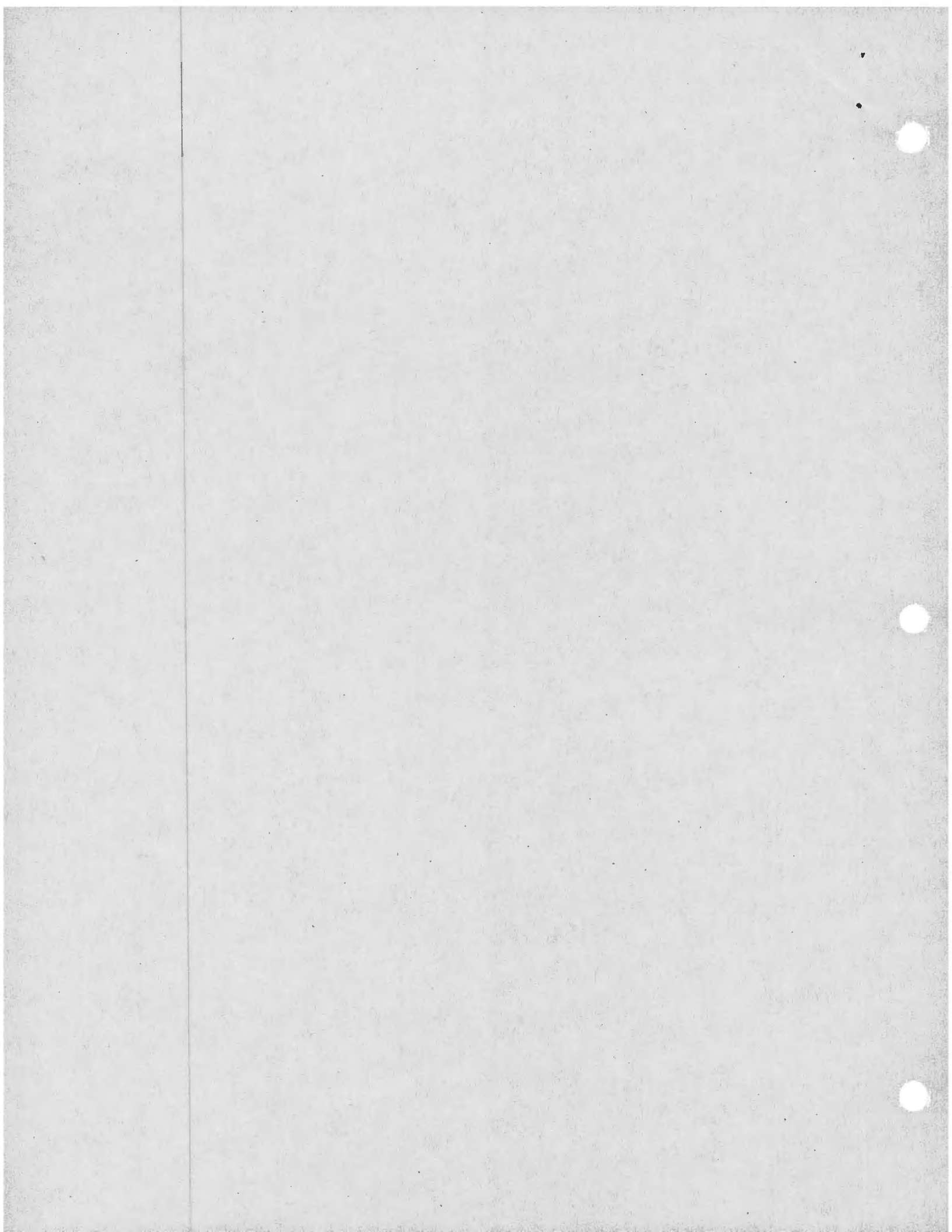
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Session V

Moving People⁽¹⁾

(1) Source: Excerpted from "The Case for Rail Transit"
American Public Transit Association, July 1977.



moving people

Between 1863 and 1935, 17 cities opened rail rapid transit systems of the basic subway style. Only four of those cities were in the United States. Between 1950 and 1977, 26 totally new rail rapid transit systems were opened. Only three of them were on American soil.

During these years, streetcar or light rail systems also appeared in cities all over the world. In the recent past, almost every metropolitan area operating some form of rail has announced expansion plans or is in the planning stage. Today construction of brand new systems proceeds as does preliminary work in cities which have yet to see any tracks being set in place.

As diverse as these networks are, they have one thing in common—the trains run because rail was selected as the mode of urban travel which could best move people, in line with local requirements.

Capacity

When a rail line enters a travel corridor, a rider trades the flexibility of an automobile for the speed and efficiency of rail transit. Trains run frequently and reliably and are not hampered by traffic congestion or weather conditions. And, rail provides capacity—one rail line carries more people, with greater speed and in less space than any other mode of urban transportation.

Rail transit is a natural for any heavily traveled, trunk-line corridor.

Currently the Bay Area Rapid Transit system operates trains of up to 10 cars every six minutes under San Francisco Bay into central San Francisco. That is 10 trains an hour, each with a passenger capacity up to 1100 riders or 11,000 passengers in one direction in one hour of the rush period. BART plans to reduce the interval between trains to three minutes, thus doubling the capacity. Twenty trains carrying 22,000 passengers in the peak direction could funnel riders to four downtown subway stations in one hour. In addition, these stations could accommodate

the same number of passengers coming from the other direction.

A 1976 study of the New York City Transit Authority's Lexington Avenue line revealed that its four tracks carry 211,350 passengers during the 3 p.m. to 7 p.m. weekday rush period. Capacity like that is hard to match.

By lengthening or shortening trains, the capacity easily can be manipulated to meet expected or unexpected passenger flows without additional construction and without any additional impact on the environment. No extra highway lanes are needed to handle the surges.

Philadelphia rail service, operated by the Southeastern Pennsylvania Transportation Authority, illustrates the point with ease. In 1972, a 1½-mile extension of the Broad Street subway was completed to the new 60,000-seat Veteran's Stadium. The rail facility is adjacent to the old Philadelphia Stadium and the newer 14,000-seat Spectrum, built for hockey, basketball and music performances.

About 15% of the attendance at the stadium travels by rail, which is available in only one direction because the station is at the end of the line. At a game with 40,000 attendance, this amounts to about 6000 persons or seven extra trains. From the time the ninth inning ends, those 6000 riders are out of the stadium and aboard trains in 21 minutes. While the transit baseball fans are speeding home arguing over the umpire's last call, motorists are still sitting in the stadium parking lot arguing over traffic—sometimes for as long as two hours. Road conditions worsen when the three facilities are in use at the same time.

When the attendance totals 60,000 to 100,000, a train leaves every two minutes with 400 persons a minute moving out while the automobile-bound driver stewes at his wheel.



moving people: the facts

- At three-minute intervals, 10-car BART trains can comfortably move as many as 22,000 passengers in one direction during one hour.
- At the end of a baseball game, Philadelphia subways get fans on their way within 21 minutes while the stadium parking lot takes as long as two hours to clear.
- For suburban residents, a well-coordinated rail/feeder bus network places access to the central city as near as the corner bus stop.
- Forty-seven percent of the riders who board the Lindenwold line at one station formerly made the trip by automobile.
- The Bay Area Rapid Transit Impact Program found that more than 50% of those making the same trip before the line's opening, did so by automobile.
- Construction costs for a suburban highway amount to 88¢ per person per mile as compared to rail construction costs of 20¢ per person per mile, according to one study.
- The interstate highway system is now expected to cost in excess of \$100 billion—almost three times the original estimate—and will be completed 15 to 29 years beyond the original completion date.

July 4, 1976—the nation's 200th birthday—in New York provides another dramatic illustration of capacity. On that day, when the stately, high-masted ships from all over the globe converged on New York harbor, public officials urged the celebrants to use transit because of the massive traffic jam they feared might occur. The celebrants listened and July 4 became a day when history was made once again.

The city subway carried 2.2 million riders compared to a normal Sunday load of 1.2 million. The Long Island Rail Road transported 107,300 people compared to a typical weekend figure of 44,500. The Hudson and Harlem commuter lines carried 55,000 passengers compared to 17,000 on that date, one year earlier. On the Port Authority Trans-Hudson trains, 135,000 riders boarded compared to the usual Sunday loading of 23,000.

The best part of the story is that vehicular counts for the day were some of the lowest ever recorded for a holiday period. The streets were left to the people for the largest birthday party that the world had ever seen.

Rail's capacity for getting people to jobs, to entertainment and to services is unequalled; and, aren't those the things cities are all about?

Coordination

Rail is used most efficiently when its service is carefully coordinated with a feeder bus network. Buses circulate through the neighborhoods adjoining rapid transit stations, transporting passengers to the train connection and returning them home later in the day. Although the traveler may live miles from the rail station, rail access is as close as the nearest corner bus stop. Today, rail system designers make special efforts to assure the ease and convenience of the bus/rail transfer.

Such unified systems are in operation in almost every metropolitan area served by rail including Washington, D.C., Chicago, Boston, Philadelphia, Toronto, Montreal and in the San Francisco region. In Toronto the coordination is so well defined that many bus routes literally enter the interior of the rail stations. With downtown office and shopping complexes also providing direct, underground access to the subway, it is possible for many Toronto Transit Commission patrons to leave the winter behind. Once TTC riders board the bus in the morning, they may not have to face the Canadian chill until they are back at their bus stop that evening.

Attractiveness

It is features like these that draw passengers to rail once the trains start running.

In 1969, three bus routes traveled Chicago's Dan Ryan Expressway. In September of that year, the Chicago Transit Authority opened its Dan Ryan rapid transit line in the median strip of the highway. Ridership jumped from 5100 per day on the buses to 110,000 per day on the trains. Additionally, almost 20% of the Dan Ryan rail patronage was either diverted from automobiles or represented new trips that were not made before.

Even more dramatic results come out of the Philadelphia-southern New Jersey region. The high-speed Lindenwold line, operating from suburban and populous Camden County into the central business district of Philadelphia, follows the right-of-way of a once deteriorated railroad commuter line which terminated in downtown Camden. Prior to construction of the Port Authority Transit Corp. or PATCO line, the railroad's ancient equipment was able to capture about 1200 riders a day. On opening day of the line's full length, PATCO carried 14,900 people. That figure has continually risen to its present level of about 42,000 revenue passengers traveling each workday.

In Haddonfield, one community on the line, 47% of the rail riders formerly drove cars, 37% came from buses and 13% had not traveled in that direction. About 3% had used the previously existing commuter rail service.

Also of significance is the traffic decrease that has occurred on the river bridge between Camden and Philadelphia. Traffic on the bridge has declined every year since 1969 as the sleek PATCO cars speed over the same span.

Chicago's Skokie Swift line has become legend in transit lore. Under an early federal, demonstration grant, the Chicago Transit Authority purchased five miles of an abandoned electric interurban line. With CTA's

Howard Street rapid transit station on one end and an expanded park-and-ride lot in Skokie on the other, rail cars began running in 1964. Expecting 1500 riders on opening day, CTA fare collectors were greeted by 4000 riders instead. That figure climbed to an average of 7500 daily passengers by the end of the third year of service.

Skokie, a 10-square-mile suburb northwest of Chicago, averages about 1.4 automobiles per household. And, consistent with this, about 86% of the Skokie Swift's passengers have one or more cars available to them. Yet, they have been attracted to the speedy, non-stop connecting service.

BART also has made impressive progress in attracting passengers. Based on about 120,000 passengers per day, the BART Impact Program found that more than 50% of those making the trip before, previously did so by automobile. And in 1977, an average of 135,000 travelers pass through BART turnstiles each day. In the busy Oakland-San Francisco trans-bay corridor, BART picks up 29% of the travel market during the peak hour. And, the silver cars have also raised area transit ridership in the off-peak many-fold.

Questions

1. What are the major advantages of a rail rapid transit system? What are the disadvantages? *speed, reliability, economy*
2. What are the problems involved in coordinating rail with a feeder bus system? *coordination, integration*
3. Comment on the use of freeway medians as transit routes. *freeway medians*

Session V

Public Transportation Systems
and Characteristics

Examples of Existing
U.S. Light Rail Transit Systems

Source: "Light Rail Transit," Special Report 161, TRB. Article
by Robert S. Korach, Port Authority Transit Corporation
of Pennsylvania and New Jersey.

The simplest type of light rail transit system in the United States is the Mattapan-Ashmont Hi-Speed Line in Boston. Its main function is to provide extension feeder service to a major Boston heavy-duty rapid transit line. It handles about 14,000 rides each weekday on a very short route with about a 20-min round-trip time. Frequencies during rush hour are about every 2 min; only 1-unit vehicles are used. Off-peak service varies from 6 to 24 min; there is no 1:00 a.m. to 5:00 a.m. operation. Control of the vehicles on this line is strictly by the sight of the operator; there is no signal system. Average speeds between stops are about 30 mph (48 km/h). There are few blind spots on the line, and this simple system has proved to be very safe during its many years of operation. The regularly used switches on the line, which are at only 1 terminal, are manually controlled. Simplicity and success describe this small but important light rail operation.

Another excellent example of a simple light rail rapid transit system is the Newark subway. This line is approximately 4 miles (6 km) long and has a running time in each direction of about 12 min. Round trips can easily be made in 30 min; rush-hour operation runs on an even tighter turn-around time. The line runs a single-vehicle operation each day from about 5:00 a.m. to 1:00 a.m. the next morning. On weekdays, headways vary from better than 2 min in the rush hours to 30 min in the late evening. Midday services range from 4 to 7 min. The Newark line runs from one terminal to another without any diverging routes. Operation over most of the route is controlled by a signal system that provides rear-end protection and a few timing devices to control speed. The operator of the vehicle observes these signals when making the round trip. At one end of the line cars are stored in a yard. In this area, during rush hours, switches are controlled from a tower. A simple display board that shows track occupancy is available for the control to use. All other switches on the line, which consist mostly of emergency crossovers, are manually operated.

A slightly more complicated type of operation is the Shaker Heights, Ohio, rapid transit system. This line, which has a 60-min round-trip cycle, has frequent rush-hour service but includes a route diversion in the form of 2 branches. Rush-hour frequencies on the trunk portion of the line are as close as 2 min; there is both single-unit and multiunit train operation. Base service is generally 10 to 30 min. A turnback loop with a 30-min round trip is available at the junction of the 2 branches for certain short-routed schedules. Control of the system is by simple signals that give rear-end protection and must be observed by the operators. The switches at the diverging point and at wayside turning loops are controlled manually by the operator. A further complication in the movement and control of this system is its 2-mile (3-km) joint operation with the Cleveland Transit System (CTS) rapid transit line. Trains of both systems are given preference automatically on this joint section of track in the order in which they entered the section. A manual override of this system is available to a central dispatcher who controls only CTS trackage. The signal system in the joint track area is equipped with track trips to give positive rear-end protection for both Shaker Heights and CTS vehicles. Surprisingly, the Shaker Heights rapid transit downtown terminal has all of its switches manually controlled, which alleviates the need for a control center or dispatcher. The equivalent of a dispatcher is always on Shaker Heights rapid transit property mainly to coordinate the crew assignments and to manually control the train operation by issuing orders.

The most complicated type of light rail operation running today is the Green Line System in Boston. This system currently handles about 175,000 rides each weekday. The trunk portion of this system is an amalgamation of 5 outer-end branches, and there are many forms of short-turn operations on both the trunk and branch lines. Multicar operation is used during the rush hour for most services; and branch-line headways are about 4 min. The trunk headway is therefore better than 1 min and is controlled by a simple rear-end-protection signal system. Because of the density of operation on the trunk portion, there are certain locations where vehicles or trains can close up on each other only by using sight observation. Timing devices also are used when they are needed for further protection. Switches at the diverging points and at most short-turn points are controlled by the power on-power off method. There is no central control over this heaviest of light rail operation.

In summary, it can be seen that light rail is readily adaptable to the simplest of movement and control systems. If greater sophistication is desired in either of these areas, light rail can be adapted to perform but at greatly added expense and with higher maintenance problems. If the purpose of light rail is simplicity and if it is to be a cost-cutting method of obtaining fixed guideway transit service, simple operating methods and controls should be considered. If used properly, they will ensure a safe, convenient, and popular transit service.

Questions - V

1. Comment on the adequacy of the control systems for each of the examples, particularly as they affect headways.
2. Given that highway facilities would be available, would express bus service be able to provide equivalent service? Why?

SESSION VI: PUBLIC TRANSPORTATION SYSTEMS AND
CHARACTERISTICS - BUS AND PARATRANSIT

Objectives of Session VI

- . To be able to define basic types of bus and paratransit systems
- . To be aware of the trade-off situations in the selection of a particular type of system
- . To be aware of the necessity to coordinate and integrate new transit systems into the public transportation system

Synopsis of Session VI

General descriptions of each type of system are given by delineating their characteristics of equipment, capabilities, cost, service, and application.

Outline for Session VI

<u>Part</u>	<u>Subject</u>
1	Bus Systems
2	Paratransit
3	Innovative Systems
4	Summary

SESSION VI: PUBLIC TRANSPORTATION
SYSTEMS AND CHARACTERISTICS- BUS

1. Bus Systems

a. Definition. Conventional bus systems refer to those transit systems serving urban areas mainly by urban buses on fixed routes and schedules, available to all interested users, and charging a published set of fares.

b. Physical and operating characteristics. The characteristics of bus systems vary by the route functions they serve. For example, bus rapid transit are buses operating on exclusive right-of-way-which provide different operating characteristics (e.g. higher average speed) than buses on city streets. (Bus rapid transit is also discussed in Session VII.) Typical normal service speeds are presented in Table VI-1. As operational conflicts increase, bus service speeds decrease as for mixed traffic in a CBD.

Table VI-1. Typical Bus Speeds

<u>Type of Service</u>	Normal Service	
	<u>Speed (mph)</u>	
	<u>Peak</u>	<u>Off-Peak</u>
Local Bus (Small City) in CBD	10	12
Local Bus (Large City) in CBD	5	7
Local Bus in Bus Lane in CBD	8	10
Local Bus on Arterial Street	10-11	13-15
Local Bus on Arterial Reserved Lane	15	17
Express Bus on Freeway	30	45
Express Bus in Exclusive Bus Lane	45	45

Source: Ref. 2

Bus headways are affected by the same type of factors which affect rail transit headways such as system policy, patronage, stops, etc. Typical minimum average headways are presented in Table VI-2. Conditions at critical stop areas (berth design, location, etc.) usually determine the minimum headway for an overall route. Bus headways are not an important safety consideration as in rail transit operations. Rather, bus headways are more important in schedule planning and adherence for routes.

Table VI-2. Typical Minimum Headways (during the peak 15 min of the peak hour)

<u>Vehicle and Facility Type</u>	Passenger Stops Along or Affecting Route Section Involved	Headways (in sec)	Resulting
			Nos. of
			Buses Per Hour
Buses in mixed street traffic	Yes	40-60	90-60
Buses in exclusive street lane	Yes	18-50	200-72
Buses in mixed freeway traffic	Yes	40-60	90-60
Buses in mixed freeway traffic	No	10-30	360-120
Buses in exclusive busway	Yes	25-35	144-103
Buses in exclusive busway	No	5-30	720-120

Source: Adapted from Ref. 1

Bus stops (location, spacing, etc.) are primary factors in passenger service but have a general tendency to increase travel times as their frequency increases. Typical bus stop spacings are listed in Table VI-3.

Table VI-3. Typical Bus Stop Spacings

Service Type	Linear Spacing (ft.)		
	CBD's	Non-CBD	
		Typical Traditional Practice	Typical Contemporary Practice
Local bus, urban	400-800	500-800	1000-1500
Limited-stop bus, urban	400-800	1200-3000	2000-5000
Express bus, urban	500-1000	4000-30,000	1-30mi

Source: Ref. 1

Bus system capacities depend mainly on vehicle and facility type. Estimated passenger capacities are given in Table VI-4. The effect of factors inherent to different types of bus operations on capacity is the same as their effect on average bus speeds. For example, as bus stops and operational conflicts increase, bus route capacities and bus speeds decrease.

Table VI-4. Passenger Capacities per Lane (hourly rate, in one direction of travel, during the peak 15 minutes of the peak hour)

Vehicle and Facility Type	Seated Only	Total Seated Plus Standing
Minibus-midibus		
a. in mixed street traffic	900-2300	1500-4000
b. in exclusive street lane	1100-3000	1800-5400
City-suburban transit bus, non-articulated		
a. in mixed street traffic	1800-5000	2700-9000
b. in exclusive street lane	2200-6600	3200-12,000
c. in mixed freeway traffic ¹	1800-5000	2700-9000
d. in mixed freeway traffic ²	3600-19,800	5400-36,000
e. in exclusive busways ¹	3100-7900	4600-14,400
f. in exclusive busways ²	3600-19,800	5400-36,000
City-Suburban transit bus, articulated		
a. in mixed street traffic	2100-6700	6000-15,300
b. in exclusive street lane traffic	2500-9000	7200-20,400
c. in mixed freeway traffic ¹	2100-6700	6000-15,300
d. in mixed freeway traffic ²	4200-27,000	12,000-61,200
e. in exclusive busway ¹	3600-9000	10,300-20,400
f. in exclusive busway ²	4200-27,000	12,000-61,200
City-suburban transit bus, double-deck		
a. in mixed street traffic	3000-6700	3900-8100
b. in exclusive street lane	3600-9000	4700-10,800
c. in mixed freeway traffic ¹	3000-6700	3900-8100
d. in exclusive bus line	5200-10,800	6700-13,000
¹ Stops		
² No Stops		

Source: Ref. 1

Table VI-5. Typical Bus Capacities

Vehicle Type	Per Single Unit		
	Seats	Standees	Total Passengers
Minibus-midibus	15-25	10-20	25-45
City-suburban transit bus:			
non-articulated	30-55	10-50	45-100
articulated	35-75	30-120	100-170
double-deck	50-85	15-30	65-100

Source: Ref. 1

UMTA's TRANSBUS program is intended to develop 40-foot vehicle designs using the best available existing technology. Improvements include: 1) Improved comfort and ride quality to make buses more competitive with the private auto; 2) Improved safety for passengers, pedestrians and occupants of other vehicles; 3) Reduced maintenance costs and easier maintainability; and 4) Specific improvements - such as lower floor, lower and fewer steps, more secure interior arrangement, improved lighting and information display - to facilitate use by the elderly and handicapped. UMTA tentatively discontinued the TRANSBUS program in 1976.

The trolley bus, as a practical transportation vehicle, first came into widespread use in the 1930's although prototypes had been in operation for twenty years prior to that time. The trolley bus combined the traction principles of the streetcar with the flexibility and lower cost of the motor bus. The initial use of the trolley bus was to replace streetcars on low volume lines or to provide low cost extensions of streetcar systems. The introduction of the trolley bus proved successful both with the patrons and with transit operators and was soon in widespread use around the country. Although World War II put a halt to transit development, the trolley bus' popularity increased even more after the war's end. It was cheaper to pave over the street car tracks and use trolley buses than it was to buy new street cars. However, within a few years the diesel engine was vastly improved and became standard equipment for buses. Diesel buses could operate cheaper than trolley buses and had greater flexibility. By the early 1950's the use of trolley buses began to decline. At that time, 34 cities were utilizing trolley buses.

The renewal of interest in trolley buses began in recent years with increased emphasis on lower polluting, less noisy vehicles and cheaper substitutes for oil-fueled vehicles.

At this time only one manufacturer (Flyer Industries, of Canada) in North America produces trolley buses. The vehicle uses the same body as the AM General Bus. The electrical equipment is located where the engine normally is. Seating capacity is in the 49-51 seat range.

The trolley bus has equivalent operating characteristics to the V-8 diesel bus, largely because of improvements of the latter in recent years.

The most recent cost of a new trolley bus was in excess of \$100,000 per vehicle. Operating costs are fairly equal but when the cost of maintaining the overhead power supply is included, slightly higher trolley bus operating costs result.

Trolley buses have the disadvantage of limited maneuvering range and because of this are more prone to traffic caused delays.

At this time, several cities, including San Francisco and Dayton, have trolley buses in service and others are considering their use.

c. Costs. Because conventional bus transit uses existing streets there are no large direct guideway costs as in rail transit. However, exclusive busways are significant cost factors. (These are discussed in detail in Session VII.)

Conventional bus system operating costs are presented in Table VI-6. Costs vary by locale and system size. Wages are a major cost item, comprising about 65 percent of the total transit industry's 1974 operating expenses. The cost due to wages are reflected in the values under "Transportation," which include driver's wages, fuel and oil, tires, etc; and "Maintenance" and "General and Administrative" items.

Operating costs per vehicle mile vary inversely with operating speed, i.e. the higher the operating speed the lower the cost per vehicle mile. This results because the same hourly operator wages (highest cost item) are spread over more vehicle miles as operating speed increases. Thus, any action taken to accelerate bus service, such as better bus stop location, preferential treatment, etc. not only attracts passengers but saves on operating costs.

Table VI-6. Bus Operating Costs 1973
(per bus mile)

	<u>Typical</u>	<u>Range</u>
Maintenance of Garage and Equipment	\$0.18	\$0.08-\$0.42
Transportation	\$0.57	\$0.25-\$1.34
Station and Advertising	\$0.02	\$0.01-\$0.05
Insurance and Safety	\$0.06	\$0.02-\$0.13
General and Administrative	\$0.11	\$0.05-\$0.26
Taxes and Rent	\$0.06	\$0.03-\$0.15
Total	\$1.00	\$0.44-\$2.35

Source: Ref. 2

d. Capabilities/Constraints. The major characteristic of buses is their ability to operate over the existing street and freeway system. As a result, new bus systems can be installed, and major service changes can be made in a

relatively short time period. Buses can be used to provide special services such as charter, school transport, sporting or other local events, etc.

As noted previously, bus systems comprise the large majority of urban transit systems for CBD distribution. Buses can also be used on suburban feeder lines for rail transit or bus line haul routes.

Preferential line-haul service is another application for buses. Preferential treatment such as exclusive busways on freeways and arterials have been successful, such as the Shirley Highway (I-95) bus and carpool facility.

The relatively low capital cost of bus systems provide flexibility and innovation in service and equipment. Typical examples lie in paratransit: demand-responsive systems, subscription-bus, and specialized service and equipment for the elderly and handicapped.

A number of aspects of bus transit related to vehicles, service (coverage, frequency, etc.) and bus stops, have made bus use unattractive to people, particularly in comparison with the auto's personalized service. Declining ridership and transit service improvements is a complex problem involving numerous issues which are addressed throughout this notebook. It is worthwhile to point out, however, that transit service improvements in the past have been constrained by financial deficits and often an unwillingness by the transit industry to institute changes. Now, with federal support, improvements in several areas of bus transit service and facilities are possible.

2. Paratransit

a. Definition. Paratransit refers to the forms of passenger transportation which are available to the public, are distinct from conventional transit, and can operate over the highway and street system. Shared-ride taxis, carpools, rental cars, and subscription bus clubs are often included under the definition.

b. General characteristics. Paratransit systems have actually been in operation in one form or another almost since the inception of the automobile. For the most part, they have been operated by the private sector and have risen and fallen according to the prevailing economic conditions and constraints.

Paratransit modes fall between private automobiles and conventional transit modes in the spectrum of urban transportation services. These systems have common characteristics in that--

- . They are designed to respond directly to demand without fixed schedules and routes, except where they are prearranged as in carpools and subscription bus operations.
- . They have origin-destination capabilities approaching those of the private automobile but are more public in character.
- . Their capital cost per vehicle is usually lower than conventional transit vehicles.

c. Types of Systems

1) Hail or phone services. Taxi, dial-a-ride, and jitney services have a common characteristic: they are hailed or telephoned by prospective users. Dial-a-ride (demand-responsive) service is most easily described as shared ride service summoned by telephone, and new calls may be answered while other passengers are still in the vehicle. The service is inferior to regular taxi services because it involves route deviation and greater uncertainty of arrival time, but offers potential cost savings over taxi service through higher vehicle occupancy. Jitney service differs from both taxi and dial-a-ride in operating on essentially fixed routes. It differs from conventional bus transit since jitney vehicles operate on relatively short headways with no fixed schedule, and are hailed on the street.

An important operating characteristic of taxi, dial-a-ride, and jitney services is that all can be provided by the taxicab. However, there are very few cities in the United States where existing regulations would permit a taxicab operator to offer this range of services, since jitney services are illegal in all but a few U.S. cities by regulation passed by the early 1920's. Relatively few cities seem to have the regulatory provisions necessary to encourage taxicabs to offer formal dial-a-ride services.

Taxicabs are subject to extensive public regulation in U.S. cities in four major areas: entry control, financial responsibility, service standards, and fares. Entry (right to operate) controls are numerical limitations on taxicabs, restrictions on the number of taxicab firms, or regulations allowing monopolistic operations in specific jurisdictions. For example, New York City has a limit of 11,787 on vehicle medallions (with buying prices which have ranged up to \$35,000 each), while Washington, D.C. has "free entry" for taxicabs and 8500 taxicab licenses. Los Angeles is divided into six taxicab zones, and one cab company has exclusive rights to operate in one zone. Many cities also grant exclusive franchises for taxicab services to airports and rail stations.

In 1973 there were approximately 3400 communities served by taxicabs. Financial responsibility, in particular public liability insurance, has been regulated since the 1920's when many operators went out of business with unpaid liability claims. Regulations relating to service standards include vehicle design and safety standards, driver qualifications, and prescribed methods of operation, including number of passengers, conditions for group riding, the use of cab stands, cruising and hailing restrictions, and conditions under which service requests may be refused. Fare regulations deal with the level of fare and the rate structure, the two main alternatives being the meter system and the zone system. Shared-taxi services operating door-to-door qualify as demand responsive transportation. Several successful taxi-based demand responsive transportation services presently operate in the U.S., and the taxi industry has recently indicated strong interest in participating in the development of demand responsive transportation.

The basic operation of a demand responsive transportation service involves dispatching a vehicle in response to a telephoned request for service to carry the patron to his destination, while simultaneously accommodating in the vehicle, other patrons whose requests for service are compatible in terms of both time and geography. The actual number of intermediate stops made between the origin and destination of a particular passenger will vary with the pattern of demand responsive transportation service offered, the time of day, the capacity of the vehicle, the level of service offered, as measured in terms of waiting time and travel time for passengers.

The basic elements of a demand responsive transportation service are: a fleet of vehicles, a means of communication between the patron and the service, a means of communication between the service and the vehicle drivers, and a control center to receive requests for service and schedule and dispatch vehicles. Around these basic elements, a variety of systems is possible in terms of organization, degree of automation, equipment, work force, service patterns, size of service area, and role in the overall public transportation system.

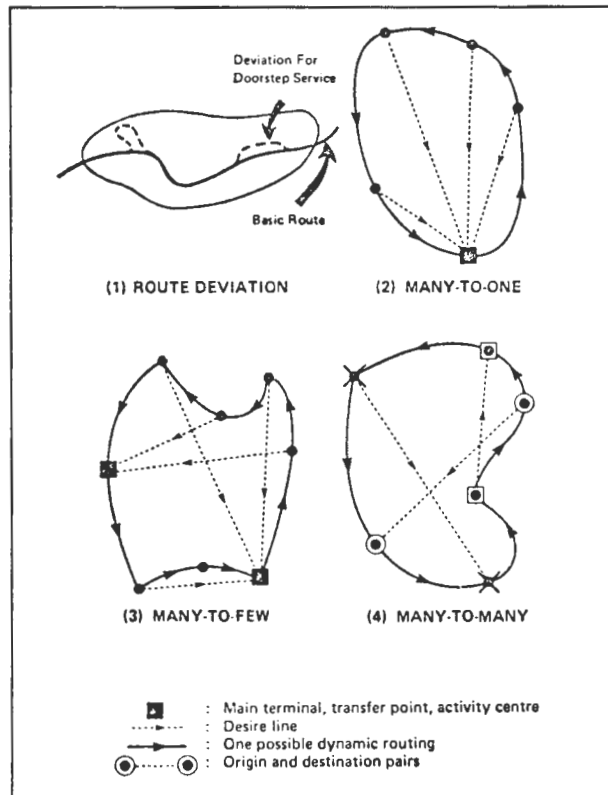
There are two kinds of demand responsive transportation service illustrated in Figure VI-3. The first, route deviation, is a limited form, in which a vehicle will deviate from a regular fixed route to pick up or discharge a passenger at a requested location, typically within several blocks of the main route. The more common kind is known as "pure" demand-responsive service, wherein the routing and scheduling of vehicles depends entirely on the particular requests of patrons. Three variants of the pure form may be employed as a basic service pattern:

- . Many-to-one -- providing transport from several origins to a common destination, such as a shopping center or bus terminal.
- . Many-to-few -- providing transport from multiple origins to a few destinations, such as major activity centers or points on a downtown loop.
- . Many-to-many -- providing transport between any origin-destination pair in the service area without limitation.

These service patterns may be used alone, in reverse, or in combination throughout a service area or on a zonal basis, depending on the characteristics of the service area.

A number of dial-a-ride (demand-responsive) systems have been installed (and abandoned) in the United States and Canada. Many of these systems have similar characteristics. The most common feature of the demand-responsive transit systems is the size and character of the service area. In most instances, the population of the service area is less than 20,000 and the area is residential in character although demand-responsive systems could operate over large areas and serve large and varied population groups.

Almost all of the agencies providing dial-a-ride service are using vans or small buses, ranging in size from 10 to 12 seats to 19 to 25 seats. The smaller vehicles appear to be adequate for many-to-many service, with the larger vehicles employed for many-to-few operations. In general, smaller buses and vans would be more acceptable in the residential areas.



Source: Ref. 6

Figure VI.3. Demand-Responsive Service Patterns

Thus far, a predictable ratio of fleet size to population size of service area has not emerged. In part, this is due to the differences in area and population characteristics and the availability and quality of alternative transportation services. More experience is needed to determine the optimum balance between level of service and costs.

The majority of the existing dial-a-ride systems provide many-to-many service. Only a few are limited to route deviation, yet this is the simplest form of service to manage. Furthermore, most of the systems rely exclusively on manual dispatching.

The overall cost of operating a demand-responsive system is a function of both wages and the level of service to be offered (the number of buses in operation). Wage rates vary greatly from system to system. Net cost (or profit) to the operators (the difference between operating costs and revenues) varies directly with both fare level and vehicle productivity. A rule-of-thumb cost figure is difficult to establish based on present systems. For example, a system with relatively low wages could, even with low vehicle productivity, produce acceptable financial results. (Current experience does indicate, however, that dispatching and control account for about 25 percent of operating costs.)

2) Hire and Drive Services. For the hire-and-drive group of paratransit services, two distinct types are daily car rental services and short-term auto rental. Daily rental car describes the hiring of automobiles by rental agreement for periods of at least a day and at most a year, as provided by Hertz, Avis, Budget, and a number of other well-established private rental car companies. A growing market of business and tourist travelers has resulted in expansion and improvement of daily car rental services. Absence of restrictive regulation has led to vigorous competition and to the development of special club services to facilitate checkout and attract customers. As a result, daily car rental operations are highly efficient and quick to respond to changing demand.

Short-term auto rental service permit the traveler to rent automobiles trip by trip from centrally located terminals. Possible applications of this concept, yet to be tried in the United States, range from renting regular automobiles at residential or business complexes to a much larger scale system within a shopping or business district with ubiquitous terminals, small electric vehicles, automated check-in and checkout, and computerized schemes for redistribution of vehicles. Most of the previous research in the U.S. has been directed at the latter application, which has been characterized both as "minicar" service and as a "public automobile system." The use of small electric vehicles has been advocated as a means for reducing pollution and congestion within the area served; the merit of this suggestion, however, will remain unclear until such a scheme is demonstrated.

3) Prearranged Ride-Sharing Services. The term "pre-arranged ride-sharing" has been used to describe services in which a group of travelers make an agreement to travel together on a regular basis. The two most common forms of this service are the car and van pooling and subscription bus. These services can usually be conducted at high levels of vehicle occupancy and at quite low cost per passenger mile.

Services of this type involve some route deviation to pick up and drop off individual travelers, but this is usually confined to relatively minor collection and distribution patterns at the beginning and end of the trip, and accounts for only a small proportion of the total trip time. The schedule is fixed by agreement of the travelers and is essentially inflexible from the point of view of an individual traveler. Pre-arranged ride-sharing service is superior to conventional transit in that they provide essentially door-to-door service and the major portion of the trip is an "express" ride. They have a disadvantage however, of schedule inflexibility, although riders are usually already tied to fixed work or recreation schedules.

Given enough incentives, the private sector can develop such alternatives as: common forms of carpooling, company-sponsored van pools, company-operated bus service, privately owned and operated bus services, services provided by neighborhood cooperatives, school bus services with part-time or volunteer drivers, and to some small degree, services provided by taxicabs and by conventional transit operators.

About 1000 vans are estimated to be in use by 50 firms in the United States for transport of employees from homes to jobs. Van pooling now takes several forms, including single-firm ventures (e.g., 3M Co. in Minneapolis/St. Paul), mingling of employees of several firms (e.g., Atlantic Richfield, Crocker Bank and Commuter Computer in the Wilshire district of Los Angeles) and brokerage (an idea of University of Tennessee researchers in which a van is leased to an individual by an agency who also provides matching ridership services as well).

Experience indicates that prearranged ride sharing services are most attractive where: trip origins and destinations are concentrated in small areas separated by a relatively long trip, there is some disincentive to private automobile travel, such as long, time consuming trips, severe highway congestion, high parking charges or restrictions, or limited access to private automobile.

Carpooling and subscription bus services are used almost exclusively for peak-hour work trips between residential areas and large employment centers. Many of the users of these services have been diverted from private automobile use, and, in Reston, Virginia, for example, have actually reduced the number of automobiles owned by their families as a result of the services. Carpooling is highly organized in some locations, and includes computerized matching of potential users and special parking privileges for high-occupancy vehicles. Subscription bus services are well patronized in locations where they have been implemented. Where part-time drivers are employed, these services are able to operate at remarkably low costs per seat-mile.

The costs of providing pre-arranged ride-sharing services can vary substantially with the mode of operation. Specialty Transit, a privately owned and operated subscription bus service for workers at the McDonnell Douglas Plant in St. Louis, operates like a large carpool with one of the passengers serving as driver and fare-collector. The buses are parked during the day at the plant, and costs are just over one cent per passenger trip mile. Carpools and van pools operate at between 1.6 and 3.0¢ per passenger trip mile, but more costly forms of subscription bus service, using charter buses and drivers from transit authorities, can cost as much as 5.5¢ per passenger trip mile. A crucial element in the costs of these services is labor; bus operator costs make up over half the cost of the Reston service.

Regulation of bus and van subscription services has not created any major difficulties to date. Interstate services are regulated by the Interstate Commerce Commission, and intrastate services by Public Utilities Commissions. Safety and equipment standards, proper licensing, and financial responsibility have been required, and existing services have generally prevailed in suits of unfair competition filed by competing services. Many of the employer van pool services are not considered as public utilities and are exempt from regulation. Several states (including Connecticut, Maryland, California, Tennessee, and Minnesota) have exempted, by differing degrees, van pools from regulation. Share-the-expense carpools are similarly free from regulation.

Federal support for van pools has recently been made available to employers through the states. The Federal Aid Highway Act of 1976 provides that federal-aid highway funds may be used by the states for 90 percent of the costs to acquire 8 to 15-passenger vans; to pay personnel

and other direct expenses of establishing van pool programs; and to recover any actual financial losses incurred if the van pool project fails.

The legislation stipulates that if a van pool project is supported by the state from federal funds, then commuters using the vans must be charged a proportionate user fee or rider fare to cover the reasonable costs of vehicle operation, maintenance and depreciation. This interest-free loan of federal-aid funds used to acquire the vans must be repaid from riders' fares within four years.

Federal-aid highway funds can also be used for implementing other aspects of car/van pool and bus programs and improving the utilization of existing highways for pool vehicles.

Capital and operating assistance funds of the Urban Mass Transportation Administration (UMTA) can also be used to assist cooperative ridesharing projects such as commuter van pools, subscription buses, and other cooperative services for the transportation of small groups.

Experience with prearranged ride sharing services provides some insight for conventional transit systems. Personalizing services to demand has been found essential to attracting and retaining ridership on these modes. Reliability, guaranteed comfortable seating, and even coffee and donuts are a common service feature. Routes and schedules are modified constantly as demand changes. Access to the services is facilitated by route and schedule information, advertising, and schemes for soliciting and matching riders. By comparison, conventional bus transit often appears an uninteresting and unattractive service.

d. Paratransit Applications.

Paratransit basically applies to new markets, rather than as a substitution for conventional transit service. Its role in public transportation is a complementary and supplementary one.

1) Feeder Service. The collection and distribution of demand-responsive transit provides door-to-door service for commuters and improves the overall level of service available to all transit patrons. Travel to and from airports and intercity bus and rail terminals holds considerable potential for taxicab services; some 15 to 20 percent of airport access trips are made by taxicab. Rapid growth in air travel over recent years has resulted in heavy demands on the ground access systems to airports, where parking price increases have been necessary to guarantee space for those prepared to pay for it.

2) Low-Density Demand Service. Travel demand in many low-density suburban and small areas and at late evening and early morning hours in large areas is often too low to support scheduled transit service. Experience to date suggests that this travel demand can be served efficiently by dial-a-ride and regular taxi services. Substitution of these types of service for conventional transit may be a good means of relieving existing transit services of unprofitable parts of their operation.

Another type of low density travel demand is limited mobility groups, traditionally classified as the young, unemployed, poor, elderly and handicapped. Demand responsive transportation vehicles can be designed to accommodate wheelchairs or other special equipment for the infirm or handicapped. Many elderly persons cannot

negotiate the steps or long walking distances involved in using traditional transit, cannot afford the expense of taxi fares, and do not have an automobile available. Demand responsive service can be tailored to their needs.

3) Line Haul Service. The home-to-work trip presents considerable potential for expanded application of prearranged shared rides. A strong preference for low-density suburban living is still being demonstrated by a substantial proportion of the U.S. work force, and much business and industrial activity continues to be located in areas of relatively high employment density where all-day parking is expensive. In serving work trips, prearranged ride sharing presents the attractive possibility of reducing the number of automobiles owned by families.

School trips also share the characteristics appropriate to prearranged ride-sharing services, and school buses provide a form of subscription service. School bus systems generally have their own vehicles and operate with very low labor costs. Entertainment and recreation travel is often suited to some form of subscription or charter bus services, e.g., travel to large sports arenas or performing arts centers. Finally, shopping and personal business trips in low-income areas are sometimes served conveniently by some form of inexpensive carpooling or subscription services.

4) CBD Distribution. Mobility within business and commercial districts can be improved by taxi, dial-a-ride, and jitney services. These services are particularly well-suited to serving the short business and shopping trips made within business and commercial districts; taxi service offers the speed and schedule reliability required by the business traveler, and dial-a-ride and jitney services can provide the low cost mobility sought by the shopper. Short-term rental cars have also been proposed for internal circulation within business and commercial districts.

3. Innovative Systems

a. Definition. Innovation refers to something new. During the last 40 years, innovation in public transportation has been practically nonexistent. Innovation has recently become a major concern on the federal level where UMTA's Office of Research and Development is searching for improvements to urban mass transportation systems.

In practical terms, there is no completely new system in public transportation. Defining innovation in transit is a matter of degree -- what is new about the system? Basically, innovation is really the degree of changes (which are hopefully improvements) in certain characteristics of a system. In transit, several important changes in service, vehicles, and facilities have come about.

The emphasis on marketing, the brokerage concept of providing transit service, and user-side subsidies are a few examples of relatively new service-related aspects in public transportation. Vehicle-related improvements can be found in the Transbus, LRV, SOAC, and Automated Guideway Transit (AGT) programs for making transit vehicles more attractive, usable and effective.

b. Modal Innovation. Modal innovation lies in the areas of paratransit and automated guideway transit (AGT). Paratransit innovation basically applies to improvements in service and vehicle characteristics. Taxis and carpools are not new, but the widespread implementation of changes in their use is new. For example, preferential treatment for carpools on freeways has only recently been installed and now undergoing a higher level of user evaluation such as on the Shirley Highway.

Automated guideway transit (often referred to as people mover) is a form of new technology for mass transit utilizing driverless vehicles over exclusive guideways. The capacity of the vehicles ranges from one or two up to 100 passengers. Single units or trains may be operated. Speeds are from 10 to 40 miles per hour. Headway varies from one or two seconds to a minute. There may be a single route or branching and interconnecting lines. Three categories of AGT are:

- . Shuttle-Loop Transit (SLT)
- . Group Rapid Transit (GRT)
- . Personal Rapid Transit (PRT)

1) Shuttle-Loop Transit (SLT) - This is the simplest type of AGT system. Vehicles move along fixed paths with few or no switches. The vehicles of a simple shuttle system move back and forth on a single guideway, the horizontal equivalent of an automatic elevator. They may or may not make intermediate stops. Vehicles in a loop system move around a closed path, stopping at any number of stations. In both shuttle and loop systems, the vehicles may vary considerably in size and may travel singly or coupled together in trains. Example: Tampa International Airport.

2) Group Rapid Transit (GRT) - These systems serve groups of people with similar origins and destinations. The principal differences between GRT and the simpler SLT are that GRT tends to have shorter headways and a more extensive use of switching. GRT stations may be located on sidings off the main guideway, permitting through traffic to bypass. GRT guideways may merge or divide into branch lines to provide service on a variety of routes. Vehicles with a capacity of 10 to 50 passengers may be operated singly or in trains. Headways range from 3 to 60 seconds. Example: AIRTRANS, Dallas/Fort Worth Airport.

3) Personal Rapid Transit (PRT) - The term PRT is restricted to systems with small vehicles carrying either one person or groups of up to six usually traveling together by choice. Plans for PRT systems typically include off-line stations connected by a guideway network. Under computer control, vehicles switch at guideway intersections so as to follow the shortest uncongested path from origin to destination without intermediate stops. Most proposed PRT systems call for vehicles to be operated at headways of three seconds or less. Example: Cabintaxi in Germany is a prototype; there are no systems in passenger service.)

Four cities (Cleveland, Houston, Los Angeles, and St. Paul) were selected in 1976 for funding of demonstration people mover systems. The objectives of the demonstration systems are to evaluate system operating cost, economic impact on the urban area, and overall feasibility for feeder distributor transit functions.

4. Summary

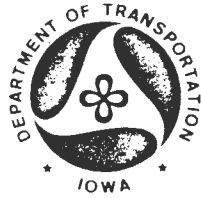
Conventional bus transit is the predominant mode serving urban areas. Many of its aspects relating to service, vehicles and facilities are major targets for improvement to make bus transit more attractive and usable. Paratransit systems are relatively new in the sense of widespread implementation and coordination with existing transit. Innovative systems refer to existing systems with new ways of financing or service provision and to new modal systems such as automated guideway transit. Technology exists for implementation but more experimentation is underway to evaluate these "new" systems in terms of public acceptance and their impact on land use, institutional relationships, and transportation needs.

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BUS SPECIFICATION & PRICE SUMMARY

DECEMBER 1976



Public Transit Division
 Terrence L. Fritz, Director
 (515) 281-4265

CAUTION: DATA IS SUMMARIZED. FOR PRECISE PLANNING DATA CONTACT IOWA DEPARTMENT OF TRANSPORTATION.

Small	Max. Pass. Cap.	Overall Length (feet)	Turning Radius (feet)	Empty Weight (lbs.)	1st Step Ht. from street (inches)	Floor Ht. from street (inches)	Headroom (inches)	Engine			Est. Oper. Life (Miles) $\pm 20\%$	Current Base Price, \$	Extra (Cost), \$			Est. Del. Time (Days)	Uniform Annual Capital Recovery Costs, \$	Per Seat Annual Costs, \$
								Mfr. Fuel	HP	MPG			Air Cond.	Wheel-chair Lift	Deluxe Seats & Carpets			
Checker Motors Corp (616) 343-6123 Kalamazoo, Mich. Aerobus	15	23.7	58.9	5,467	13.25	13.25	39	Chev.-G	165	10	200,000	9,460	790	N.A.	N.A.	70	6,043	402
Coach & Equip. Sales (315) 536-2321 Penn Yan, New York Fortivan Commuter	16	17.7	26.5	6,800	13.5	26.25	74	Dodge-G Chev.-G	280	12	140,000	11,750	1,100	1,700	265	90	10,492	655
Fortibus	15	19.5	26.8	7,150	10	29	74	Ford-G Dodge-G Chev.-G	226	12	175,000	14,250	1,250	1,790	150	120	10,093	673
Fortibus Commuter	20	21.2	26.8	7,390	10	29	76	Ford-G Dodge-G Chev.-G	226	12	175,000	17,300	2,250	1,900	Std.	150	12,389	619
Collins Industries (316) 663-4441 Hutchinson, Kans. Omni/Bus	20	21.8	35	8,280	8	25	76	Ford-G	225	10	200,000	19,500	4,000	1,800	1,200	90	13,485	674
Fleury Industries (306) 373-1363 Saskatoon, Canada Model 2000	15	19.6	26.8	7,020	12	31	74	G M -G G M -G G M -G G M -G	145 175 145 175	11	150,000	19,200	580	1,000	1,200	120	15,575	1,038
Model 2200	18	22.2	28.2	7,600	13	31	77.5			10	150,000	22,600	580	1,000	1,200	120	18,002	1,000
Grumman Allied Ind. (516) 741-3500 Garden City, N.Y. Jitney	15	18	25	6,140	15 or 10	31	77.5	Chev.-G	240	8	200,000	10,500	2,500	2,500	2,000	90	8,906	594
17	19	20	26	7,900	13 or 10	31	77.5	Chrysl- ler-G	240	8	200,000	18,000	2,500	N.A.	2,000	90	11,499	603
Arporter	19	23	29	8,175	10	31	77.5	Chrysl- ler-G	240	8	200,000	21,000	2,500	N.A.	2,000	90	12,976	683
Mercedes-Benz (312) 455-9131 Franklin Park, Ill. 0309D	19	19.7	20	7,960	13.5	32.4	74.8	M. Benz- D	80	15	300,000	21,438	4,713	5,000	1,745	90	10,469	551
Micro Bus (213) 923-3221 Downey, Calif. Model 2200	15	22.6	25	9,450	12 ²	30	84	Chrysl- ler-G	175	8	125,000	22,000	2,500	6,000	4	120	21,612	1,441
RICD-Recreational Ind. (216) 393-1518 Warren, Ohio Transmode	19	26 or 23	28.2	9,400	8	18	75	GMC-G	212	10	150,000	30,000	3,300	7,500	Std.	180	28,910	1,522
Transporter	16	17.7	23	4,200	8	26.5	74	GMC-G	160	12	150,000	10,000	Std.	N.A.	Std.	90	8,503	531
Elderly & Handi.	16	17.7	23	6,000	8	26	72	Chrysl- ler-G	285	8	150,000	9,000	400	N.A.	Std.	90	8,077	505
Specialized Vehicles (303) 232-2436 Golden, Colorado National	15	17.7	23.1	5,200	8-12	23.48	74.5	Chrysl- ler-G	285	7	100,000	10,600	790	1,290	180	150	15,064	1,004
Travel Equip. Corp. (219) 533-4161 Goshen, Indiana Model 219	16	17.8	24	5,500	8	24	74	Chrysl- ler-G	285	8	175,000	14,500	800	1,595	Std.	120	9,778	611
Model 220	12	17.8	23	5,200	8	24	74	Chrysl- ler-G	285	8	175,000	11,500	800	1,595	Std.	120	8,040	670
Wayne Corporation (317) 962-7511 Richmond, Indiana Busette	17	17.5	25	6,187	12	24	63	G M -G Dodge-G	165 150	9	150,000	11,600	1,910	2,300	360 ⁵	60	11,457	674
Transette Custom	17	17.5	25	6,650	11.1	24	75	G M -G	165	8	150,000	13,700	1,910	2,300	360 ⁵	60	12,944	761
Transette Vista	17	17.5	25	6,775	11.1	24	75	G M -G	165	8	150,000	17,100	Std.	2,300	Std.	90	13,746	809

1 G - Gasoline D - Diesel 2 Helper step reduces to 6" 3 Propane and diesel engines also available 4 As specified by customer 5 Carpet not available

Note: See last page for explanation of Uniform Annual Costs on Investment.

Mid	Max. Pass. Cap.	Overall Length (feet)	Turning Radius (feet)	Empty Weight (lbs.)	1st Step Ht. from street (inches)	Floor Ht. from street (inches)	Headroom (inches)	Engine			Est. Oper. L.H.Fe (Miles) $\pm 20\%$	Current Base Price, \$	Extra (Cost), \$			Est. Del. Time (Days)	Uniform Annual Capital Recovery Costs, \$	Per Seat Annual Costs, \$
								Mfr. Fuel	HP	MPG			Air Cond.	Wheel-chair Lft	Deluxe Seats & Carpets			
Alstream (513) 596-6111 Jackson Center, Ohio Argosy CB	25	26	28.3	9,345	12	27	79	Chev.-G	454	7	150,000	17,000	1,461	4,000	Std.	120	15,914	637
Blue Bird Body Co. (912) 825-2021 Fort Valley, Georgia Blue Bird	35	29.4	29	18,000	19.5	30	77	Detroit-D	195	6.5	450,000	50,000	5,000	4,000	5,300	90	13,692	391
Fluery Industries (306) 373-1363 Saskatoon, Canada Model 2500	26	24.8	30.2	8,180	13	31	77.5	G M-G	145	9	150,000	24,000	580	1,000	1,200	120	18,975	730
Fixible Company (614) 369-7671 Delaware, Ohio Model 35096	35	30.88	23.64	20,500	13.29	34.20	78	Detroit-D	167	5	500,000	56,000	5,000	12,000	3,400	240	14,416	412
Grumman Allied Ind. (516) 741-3500 Garden City, N.Y. 23	23	23	29	8,060	13	31	77.5	Chrysler-G	240	8	200,000	20,000	2,500	2,500	2,000	90	13,739	597
Micro Bus (213) 923-3221 Downey, Calif. Model 2500	27	26.6	32	9,910	12 ²	30	84	Detroit-D4	225	16	250,000	45,000	2,500	6,000	3	120	21,426	794
Minibus, Inc. (213) 962-1972 Downey, California MBD-8000	25	25	25.6	12,500	14	32	78	Caterpillar-D	150	8	500,000	50,000	Std.	6,500	2,500	240	11,132	445
Superior (Shelter-Globe) (419) 227-7777 Lima, Ohio Pacemaker Cruiser	23 38	18.8 29.8	21 34	7,100 17,000	10 14	29 36	78 78	Chev.-G IHC-G	160 157	7 8	200,000 300,000	12,756 28,739	2,900 5,000	3,100 3,100	1,590 1,740	90 120	10,354 12,277	450 323
Urban Transportation Development Corp., Ltd. (312) 337-2868 (Fairfield Corp.) Chicago, Illinois Urban Transport	24	24.2	30	8,500	15	30	75	Chrysler-G ⁵	220	5	100,000	23,900	3,261	4,300	Std.	90	35,292	1,470

1 G = Gasoline D = Diesel 2 Helper step reduces to 6" 3 As specified by customer 4 Propane and gas engines also available 5 Diesel available

Large	Max. Pass. Cap.	Overall Length (feet)	Turning Radius (feet)	Empty Weight (lbs.)	1st Step Ht. from street (inches)	Floor Ht. from street (inches)	Headroom (inches)	Engine			Est. Oper. L.H.Fe (Miles) $\pm 20\%$	Current Base Price, \$	Extra (Cost), \$			Est. Del. Time (Days)	Uniform Annual Capital Recovery Costs, \$	Per Seat Annual Costs, \$
								Mfr. Fuel	HP	MPG			Air Cond.	Wheel-chair Lft	Deluxe Seats & Carpets			
AM General (313) 722-4900 Wayne, Michigan 10235	42	35 ²	34.9	22,500	13.5	33.5	81.8	Detroit-D	172	5	400,000	60,000	Std.	N.A.	5,700	240	9,642	230
10240	51	40 ²	42	23,500	13.6	33.6	81.8	Detroit-D	238	5	400,000	65,000	Std.	N.A.	7,000	240	10,567	207
Eagle International (214) 252-4371 Dallas, Texas Model 05 (Intercity bus)	46	40	44.6	28,000	16	55.1	75.5	Detroit-D	305	6.5	1,000,000	81,500	Std.	N.A.	N.A.	90	11,960	260
Fixible Company (614) 369-7671 Delaware, Ohio 53102/53096	53	40 ²	36.3	24,000	13.5	33.79	78	Detroit-D	255	5	500,000	57,000	5,000	12,000	4,000	240	11,447	216
45102/45096	45	35 ²	29.9	23,000	13.5	33.79	78	Detroit-D	255	5	500,000	56,500	5,000	12,000	3,700	240	11,330	252
870	49	40 ⁴	42	24,000	14	34	79	Detroit-D	265	8	500,000	75,000	Std.	7,000	Std.	240	12,034	246
General Motors Corp. (414) 352-1634 Milwaukee, Wisc. RTS-2/TH-8201 ³	50	40 ²	41.6	23,489	12.8	32	80.25	Detroit-D	270	6	1,000,000	75,000	Std.	N.A.	Std.	300	11,007	220
M.A.M. Corporation (A.M. General for U.S.) (313) 722-4900 Wayne, Michigan SG-220-USA	69	59.88	39.37	35,532	14.45	37.34	78.34	M.A.N.-D	235	4	1,000,000	171,163	Std.	N.A.	. ⁵	1,095	25,120	364
SG-220-USA	65	54.63	39.37	35,090	14.45	37.34	78.34	M.A.N.-D	235	4	1,000,000	169,550	Std.	N.A.	. ⁵	1,085	24,883	383
Motor Coach Ind. (312) 842-0800 Chicago, Illinois MCSB (Intercity bus)	45	35	40.75	22,200	15.5	44	75.5	Detroit-D	285	6	500,000	69,500	Std.	N.A.	. ⁵	120	10,200	227
MCS (Intercity bus)	53	40	51.3	26,700	15.5	51.5	77	Detroit-D	285	6	500,000	83,000	Std.	N.A.	. ⁵	120	12,181	236

1 G = Gasoline D = Diesel 4 35' and 31' models will be available in the future in widths of 96"
2 Widths of 96 and 102' available 5 As specified by customer
3 The RTS - 2 includes 8 models, from 30 to 40 feet, in 6 and 8 cylinder engines

Session VI

The Madison, Wisconsin Experience⁽¹⁾

(1) Source: "Why is This Bus System Popular," Transportation USA,
United States Department of Transportation, Winter 1977.

Bus ridership on the Madison, Wis., transit system has more than doubled since 1970. The number of riders has risen from 5.7 million in 1970 to 11.9 million in 1975 and was expected to top 12 million in 1976. Ridership has been climbing steadily by 8 to 10 percent a year.

Why is the bus system so popular?

As a result of innovative planning, good management and strong community support, the Madison bus system has grown steadily and substantially in the past six years. Madison has expanded regular service by 178 route miles. It has encouraged commuters to take the bus by increasing parking fees and restricting auto traffic in certain congested and residential areas. It has spread out the peak-hour traffic flow through staggered work hours and, through various incentives, has increased the ridership of the bus system during off-peak hours.

In recognition of these accomplishments, in October 1976 the Urban Mass Transportation Administration (UMTA) presented Madison with its Administrator's Award for Outstanding Public Service. Madison was chosen for its "innovative approach to providing public transportation services in a small urban community."

One large factor in the success of the bus system is the support of the residents of Madison. The city of Madison took over the bus system with strong community support.

"When we purchased the bus company in 1970 it was an issue of city-wide proportions," said Madison Mayor Paul Soglin. "The entire process generated a good deal of discussion and debate. For the first time, city council meetings were televised. This indicates how much interest there was in the system and it also brought the discussion into everyone's home so that everyone felt involved."

In 1968, Madison voters approved the public takeover of the bus system by better than a three-to-one margin. Public takeover occurred in May of 1970 with the assistance of an UMTA grant.

Immediately, work began to improve the system. "In 1970 we had only 28, 32, and 38 passenger buses," said Jim McLary, transit coordinator for Madison. "We immediately bought 45 and 53 passenger buses which allowed us to increase capacity without increasing the number of buses required."

Five months after the takeover route extensions began, the first since 1954. Today, a transit route is located within one-

quarter mile of 90 percent of the service area population. There are 400 regular route miles compared to 222 in 1970. Route miles for lines operated only in peak hours have increased 77 percent.

Madison has taken decisive steps to maintain the downtown as an employment and shopping center. Madison has a well defined central business district (CBD) which is growing. This makes route planning easier and more efficient. The University of Wisconsin is located at one end of the CBD and the state government offices at the other. In 1969, city officials persuaded the state government to retain all its employment locations within the downtown area. The expansion of government and non-government jobs that followed helped maintain the vitality of the CBD despite the movement of many retail activities, such as regional shopping centers, to the suburbs. CBD jobs were created as hospitals, retirement homes, banks and financial institutions were opened and expanded.

Since 1971, approximately 10,000 additional government workers and college students were employed or enrolled in courses in the center city.

In conjunction with the effort to increase employment in the CBD, the city has backed citizen efforts to renew a large residential area near the CBD and retain its family orientation and neighborhood schools. This has also helped to revitalize the center city.

All of these efforts have encouraged people to go into the downtown area in Madison and an increasing number use the bus to do so.

In addition, the city has worked to discourage people from bringing their cars into the downtown area. The city, which owns and controls all of the parking facilities, has increased the fees, thus making it more economical to take the bus. Most on-street parking has been replaced with off-street parking. Rates have been set to encourage short-term parking by shoppers and discourage long-term commuters. Short-term meters are 10 cents per hour while long-term meters (5 hours or more) have been doubled to 20 cents per hour. For anyone parking longer than two and a half hours, it is cheaper to take the bus. The basic one-way fare is 25 cents.

"We are also reducing the time available on the meters," Mayor Soglin said. "The 10-hour meters are being reduced to five hours and the three hour meters reduced to one."

In 1973, Madison also persuaded the state government to charge for employee parking.

The Dane County Regional Planning Commission has also gotten involved in the effort. In April 1975, it persuaded the University of Wisconsin to accept a plan to reduce the number of parking spaces at an expanding hospital from 2,200 to 1,600 to discourage people from bringing their automobiles into the city.

Madison also opened a contra-flow exclusive bus lane on University Avenue in the downtown area which allows buses to move quickly even in rush hour. This too has been expanded. "The south side of University is a contra-flow lane," McLary explained, "and on the north side we have opened a diamond lane which is restricted to buses, bicycles and right turns only." (Madison has more bikes than cars. In a city of 175,000, there are 100,000 bikes and 75,000 cars.)

"We are also working on a transit mall," he continued. "The first two blocks, which are for pedestrians only, are now open. Construction should begin on the next six blocks and Capitol Square in 1977 with an anticipated opening of the first two blocks in late 1978 or early 1979."

Madison has taken other steps to control the automobile traffic in the downtown area. The city has restricted auto flow through a residential renewal area near the CBD with turn prohibitions and dead ends to eliminate through traffic. It is estimated that approximately 500 cars were diverted out of the area, making the way easier for the buses.

In 1975 signals were changed in the traffic circle around the capitol building to reduce auto flow in the inner loop used by transit and speed auto flow around the outer loop. This resulted in a 25-30 percent reduction in autos using the inner loop.

Madison has also instituted staggered work hours to improve peak-hour traffic flow and increase transit efficiency. State and local government agencies concentrated in the CBD had working hours from 8 a.m. to 4:30 p.m. In 1972 a staggered work hour program was established with work closing times divided into 15 minute intervals between 3:45 and 5:15.

A common problem of most bus systems is how to encourage people to ride during the off-peak hours, generally 9 a.m. to 3 p.m. and 7 p.m. to midnight. Madison has developed a series of incentives to encourage people to use the bus during these slack hours.

"The peak hours pay, we have standing loads during that time," McLary said. "It is during the off-peak hours that we lose revenues and it is at these hours that we have aimed most of our programs."

In 1973, Madison eliminated the fare entirely from 9-3, on an experimental basis only. Bus ridership increased 100 percent as a result. When the fare was reinstated, bus ridership during these hours increased by 15 percent and this figure has held fairly constant. "This experiment encouraged people to try the bus who had never used it before and many of these found that they liked it," McLary said.

Madison also has a shopper's pass. For 55 cents, a person can have an unlimited number of rides between the hours of 9 and 3. After three, the rider is guaranteed one free ride home. Many bus systems have shoppers' fares but most require that the person be home by 3 to take advantage of the lower rates. But in Madison, people who normally wouldn't take the bus shopping because of the time constraint, are guaranteed a ride home during the peak hours at the lower rate.

There is a 10-cent fare for all elderly and handicapped persons during off-peak hours. And since the bus is so close to so many, the elderly and handicapped are able to use the system. The number of elderly taking the bus has increased 20 percent since this fare was introduced in 1973.

Madison also encourages school groups to use the bus. If a group is going someplace along a regular route such as a museum, the school is encouraged to let the students take the bus and pay a fare of 15 cents per person, rather than chartering a special bus for the event. Arrangements are made to pick all of the students up at one place and take them to their destination and pick them up at a prearranged time for the trip back to the school. "This not only increases the numbers of people using the bus during the off-peak hours but it introduces the students to the bus system," McLary said.

All of these factors combine to give Madison one of the most innovative systems in the country.

Madison has 160 buses running over 400 miles. Twenty-four of these were purchased recently and have been assigned to all of the city's five main line routes and four express lines. As a result, headways (the length of time between buses) have been shortened to 10 minutes during the peak hours. Peak hour load factors have also been reduced.

In Madison buses provide service on nine arterial routes, two shopper shuttle routes, five express routes and several other special routes. Bus service operates seven days a week between the hours of 5 a.m. and 11:30 p.m. on weekdays, 6 a.m. to 11:30 p.m. on Saturdays and 6:30 a.m. to 11:30 p.m. Sundays.

Madison has developed new route maps, schedules, telephone service and an information booth on the Capitol Square to keep people informed about the system.

Several banks advertise transit and one bank provides space for a transit information center. Additional advertising is done in neighborhood newspapers.

Since the city took over the system, the purposes for which people use the bus have changed. In 1965, 38 percent of the riders used the bus primarily to get to and from work. By 1975, this figure had risen to 67 percent. More than 50 percent of those who use the bus regularly are between the ages of 21 and 35.

Madison has benefited from an unusual degree of cooperation between the federal, state and local governments and the people of Madison. Since 1970, UMTA has provided over \$8 million to the transit system and the city has put up \$5 million. Starting in 1976, the system was funded on a general formula under which UMTA pays 50 percent of the total deficit, the state pays one-third and the city pays one-sixth. In 1975, the metropolitan area paid \$459,000, the state \$644,000 and UMTA \$726,000. In addition, UMTA provided \$1.6 million in 1976 in capital assistance which was spent for buses and related equipment.

"We must realize that subsidizing public transportation is just as important as subsidizing local garbage collection, which we do regularly," said Mayor Soglin. "The cooperation we have received in Madison has been outstanding.

"Public support, the interest of elected officials and competent staff have been the reasons for our success," Soglin said. "Add to that the role of UMTA which has provided us with excellent technical assistance. I had never before seen a federal agency that knew how to respond without red tape and bureaucratic nonsense."

And, Madison is looking to the future. "We must ask some important questions," said the Mayor. "Let's not get wedded to the bus as we became wedded to the car. Let's look to other forms of transportation to supplement our present system." Madison is looking into the possibility of a light rail system and express bus lanes on the railroad rights of way. "This may be ten years in the future but we must look ahead," Soglin continued.

By 1978, Madison plans to have a fleet of about 200 buses. Through continued efforts, the number of cars driven into the downtown area should be further reduced and buses should be able to move through the most congested parts of the city free from competition from autos.

In presenting the award to Madison, UMTA Administrator Robert E. Patricelli summed up the reasons for Madison's success: "Intergovernmental cooperation, backed by substantial public support and citizen participation, is what it takes to make transportation services truly responsive to local needs."

fine rates in off peak to build ridership
 expanded CBD, discourage rates in CBD (increased parking fees,
 moving on street parking to off street parking
 public support, expanded bus capacity, expanded routes

Questions - VI

1. What local policies appear to have contributed to the increased use of buses in Madison?
2. The article mentions favorably the fact that 90% of the service area population is within ¼ mile of a bus route. Is this good? Why?

Session VI

Public Transportation Systems
and Characteristics

Federal Grant for New Bus
Fleet in Pittsburgh ⁽¹⁾

(1) Source: UMTA News Release, January 19, 1977.

A grant of \$19,491,660 to the Port Authority of Allegheny County for the purchase of 220 new radio-equipped air-conditioned buses for use in the Pittsburgh area was announced today by Robert E. Patricelli, Administrator of the U.S. Department of Transportation's Urban Mass Transportation Administration (UMTA).

Patricelli commended local officials for their "dedication to improved mass transit service and prudent use of Federal funds for the benefit of commuters and other transit patrons throughout the Pittsburgh area."

The Administrator expressed confidence that "the increased reliability and added comfort of the new vehicles will attract additional new riders to the already fine system. Benefits in reduced congestion, pollution and the need for construction of new roads and added parking facilities are expected."

"The purchase of 220 new air-conditioned buses as replacements for a like number of vehicles averaging 16.6 years old, many of which are not air-conditioned, exemplifies the Authority's concern for greater reliability and increased passenger comfort." Patricelli said.

The Administrator noted that the Port Authority "accomplished its peak transit patronage year in 1975, carrying 109,636,359 passengers, up 18,604,677 since 1972."

The new buses include 20 new articulated buses with a capacity of 63 to 67 passengers, 120 new 47 to 49 passenger coaches, 20 new 49 passenger suburban type buses, 40 new 41 to 43 passenger buses, 10 new 33 to 35 passenger buses and 10 new 16 to 19 passenger vehicles.

The high capacity articulated buses will be used on major arterial and express routes, the standard transit and suburban coaches will be used on heavily traveled routes throughout the city and the smaller buses will be used on less heavily patronized routes in both residential and downtown areas.

The grant also provides for the purchase and installation of 1,100 fare collection units, 14 remote processing computer terminals, bicycle lockers, bus passenger shelters, benches, bus stop signs and related bus transit equipment.

A local source for additional information is Mr. James R. Maloney, Executive Director, Port Authority of Allegheny County, Beaver and Island Avenues, Pittsburgh, Pennsylvania 15233, (412) 237-7075. (PA-03-0064).

Questions - VI

1. What is your opinion on the mix of vehicles acquired by Pittsburgh?
2. What savings would you anticipate from the new buses?
3. Are there any additional costs that might be anticipated?

SESSION VII: PREFERENTIAL TREATMENT AND LOW CAPITAL PROGRAMS

Objectives of Session VII

- . To be able to identify preferential treatment and other low capital techniques in modifying or creating public transit systems
- . To be able to identify general constraints on these types of treatment

Synopsis of Session VII

This session is a general review of priority treatment projects for high occupancy vehicles on freeway, arterial, and city streets.

Outline for Session VII

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Arterial and City Streets
3	Freeway Application
4	Low Capital Programs
5	Summary

SESSION VII: PREFERENTIAL TREATMENT AND LOW CAPITAL PROGRAMS

1. Introduction

Preferential treatment, as the name implies, means giving preference to or priority for buses and other high occupancy vehicles (HOVs)* in the traffic stream. In essence, it creates two classes of travel or two transportation systems within the same highway facility.

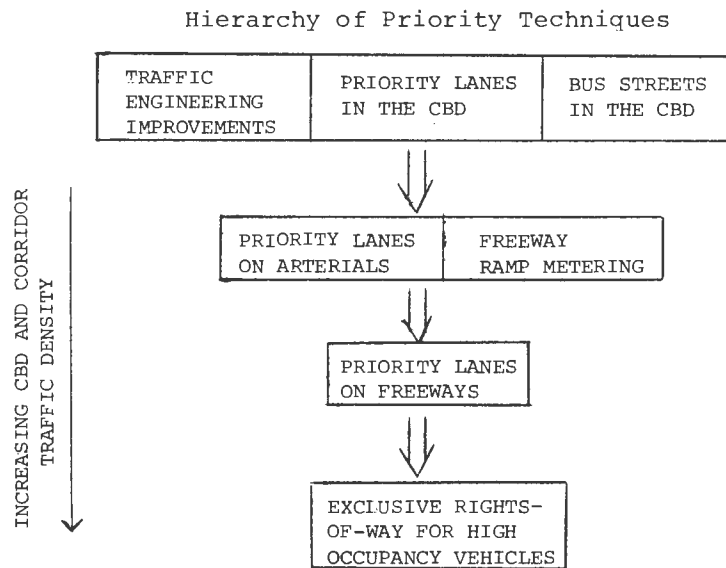
The large number of preferential treatment projects of the last few years has been caused by a number of factors including:

- . Environmental/Social considerations
- . Fuel shortages and rising fuel prices
- . Upsurge in highway construction costs in conjunction with lower revenues
- . Greater emphasis on achieving maximum efficiency from existing facilities.

The concept of preferential treatment itself is not new. Preferential treatment has been given to high occupancy vehicles, particularly streetcars and trolleys for a long time. However, the first recorded preferential treatment for a bus was on N. Sheridan Road in Chicago in 1939. By the mid 1950's, a number of other cities began to experiment with preferential treatment and at the present time the concept is quite widespread in both this country and overseas.

Preferential treatment may be divided into two major categories:

- . Projects on Arterials and City Streets
- . Projects on Freeways



*HOVs include motor vehicles such as autos, vans, taxis, or jitneys with 2,3, or 4 or more occupants. The definitions of what constitutes a high occupancy vehicle varies from project to project.

2. Arterials and City Streets

Most bus travel takes place on city streets. In outlying or residential areas there are few impediments to the smooth flow of transit vehicles. It is the major arterials and the CBD where transit service is complicated by other components of the traffic stream. One lane of an arterial street, using curb side bus stops, can accommodate over 100 buses an hour. This meets the needs of almost all locations in the country. Only the most densely traveled corridors in the largest cities have a greater demand. Preferential treatment can and should be provided to transit service on the city street system. A partial listing of treatments follows.

a. Bus Stop Location

Care in locating bus stops can facilitate entry and exit by the bus and minimize the stop time.

b. Preference in Signing

Turn prohibitions, particularly during peak periods, may exempt transit vehicles thereby facilitating transit routing. Intersection controls (e.g., stop signs, yield signs) may be utilized to provide preference to the street carrying a transit route. Parking prohibitions near bus stops facilitate bus operations.

c. Preferential Traffic Signals

Bus priority systems have been tested (UTCS project) which extend green intervals for a non-stopping bus. Signal timing plans have been prepared favoring bus progression. Bus preempt systems have been implemented whereby loaded buses can preempt traffic signals in the same manner as emergency vehicles and trains.

d. Terminals and Transfer Points

Greater emphasis is being placed on bus terminals and/or modal change transfer points. Careful design of such facilities and preferential entry and exit treatments can minimize the inherent delay of transfers and loading. Extensive work has been done on the modal change transfer points on new rail systems such as BART and Washington Metro.

e. With-Flow Curb Lanes

Curb lanes for buses operating in the direction of normal traffic flow are relatively simple and inexpensive to implement. Where volumes of buses are relatively high, the operation is self-enforcing. When bus volumes are low, other vehicles will attempt to use the lane. Right turning vehicles can pose a problem. This problem is usually improved by allowing right turning vehicles to use the lane and using far side bus stops, or by banning right turns.

f. Contra Flow Curb Lanes

Operation of buses in the opposite direction to normal traffic flow on a one-way street has proven effective in a number of locations. Such a lane helps utilize unused capacity when peak flows are unbalanced. These lanes tend to be self-enforcing and usually provide higher operating speeds than normal flow lanes. Examples of this type of operation include:

- . Madison, Wisconsin where a raised curb separates the bus lane from opposing traffic.
- . San Juan, Puerto Rico where a pair of contra flow lanes operate on 2 one-way streets over 10 miles (16 km) in length. There is no physical separation.
- . Tel Aviv, Israel has contra flow transit lanes and also allows taxis and sheruts (a form of jitney) to use the lanes. At times, loading and unloading taxis delay buses in these lanes.
- . Minneapolis marks contra flow lanes with street mounted signs at the end of each block.
- . Seattle relies upon pavement markings (i.e., double yellow stripes) and do not enter signs.

g. Contra Flow Center Lanes

Reserving interior lanes for transit use is quite complex and normally is suited only to express run segments. On Kalaniana'ole Avenue in Honolulu a contra flow bus lane is provided on a two-way four lane, undivided section. Cones are used to separate the opposing flows. When the arterial becomes a six-lane divided arterial, the preferential lane is the median with-flow lane.

On the divided South Dixie Highway in Miami, a contra-flow bus lane was provided on the left side of the median. The median with-flow lane, was reserved for carpools. Later, this was changed - the contra-flow lane was dropped and both buses and carpools use the median with-flow lane.

Left turns are prohibited at most intersections during the period of preferential operation.

h. Median Bus Lanes

Bus lanes can be provided in or adjacent to medians on divided streets. Major problems in loading and unloading limits most such lanes to express runs. A notable exception is New Orleans, where the removal of a trolley from a wide median allowed replacement with bus lanes and still allowed buses to load and unload with adequate safety.

Other median lane operations include the six lane section of Kalaniana'ole Avenue in Honolulu and the current operation on South Dixie Highway in Miami referred to above.

Still another type of median lane operation is the use of a center lane (perhaps a two-way left turn lane or a reversible lane) as an exclusive bus lane during certain periods. Such an operation was in place on N.W. 7th Street in Miami prior to the opening of the I-95 exclusive lanes. Buses preempted signals along the route. Estimates indicate a 20% increase in speed because of the signal preemption and an additional 10% increase because of the exclusive bus lane. This represents a 6 minute savings in travel time.

i. Bus Only Streets

Streets that are reserved for buses only provide the most effective means of separating transit vehicles from other vehicular traffic. When implemented in conjunction with other improvements this can provide a very desirable focus for an area as well as the transit element. The Nicolett Mall in Minneapolis is a prime example.

Both Washington, D.C. and Chicago have created short bus streets which act essentially as on-street terminals with several major routes radiating from the bus street.

3. Freeway Application

Freeways were planned, designed, and built to meet transportation needs in major corridors. This concentration of travel desires becomes a prime candidate for preferential treatment activities. Although some treatments may be effectively applied to uncongested freeways, major benefits are achieved when preferential vehicles save significant amounts of travel time over the vehicles in the normal traffic stream.

a. Express Bus Operation

An express bus operation on a freeway with a limited number of stops on or adjacent to the freeway is the simplest and cheapest treatment that can be employed. The stops are usually in an interchange area - a short connector between an off and on ramp or a separate off and on ramp with a dedicated loading zone. Typical locations for such bus stops are:

- . major transit transfer points
- . fringe parking lots
- . major generators - shopping centers, industrial plants, universities, hospitals, etc.
- . high density residential complexes.

The only preferential treatment the buses receive is the ability to stop within the freeway right-of-way rather than having to leave and reenter the freeway at each stop. Express bus service becomes less effective as congestion increases. One inducement is relation as a passenger rather than tension as a driver.

b. Ramp By-Passes

As freeways become congested, particularly as they approach the central city, queue build-up on ramps becomes apparent. Metering to prevent stoppage on the main line is being used in many locations adding to the queue build-up. Ramp closures during peak hours add to the pressure on the remaining ramps. Buses and other HOVs in the mixed stream suffer the same delay.

On I-35 in Minneapolis, nine bus ramps that by-pass the main metered ramps have been constructed. These ramps are exclusively for buses. Bus ridership has increased dramatically but time savings are nominal.

In Los Angeles, 13 ramps and ramp shoulders have been restriped into two lanes. The ramp lane is metered and must be used by all vehicles except buses and two or more person carpools. Buses and carpools are allowed to flow freely in the shoulder lane, by-passing the queue.

In Seattle, a special bus only ramp is used to expedite access to and from the central district in peak hours. Fifty buses carrying 2,500 persons use the ramp in the peak hour with a 5 to 10 minute savings over the other routes.

As transportation demand continues to grow, greater need for converting ramps during peak periods to the exclusive use of buses and/or other HOVs will develop.

c. Congestion By-Passes

On some freeway systems, bottlenecks restrict flow and cause queueing and delay. By-pass routings for buses and HOVs can effectively reduce travel time.

One example is I-93 in Boston where a preferential lane is reserved for buses and carpools of three or more persons. The intent of the preferential lane is to by-pass a standing queue and give head-of-the-line privileges to buses and carpools headed for downtown Boston during the morning rush. Time savings of up to 10 minutes per vehicle are achieved. Because of the unique configuration, an officer stationed at the gore area can direct violators onto an off-ramp connector which increases travel time to the CBD by as much as 20 minutes.

A bus-carpool lane on I-280 in San Francisco to by-pass a bottleneck queue has had somewhat different results. A three lane section downstream of a heavy on-ramp is a bottleneck section because it cannot accommodate the combined freeway and on-ramp demand. A daily back up from the merge occurs. The bus-carpool lane is to provide a means for priority vehicles to by-pass the congested area and merge back at the head of the line. Preliminary indications show 3½ to 5 minutes savings over adjacent lanes. However, 2 to 3 minutes of the total delay to low occupancy vehicles is due to a decrease in bottleneck capacity (5,400 vph before to 4,900 vph after). Enforcement is difficult and violations are high. Demand, even with violations, is low enough that vehicles can merge easily at the end of the priority lane.

Another unique form of congestion by-pass is accomplished on the approach to the San Francisco-Oakland Bay Bridge. The system was designed to make more efficient use of roadway spaces where vehicles merge from 17 toll-gate lanes to five lanes on the bridge. One lane is reserved for buses and two are reserved for three-person carpools. These lanes do not require stopping at the toll gates (buses and carpools are free) and allow free access through the metering system which allows vehicles to proceed one at a time in the other lanes. No significant problems have been encountered, although during periods of severe congestion, priority vehicles are delayed until they reach the beginning of the priority lane. Priority vehicles save up to 5-minutes during the peak period.

d. With-Flow Reserved Lanes

In this treatment, one or more lanes is designated a bus only or a HOV only lane. In most cases it is the left-most or median lane of the facility. When the reserved lane is newly constructed or added by paving shoulders, narrowing lanes, or other means, it is generally accepted by the public. When an existing travel lane is reserved, especially in a congested area, a high degree of controversy can be expected.

Bus and HOV lanes will attract an increased number of transit users and carpools providing there is a significant savings in travel time relative to the normal traffic stream. Where remaining lanes flow in an uncongested manner, the benefits of the priority lanes are lost.

Priority lanes that are not physically separated from normal travel lanes can experience high violation rates (up to 60%) and are difficult to enforce. High violation rates detract from the effectiveness and public support for such projects. Safety aspects of adjacent lanes traveling at significantly different speeds are a prime concern. In one instance, (California Route 101 in Marin County), bus operators were requested to maintain a maximum speed differential of 30mph (48 kph). Although partially successful, some buses travel 55mph (88 kph) or even faster adjacent to stop and go traffic.

The I-95 project in Miami is the final stage of a series of projects to enhance transit service in a corridor (see 7th Avenue project under arterial systems). The median shoulder was reconstructed for exclusive use of buses and carpools (3 persons or more). The 7½ mile (12 km) extend north from the CBD, Airport and Civic Center and includes a 2,200 space fringe parking lot. Bus travel time savings of 6 minutes are expected. Usage is low with almost 50% violations. Several major accidents have occurred during off-peak periods when lanes are open to all traffic. It would appear that these lanes should be closed during off-peak periods to provide median refuge when not required for capacity.

The Banfield Freeway in Portland, Oregon was resurfaced to remove the shoulder and add a median HOV lane. Lanes were narrowed to 11 feet and emergency turnouts were constructed every 1,500 feet. Although HOV lane speeds were higher than mixed flow lanes, early usage was disappointing. The HOV lane was carrying significantly fewer persons per hour than the mixed traffic lanes.

The median lane in each direction on the Moanalua Freeway in Honolulu is reserved for buses and carpools. These lanes were constructed as new lanes for general use but designated as preferential lanes when construction was completed. It is heavily used by carpools, violations are approximately 10% and as much as 10 minutes in travel time are saved over a 2.7 mile (4.3 km) section.

No discussion of with flow reserved lanes would be complete without mention of the Santa Monica Diamond Lane. The project covered a 12.6 mile (20.2 km) section of the 10 lane Santa Monica Freeway in Los Angeles. The median existing lane in each direction was reserved for buses and three person carpools between the hours of 6:30 and 9:30 a.m. and 3 to 7 p.m. During the first day of operation, extreme congestion occurred due to the novelty of the project, confused motorists, a malfunctioning ramp meter, and a major accident that occurred outside the boundary of the project. Numerous accidents within the project also occurred. The project created heated and continuous controversy. After 21 weeks of operation, the project was halted by a U. S. District Court Judge who ordered additional environmental studies prior to the project being continued. A summary of the evaluation study findings follows:

- . Nearly three percent more people were traveling on the Santa Monica Freeway in the morning and evening peak periods in the 21st week in 7% fewer cars, compared to March 1975.
- . In the final week, carpools totaled 269% of the number before the project.

- . Riders of the Southern California Rapid Transit District and the Santa Monica Municipal Bus Lines more than tripled in the 21 weeks of the lane's operation.
- . About 16.9% of all persons using the freeway in peak hours were riding in buses or carpools in the 21st week, compared with 6.3% before the lane was opened.
- . Traffic on parallel city streets at the end of the 18th week (the date of the most recent count) was 10% less than preproject in the a.m. eastbound direction and 2.9% more in the p.m. westbound.
- . Average freeway travel time for single-occupant vehicles traveling the full length of the Diamond Lanes over the last 19 weeks of the project was virtually the same as preproject during the a.m. peak period eastbound. In the p.m. peak period westbound, travel time increased by 24 seconds.
- . Average total travel time, including delay at on-ramps for trips entering the freeway at ramps within the project, was less than before the project, with the exception of traffic entering westbound at La Cienega. The maximum total travel time savings was 5.0 minutes for bus and carpool riders whose trips started at unmetered ramps within the project.
- . By-pass lanes at metered ramps saved carpools and buses between five and 11 minutes.
- . If the project had continued for a year with trends in vehicle miles traveled remaining as they were, almost 2.9 million gallons of gasoline would have been saved in this freeway corridor.
- . Auto-related pollution at the end of the 13th week showed a very slight decrease over the "before" condition.
- . Accidents continued at a higher rate than before the project. Most accidents were of the "rear end" type, and occurred in the lane next to the Diamond Lane. Accidents in the afternoon were nearly twice those occurring in the morning.
- . Violations in the use of the Diamond Lane ranged generally from 10 to 19% of total Diamond Lane traffic, and constituted about 1% of all freeway traffic.

d. Contra-Flow Reserved Lanes

On many radial freeways, while the peak flow direction is heavily congested, the off-peak direction has large amounts of unused capacity. Utilizing one lane in the off-peak direction for peak flow travel provides a large increase in capacity. To date, such contra flow lanes have been limited to buses primarily because of safety considerations. Perhaps HOVs will also be allowed in the future.

One of the earliest and most successful contra-flow lanes is on I-495 approaching the Lincoln Tunnel in New Jersey. This 2.5 mile (4.0 km) segment between the New Jersey Turnpike and the Lincoln Tunnel has been in operation since 1970. It operates in the inbound direction and during the morning peak period only. The contra flow lane is

separated from the two outbound lanes by cones. During the peak hour the lane carries 450 buses with 22,000 passengers.

A contra-flow lane was installed on U.S. 101 in Marin County, California extending 4 miles (6.4 km) north of the Golden Gate Bridge. Two of four southbound lanes are coned off during the p.m. peak - one for northbound buses and one to serve as a buffer lane. The roadway has sustained 6% grades, both up and down, and has a winding alignment. The preferential lane is limited to buses with a permit to ensure knowledge of the rules of operation. There are approximately 100 buses in the peak hour. Buses do not normally save time, but are more dependable because they are unaffected by incidents in the normal travel lanes. The contra-flow lane also provides the benefit of separating bus and auto operations, resulting in somewhat better flow for both.

There are no plans to introduce carpools into this lane because of the potential increased hazard and the relative lack of congestion on the normal flow lanes. A significant number of buses cannot use the contra-flow lane because they exit near or within the limits of the lanes. This is a problem with many contra-flow potential locations.

e. Bus Ways (Exclusive Rights-of-Way)

Separated roadway exclusively devoted to buses (with or without other HOV's being permitted) provide the highest level of service in terms of moving people in buses and/or HOV's. Many busways will be part of freeways or on freeway right-of-way while others may take advantage of abandoned railroad right-of-way or other natural features to provide a separate way.

The Shirley Highway (I-95) is a major radial freeway leading into downtown Washington from the suburban Virginia area. The freeway varies from 8 to 10 lanes, with the cross section being 3, 2, and 3 or 4, 2 and 4 (inbound, reversible, outbound). The two reversible lanes used only by buses and four-person carpools are in the median and are separated from all other lanes by safety-shaped barriers. The facility is 11.8 miles (18.9 km) in length. It was initially limited to buses only but in 1973, four-person carpools were allowed to use the reserved lanes when it was found that the buses did not utilize all the available capacity. Entrance and exit to the facility are at separate ramps used exclusively by the buses and carpools. The two lanes operate on a reversible basis being inbound in the morning and outbound in the evening. At the present time over 450 buses and 2,700 carpools carrying 30,000 people use the facility in the a.m. peak period. Almost 70% of these persons travel in a single peak hour at speeds 2 to 3 times as fast as the regular lanes. During the peak hour the two express lanes carry almost four times as many people as the adjacent four inbound freeway lanes.

"The El Monte Busway provides a separated facility for buses only within the right-of-way of the San Bernardino Freeway east of Los Angeles. East of the Los Angeles River, two separate roadways were built outside the freeway lanes; each roadway is striped for one running and one emergency stopping lane. Because there is a bus station with a center platform in this section, the one-way operation is British style to the left.

Beyond this 4-mile (6.5 km) section, the roadways reverse sides and enter the median of the freeway. At the outer end, the busway leaves the median via an underpass and enters an off-street terminal where a large park-and-ride lot and a direct connection to a bus storage and maintenance facility are provided.

Intermediate stations are placed adjacent to a large county medical center and to a state university campus. Pedestrians reach these bus platforms by bridges and elevators.

Approximately 17,000 person trips a day use the facility in both directions. When the project began in 1973, patronage was 1,800 persons daily.

The portion of the facility in the median was open to carpools in October of 1976. Approximately 500 carpools use the facility in both directions during a single peak period with 90% in the predominant direction.

4. Low Capital Programs

Hedges (6) identifies low-capital urban transportation improvements as:

- . Capacity-oriented: Included here are traffic operations improvements, and preferential treatment for HOV's.
- . Demand-oriented: This category includes pricing, demand spreading, ride sharing, improving transit, restructuring commuter rail, facilitating bicycling, and improving goods movement.

There has not been much experience with a number of these actions, particularly the pricing strategies. As Hedges (6) aptly states:

"The type of improvements described in this paper have largely been applied on an ad hoc, piecemeal basis, with no attempt as yet to exploit their full potential by employing them in a consistent and coordinated manner. In other words, they have not been planned and implemented as a group in any city, and the underlying philosophy has not yet been embraced as part of the 'continuing comprehensive cooperative transportation planning process' at the local, state or federal level."

Classifying improvements as "low capital" leads to considerable definitional overlap among these items. However, some effort is being made on the federal level to clarify (and implement) urban transportation improvements through recent regulations covering Transportation System Management (TSM) actions. TSM is discussed fully in Section XIII. Discussion of selected low capital programs follow.

a. Pricing

Congestion pricing involves increasing the cost of peak hour travel into the central business district. Congestion

pricing actions have not been widespread thus far. Examples of pricing actions include:

- . Zone or area pricing or licensing
- . Time-calibrated and self-cancelling tickets
- . Peak-hour tolls on toll facilities
- . Peak-hour parking charges
- . Peak-period transit surcharges

b. Demand Spreading

Congestion results from a condition of demand exceeding existing capacity of the transportation system. Demand spreading would shift trips from peak time periods to other periods thereby "flattening" the peak demand during critical time periods such as 7:45 to 8:45 a.m. Such an overall policy could benefit all modes, although highway congestion is the most common target.

Demand spreading actions include:

- . Staggered work schedules. Implemented by government agencies, employers, etc.
- . Flexible hours (flextime). Employees select their starting and quitting times according to a designated common time block.
- . Shortened work week. There are two types: reduced work week in which the total number of hours worked is reduced, and compressed work week which retains total hours but over fewer work days. Only part of the labor force in any one employment area would adopt a shortened work week.
- . Combination of the above. For example, shortened work week with staggered hours.

5. Summary

As America shifts emphasis from construction of new highways to improving existing facilities and systems, closer attention is being paid to an overall view of satisfying urban travel demand. This is a view of balancing demand and supply by demand modification and improving facilities. However, we are still in an era of transition. While preferential treatment and low capital concepts are not new, their widespread application has not occurred. Coordinated actions and programs in urban areas are in an embryonic stage.

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Session VII

Preferential Treatment and
Low Capital Programs

U.S. 1/South Dixie Highway Demonstration Project
Dade County, Florida

Source: Excerpted from "Evaluation Report - U.S. 1/South Dixie Highway Demonstration Project," Metropolitan Dade County, Office of Transportation Coordinator, April 30, 1975,

For more than two years U.S. 1 South Dixie Highway has had auto volumes in excess of 72,000 per day. It's design capacity is no more than 40,000 vehicles per day at any point. The historic trend for several years has been an increase of 2,000 to 3,000 vehicles per year along the six lane arterial which is divided by an island ranging from about 12 to 18 feet in width.

In order to deal with a pressing problem which rapidly was reaching crisis proportions and to respond to the energy crisis of 1973-1974, Metropolitan Dade County and the Florida Department of Transportation initiated a project on July 22, 1974 involving a contraflow bus lane, a carpool lane and traffic signal improvements on a 5.5 mile segment of South Dixie Highway. This segment package stretches from S.W. 72 Avenue in South Miami to the entrance to I-95 one mile south of the Miami Central Business District. The project is designed to reduce congestion on the highway and encourage commuters to use express buses or carpools to get to work. Originally it operated from 6-9 a.m. and 4-7 p.m., but was recently changed on April 21, 1975 to 7 -9 a.m. and 4-6 p.m. each weekday. Express buses known as the "Blue Dash" use the off-peak direction inside lane in contraflow to carry nearly 2,000 persons per day. The service connects the South Dade area to major Dade County employment centers including downtown Miami, the Civic Center, and the Brickell Avenue business area. The carpool lane which functions at the peak of the rush hour carries 40 percent of all persons traveling on the highway. It is restricted to passenger vehicles with two or more occupants. The traffic signal improvements were designed to increase the "green" time for all lanes of the highway, thus allowing a greater number of vehicles to be accommodated during the peak rush hours

An evaluation program was designed to determine the positive and negative results of the demonstration project. Various studies were conducted to evaluate separate facets of the project and were carried out over a nine month period. This report summarizes the findings of these studies.

A stated goal of the project is to increase the people moving capacity of U.S. 1 South Dixie during rush hours. Through increased ridership on MTA buses and more efficient use of the private automobile by encouraging carpools, U.S. 1 in peak hour periods is now carrying approximately 2,390 more persons in 345 less automobiles than prior to the start of the project. The occupancy rate in automobiles has risen from 1.38 persons before the project, to 1.6 persons at present. The time needed to travel the 5.5 miles has decreased for express "Blue Dash" users from 10 to 16 minutes compared to previous bus operating times. Carpool users have reduced travel time by about 6 to 8 minutes, while general lane users lose about one minute from the time required to negotiate the 5.5 miles prior to the project.

A ridership on the express buses of 2,000 per day has been achieved. Average daily ridership has stabilized at about 1,955 per day which represents about a 100 percent increase since the start of the project. Transit operating costs have been minimized by decreasing the number of buses and readjusting their schedules as needed to increase loads.

As with any express service, the bus service requires a high degree of subsidy. The number of buses assigned to the project has been reduced from the original 82 to 61 per day at present. These buses run at 68 percent of seating capacity.

Surveys conducted since July, 1974, indicate that the "Blue Dash" riders use the service primarily because they feel it is convenient, fast, and inexpensive. Carpool users feel that they save time and expense by "doubling up". The business community on and around U.S. 1 indicates that the business volume has not been substantially affected by the prohibition of left turns during project hours.

Numerous signs have been erected along U.S. 1 describing the restrictions and regulations of the project. Enforcement personnel regularly patrol the corridor in an effort to keep the bus lane clear of unauthorized traffic and enforce the two-per vehicle requirement of the carpool lane. These enforcement personnel have regularly provided important information and suggestions for "fine tuning" the system.

The total number of accidents on the affected portion of U.S. 1 increased by nearly 100 during the first nine months of the project as compared to the previous year. The majority of these accidents involve rear-end collisions of automobiles and are of a relatively minor nature. A total of 32 bus related accidents have occurred, primarily due to illegal left turns by motorists. Since April 23, 1975, all non-signalized "T" intersections have been blocked by traffic cones during the project hours. The immediate result has been, that since this date there have been no bus accidents and illegal left turns have been greatly reduced. Facilities to re-route left hand turns were created to accommodate such movements for persons not traveling the entire 5.5 miles.

The various parking facilities provided as part of the project are utilized to capacity each day. The downtown Miami carpool parking lot is used by 200 cars daily as is the 200 vehicle park-and-ride lot near Dadeland, at the southern end of the project corridor. Certain bus stops in South Dade have been shifted, or eliminated, in response to user demand.

The project has offered many South Dade commuters a choice of mode where one did not exist before. A large majority of "Blue Dash" riders have incomes in excess of \$10,000, and own cars which they used to get to work before the project began. For others, the carpool

lane provides the convenience of the private automobile, with reduced user costs and quicker travel times. The project was designed to have a minimal impact on surrounding neighborhoods yet offer a low capital intensive alternative to help the thousands of people who must use U.S. 1 to commute to work each weekday.

U.S. 1 will continue to be heavily used, according to all long range projections, due to the growth of the South Dade area. The U.S. 1/South Dixie Demonstration Project is an effort to address the problem on a day-to-day basis by providing alternative modes which save time and cost to the user. Until a permanent solution, such as the proposed rapid transit line can be introduced to carry even greater numbers of commuters at still faster speeds and increased convenience, the U.S. 1/South Dixie Program offers a possible solution to moving peak hour traffic in the corridor.

Project Elements

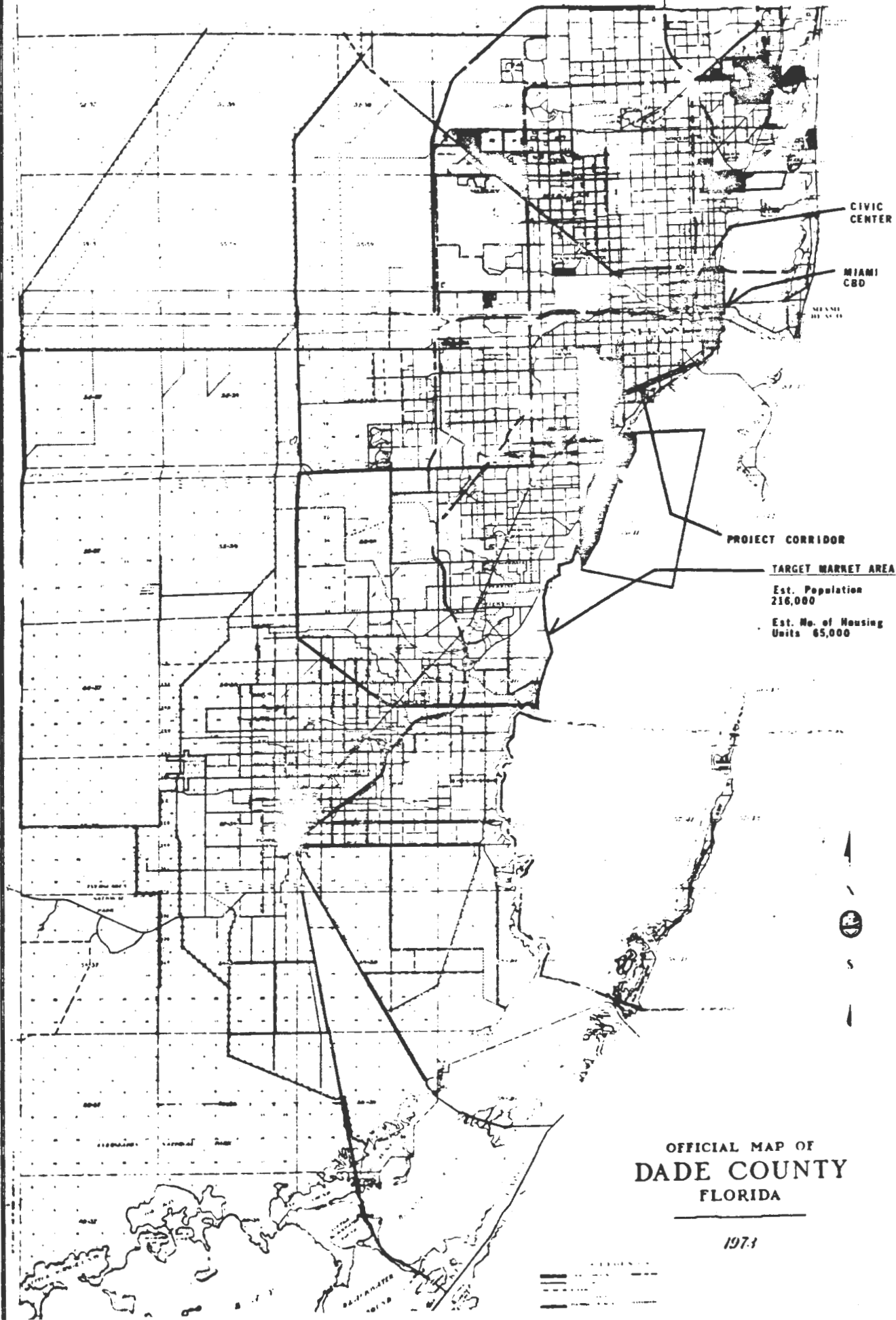
The U.S. 1/South Dixie Transportation Improvement Project consists of three separate, but associated components which include (1) a contraflow bus lane, (2) a priority carpooling lane, and (3) a series of operational traffic improvements. The latter involves signal improvements from Caribbean Boulevard in South Dade to I-95 on the outskirts of the Central Business District. See Figure 1. The contraflow bus lane and the carpool lane extend from S.W. 72nd Street (Sunset Drive) to 17th Avenue, a distance of approximately 5.5 miles. However, the feeder portion of the bus routes extend south and west of Sunset Drive and north and east of 17th Avenue. The contraflow and carpool elements are in operation from 7-9 a.m. and 4-6 p.m., Mondays through Fridays, excluding holidays.

1. Contraflow Bus Lane

The transit element involves utilizing the inside off-peak lane as a bus-only lane in the peak direction. In the morning peak, as the inbound lanes are heavily used, the median (inside) lane in the outbound direction is separated from the normal flow by removable safety posts in order to allow Metropolitan Transit Agency buses to proceed unimpeded inbound. The afternoon procedure is reversed, with the buses running contraflow on the inbound side of the highway. Notice of this changing lane configuration is provided by overhead variable message signs displaying "MTA Bus Only" in the bus direction and "Lane Closed" in the normal traffic direction.

As originally planned and executed, MTA scheduled 41 buses in the a.m. and 41 buses in the p.m. This has been reduced to 61 total in response to schedule adjustments and ridership patterns. Park-and-ride facilities are provided at pickup points to encourage transit usage, as are walk-up bus stops. The buses, termed "Blue Dash" serve the Central Business District,

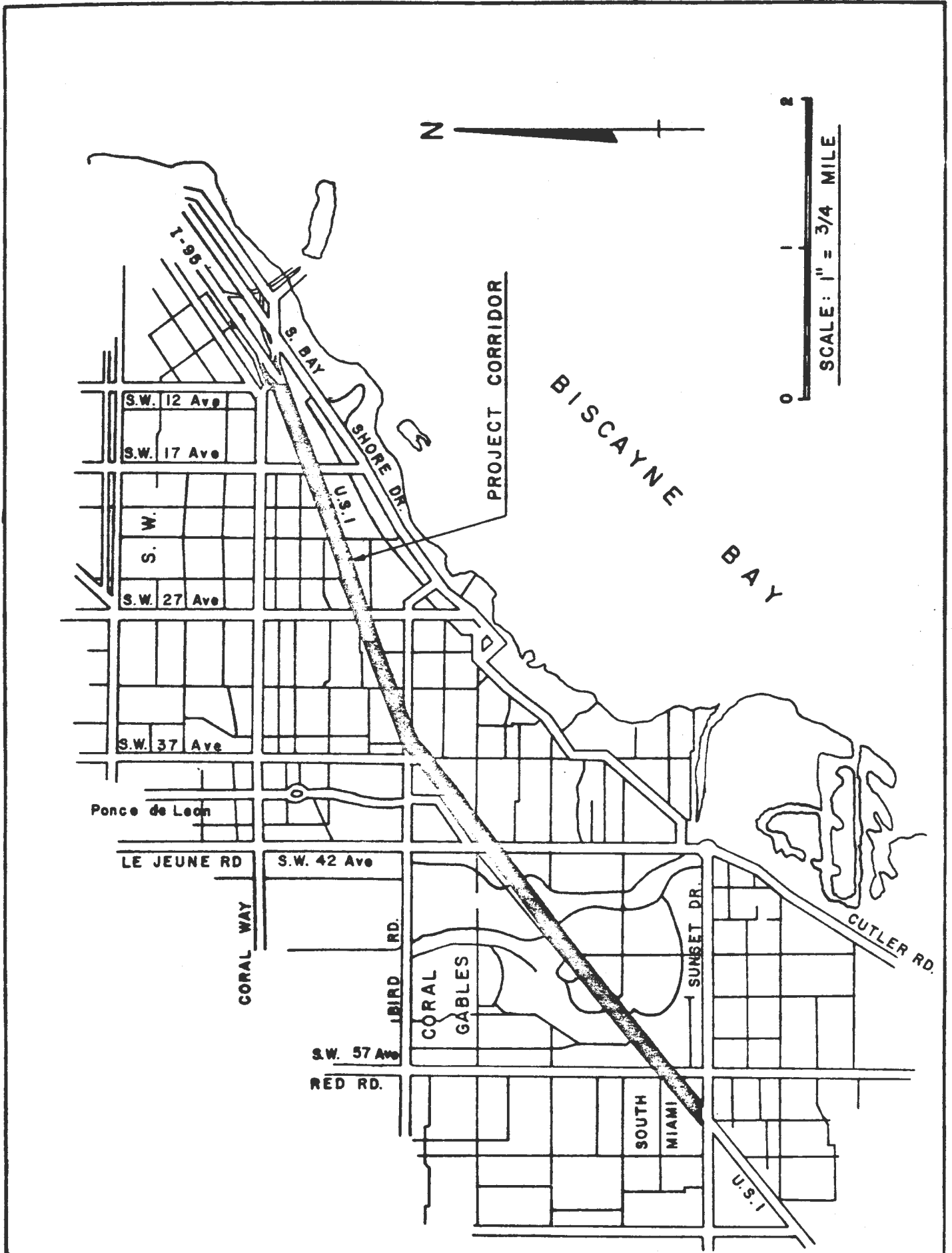
FIGURE 1



OFFICIAL MAP OF
DADE COUNTY
 FLORIDA

1973

FIGURE 2



Brickell Avenue, the Civic Center and the Miami Herald/News area with peak hour service for 50¢ or 60¢ depending on the boarding point. From the feeder points in the a.m. the buses enter the contraflow lane at Sunset Drive proceeding north to S.W. 16th Avenue, where they re-enter into mixed mode. In the p.m., the buses enter via a paved crossover in the median between 16th Avenue and I-95 and proceed south to Sunset Drive.

2. Priority Carpool Lane

The carpool lane involves a preferential peak flow lane for passenger vehicles with two or more occupants. The lane is not restricted as to distance traveled, to facilitate use for persons wishing to enter or exit the highway. The overhead variable message signs are designed to delineate the carpool lane when the lane is open for that use. Once again, the lane is open in the peak direction from 7-9 a.m. and 4-6 p.m. Enforcement of this lane, as well as the bus lane, is accomplished by mobile police personnel patrolling at strategic points along the 5.5 mile corridor. The lane is designed to encourage the more efficient use of the automobile by giving carpoolers a time advantage over single occupant vehicles.

3. Operational Traffic Improvements

The operational improvement package is designed to improve traffic flow along an 18.5 mile portion of U.S. 1 between S.W. 200th Street and I-95. The package involves three basic signalization improvements:

- a. Changing the off-set relationships to reference each signal to the green indication instead of the yellow. This serves to improve green time utilization by vehicle platoons by providing progression for the beginning of each platoon instead of the end of the platoon.
- b. Extending the cycle length of the signal system from 90 to 100 seconds, giving the extra time to traffic on the U.S. 1 corridor. This provides greater traffic flow along the corridor.
- c. Reduce certain multi-phase signals to two phases by eliminating or restricting left turns at some intersections and providing ground loop patterns as alternatives.

Questions - VII

1. What alternative operating strategies or policies would you have considered in this corridor.
2. What would have been the effect of defining a carpool as three persons.
3. Comment on the level of transit service being provided in this corridor.

SESSION VIII: TRANSIT FACILITY DESIGN FEATURES

Objectives of Session VIII

- . To be able to identify important design elements, constraints, or considerations for certain transit facilities
- . To be aware of the relative design requirements for various types of systems

Synopsis of Session VIII

This session is a description of the basic features of transit facility design.

Outline for Session VIII

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Bus Systems
3	Rail Systems
4	Summary

SESSION VIII: TRANSIT FACILITY DESIGN FEATURES

1. Introduction

The facilities over which transit vehicles operate are essential elements of the total system. For bus systems, these are the streets and freeways which were designed originally for moving all types of motor vehicles, not just transit vehicles. Trackage for transit rail systems, on the other hand, was designed specifically for transit vehicles. There is also a growing need for careful consideration of terminal facilities. This session presents some of the more important design features for facilitating bus transit and the basic design elements that are required in rail systems.

2. Bus Systems

Because buses operate on conventional city streets and freeways, this mode has the advantage of an existing road bed and the technology advances in pavement design, highway operations, etc. Design features of a bus transit system refer mainly to lane configuration, assignment and layout; bus stops and shelters; intermodal transfer facilities; and communications.

a. Bus Lanes on Surface Streets

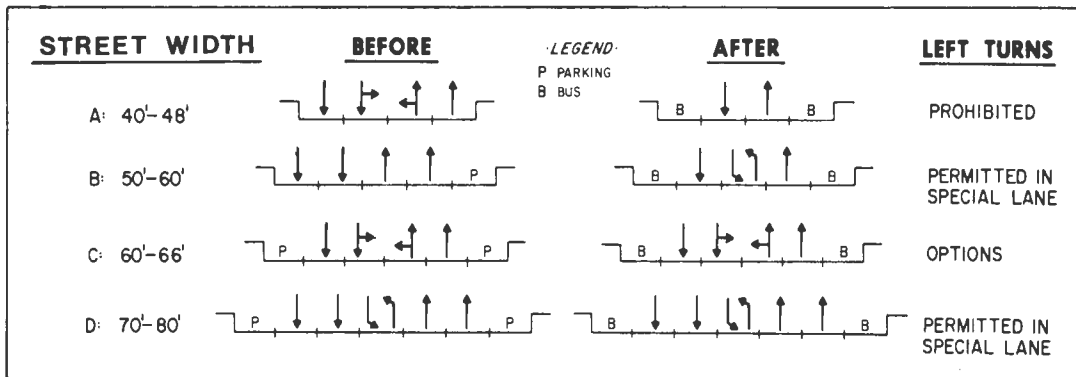
As the concentration of buses on a street increase, the need to designate special bus lanes also increases.

1) With-Flow Curb Bus Lanes. Designating existing curb and median curb lanes on arterials and city streets is the easiest bus lane treatment to implement and costs under \$6,000 per mile. However, a high level of enforcement is necessary.

Right curb lanes can be implemented under the following conditions:

- . No parking or standing in the bus-lane
- . At least two other lanes are available for other traffic
- . Prohibit curb access of service vehicles
- . Right turn delays can be minimized

Bus lanes should be at least 10 feet wide, wider along curves. However, the number of lanes should be maximized rather than obtaining optimum lane width. Typical curb bus lane configurations are presented in Figure VIII-1.



Source: Ref. 1

Figure VIII-1. Typical Curb Bus Lane Configurations

Lanes (8-12' wide) may be delineated by solid white lines, "BUS ONLY" signs posted 8 feet high every block and twice where blocks exceed 300', and signs preferably over the lane every block. Standard diamond pavement markings should follow the latest MUTCD recommendations.

Median curb bus lanes are used for express service to avoid problems in providing pedestrian crossing and pedestrian considerations. They can be used to bypass street sections where there are heavy right turns, queues at parking facilities, taxi stands, and necessary right curb access for service vehicles.

3) Median Bus Lanes. Median bus lanes (center lanes) require wide street arterials with provisions for service stops and pedestrian refuge areas. Costs range from \$15,000 to \$100,000 per mile.

A suggested warrant is a minimum of 60 to 90 peak hour buses serving 2,400 to 3,600 people using each median lane. Where lanes operate throughout the day, they should carry 600 buses per day.

The street should be wide enough to allow for passenger loading platforms. Minimum street widths range from 50 feet for a single median lane on a one-way street to 65 feet for double median lanes on a two-way street. Also, there must be width for at least two traffic lanes besides the bus lane.

Bus lanes should be at least 10 feet wide for one-way operation, and 20 to 22 feet wide for two-way operation. However, 9-foot bus lanes may be used in unusually restrictive conditions.

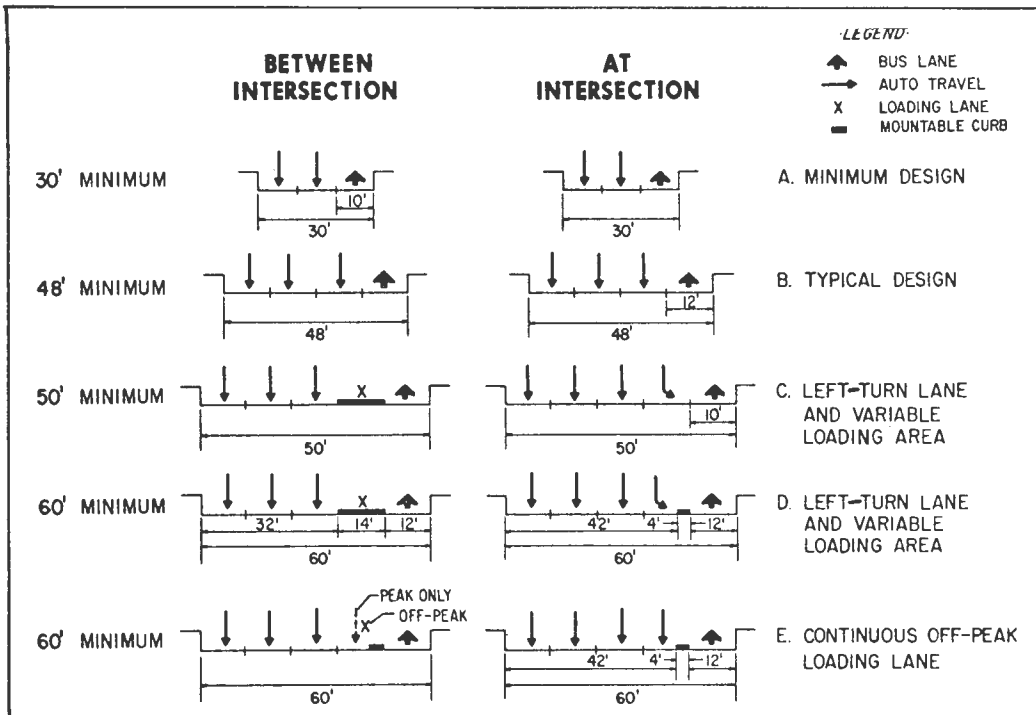
Pedestrian islands should be at least 5 feet wide and 100 feet long. Under very restrictive conditions 4-ft.-wide islands may be used, and the length should be 5 feet greater than that of the longest bus using the zone. Islands, where not continuous, should be located at the near side of intersections in conjunction with near-side bus stops.

Pedestrian access to safety islands should be permitted at the near-side crosswalk. Where islands extend an entire block, access also may be provided from a far-side crosswalk. Side protection of pedestrian areas may be provided by splash plates; pipe posts connected by chains or rails; stanchions; or wire-mesh fencing.

Where there are no raised barriers or pedestrian loading platforms, bus lanes may be delineated by 8-12" solid white lines from traffic in the same direction and from traffic in the opposite direction by double 6" yellow lines. A single 6" yellow line should separate bus flows on two-way bus lanes.

3) Contra-Flow Bus Lanes. Contra-flow bus lanes on arterials or city streets are lanes for travel in the opposite direction of a one-way roadway's normal flow. For arterials, a median lane serves as a contra-flow lane. The left-side curb lane of one-way streets usually serve as contra-flow lanes, unless special raised islands are provided for right-side lanes (for boarding and alighting).

Bus lanes should be at least 12 ft. wide, though lanes 10 ft. wide may be used where paint separation is used. General traffic lanes should be at least 10 ft. wide. Contra-flow lanes could be provided on streets of 30-ft width, although 40 ft. is a desirable minimum. Bus lane arrangements are shown in Figure VIII-2.



Source: Ref. 1

Figure VIII-2. Contra-Flow Bus Lane Configurations

Contra-flow bus lanes may be separated from the normal direction of travel by paint or physical channelization. Physical islands, however, pose maintenance problems for snow removal. Double solid yellow 6-in. paint lines should delineate 24-hr. contra-flow lanes. For part-time usage these lines can be broken. Painted pedestrian refuge islands should be complemented by stanchions and delineated by yellow diagonal markings. Physical islands should be mountable to permit buses to pass stalled vehicles. Islands should be at least 4 ft. wide where they serve as pedestrian refuge or provide access for loading vehicles.

Costs range from \$4,000 to \$100,000 per mile, depending on the amount of street reconstruction.

4) Bus-Only Streets. Basically, design of bus-only streets involve modifications to the existing street system. They can be designed as part of an overall improvement of an area including sidewalk widening installation, and other pedestrian amenities such as planting, kiosks, and bus shelters.

Bus-only streets should serve major retail and office centers. Since resistance can be expected from stores, etc. fronting the street, service and access to them must be maintained. Provision for passing capability such as multiple-lane bus operation is necessary where bus volumes are high and no alleys or intersecting streets are available for service-vehicle loading and unloading. Typical roadway cross-sections are shown in Figure VIII-3. Curb loading zones can be installed for off-peak use.

Considerations for displaced auto traffic are also necessary, such as ensuring the availability of parallel traffic routes and access to major parking facilities. For example, access to parking garages may require auto use of short sections of a bus-only street.

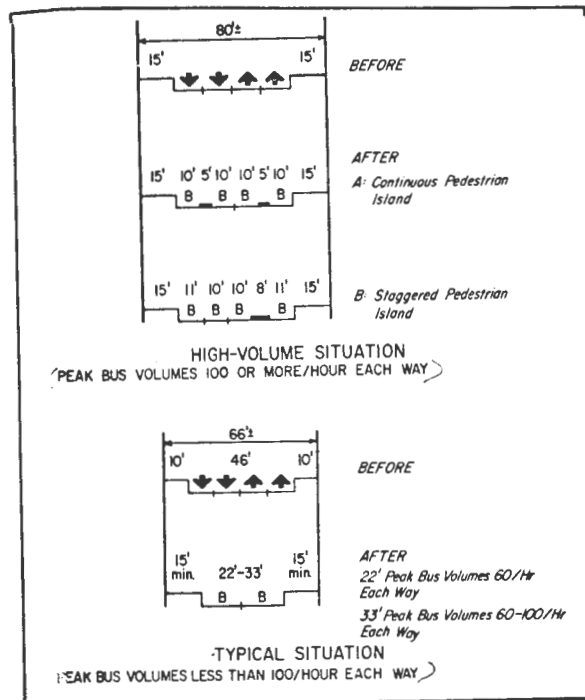
Transition points between normal and bus-only streets should take advantage of existing changes in street configuration. Bus entry and exit may be facilitated by combining preferential treatments.

Depending on the degree of street reconstruction and amenities provided, costs can range from \$500,000 to \$2,000,000 per mile.

Five bus-only street applications are suggested in one study(1):

- . Terminal approach. Exclusive bus access can be provided adjacent to a downtown bus terminal and/or on links connecting the terminal to other bus lanes.
- . Bus loop. A series of bus-only streets forming a loop may be appropriate where streets terminate and extended bus layovers are required.
- . Short connector links. Short sections of bus-only roadways provide direct service where existing street continuity is limited and bus service over arterial streets is circuitous and slow.

- . Bus-pedestrian mall. Bus malls -- as incorporated in urban redevelopment projects -- provide direct bus access to major generators. They are designed to simultaneously improve pedestrian amenity and bus access. Bus malls could operate throughout the day or be limited to peak hours. Taxis and service vehicles during off-peak periods can use bus streets.
- . Auto-free zone. The prohibition of automobiles from major portions of downtown areas is becoming common in European cities with narrow, discontinuous, high convergent street patterns. Buses are allowed to traverse the auto-free zones to serve major activities. Prohibition of cars helps to increase bus speeds.



Source: Ref. 1

Figure VIII-3. Bus-Only Streets

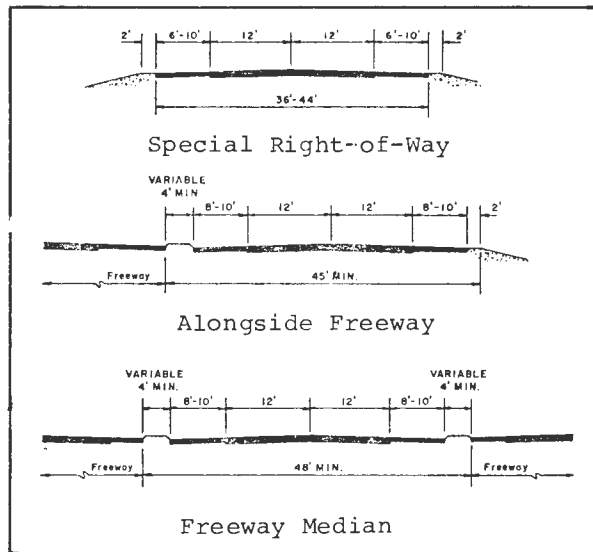
b. Freeway Bus Applications

1) Busways. Busways are special roadways designed primarily for exclusive use by buses. Busways segregate buses from other road traffic while providing:

- . Line-haul express service to the CBD
- . Feeder service to rail lines
- . Short bypasses of major congestion areas.

A demand of at least 1500 passengers in the peak hour per lane should exist for busway (and reserved lanes) implementation.

There are numerous types of busways depending on location and grade characteristics. Locations can be a freeway median, along side the freeway, and on its right-of-way. Busways can be elevated, depressed, tunnel, and at-grade sections. Typical busway cross-sections are shown in Figure VIII-4.



Source: Ref. 3

Figure VIII-4. Busway (two-way) Cross-Sections

As shown in Figure VIII-4, lane widths are normally 12 feet but may be 11 feet. Lane widths of busways without shoulders should be 13 to 15 feet. If carpools use of a busway is intended, 8 to 10 feet wide shoulders are necessary.

Minimum vertical clearance for a busway is 12.5 feet, and 15 feet for double-decker buses and when conversion to rail is anticipated. Lateral clearance requirements are similar to current highway standards covering continuous and non-continuous obstructions.

Road gradients also are similar to current highway design principles. Mainline grades should have a maximum of 5 to 6 percent. Ramp grades should not exceed 8 percent. Design flexibility may be a consideration, where busway conversion to rail guideway requires a maximum grade of 3 or 4 percent.

On curves with radii less than 1000 ft., wider pavement for the travel lanes may be necessary. Horizontal curves should be designed for bus operating speeds. Recommended minimum radii are as follows: at 30 mph - 250 feet, at 50 mph - 750 feet, and at 70 mph - 1600 feet.

2) Reserved Freeway Lanes. Freeway lanes can be reserved for bus use in the normal or opposite direction of flow during peak periods. For normal lanes, geometric requirements are the same as for the normal lanes with a shoulder width of 8 to 10 feet.

Several design options for reserved lanes include:

- . Using shoulders to add a normal direction lane (Banfield Freeway in Oregon)
- . Using median to add a normal direction lane (I-95 in Miami)
- . Designating existing lane as normal direction bus lane (U.S. 101 in Marin County, Calif.)
- . Designating existing lane as bus contra-flow lane (I-495 in New Jersey, U.S. 101 in Marin County, California)

Contra-flow freeway bus lanes should be separated by traffic posts spaced at 40 ft. intervals and delineated by either solid or dashed white lines. Because the freeway space occupied by contra-flow bus lanes will function as normal-flow lanes for most of the day, pavement markings delineating the lanes should conform to standard highway practice.

Signs reading BUSES 35 (OR BUSES 50) should control bus speeds in the contra-flow direction. Signs reading LEFT LANE CLOSED, ON-COMING BUSES should be located along the right-hand side of the roadway, and immediately above the bus lane. Overhead lane-control signals provide a more positive (and costly) means of lane-use allocation. These signals could be automatically actuated from a central control point.

Contra-flow bus lanes can be installed at low initial costs; however, provision must be made for their maintenance and enforcement (\$80,000 to \$100,000 per mile per year per lane).

Transition treatments for contra-flow lanes are especially important. A toll plaza provides a natural transition point because speeds are low and enforcement is relatively simple. Transitions also can be located at (1) the junction of two freeways, by providing special bus ramps and (2) directly from normal freeway lanes.

Transition design-details are as follows:

- a) The transition should be located on a tangent section of roadway where approach visibility is not constrained.
- b) The transition point should be located at least 1 mile downstream from where buses enter the freeway with $\frac{1}{2}$ mile as the absolute minimum distance. This distance will allow buses to weave from right-to-left-hand freeway lanes during heavy traffic periods.
- c) The transitions should be sufficiently abrupt to discourage general traffic use. A 20-ft. wide transition lane should be provided on a 6 to 8 degree angle. This corresponds to a minimum median opening of 150 to 200 ft.

- d) Flexible traffic posts should be mounted on 20-ft. centers in the transition area and on 40-ft. centers elsewhere along the contra-flow bus lane. The taper for through traffic should approximate the design speed (i.e., 50 mph, 50:1).

3) Preferential Treatment in Mixed Traffic. Buses operate in a number of freeway areas where preferential treatment of bus operations is possible. These areas and treatments include:

- . Bus bypasses at metered freeway ramps. This treatment involves providing a lane as a bypass of queued traffic on a metered ramp. Widening and straightening the ramp shoulder may be all that's necessary. Another option is a separate ramp with minimum geometrics.
- . Exclusive bus access to freeway lanes. Access can be provided by a carpool-bus ramp, an exclusive bus ramp, or converting an existing ramp to exclusive bus use.
- . Bus bypass of congestion point. Bus bypass lanes should be started upstream of a bottleneck without reducing existing capacity. Starting points should be located 300 to 500 ft. before end of existing queues. Lanes should be physically separated from normal freeway lanes.

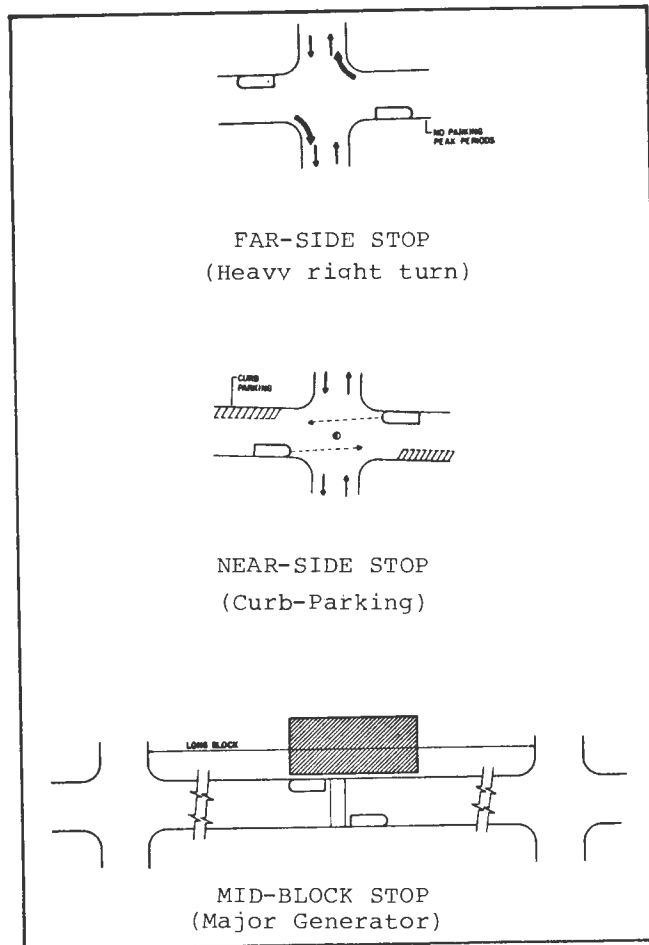
c. Bus Stops and Shelters

Careful design of bus stops and shelters can eliminate a number of unattractive aspects of using bus transit. Bus stop location, frequency, and length depend on consideration of passenger service (demand, convenience, safety), type of bus service (local, limited-stop, express), and effects of stopped buses on traffic flow.

- 1) Frequency of stops. As noted in Session VI, as frequency of stops increases, the average bus speeds decrease and passenger travel time increases. Stops should not exceed 8-10 per mile (every 500').
- 2) Location of stops. Bus stop locations should be standardized in a community wherever feasible for consistency. Problems arise with vehicle conflicts during bus stops or starts.

Three types of locations are characterized by their position to intersections (shown in Figure VIII-5)

- . Far-side
- . Near-side
- . Mid-block



Source: Ref. 1

Figure VIII-5. Bus Stop Locations

Far-side bus stops are preferable where sight distance or signal capacity problems exist, where buses have use of curb lanes during peak travel periods, or where right or left turns by general traffic are heavy. They are also preferable wherever buses turn left, because they allow sufficient maneuvering distance from curb to left lanes.

Near-side bus stops are preferable where transit flows are heavy but traffic and parking conditions are not critical. From the driver's point of view, they are preferable because they make it easier to rejoin the traffic stream, particularly where far-side curb parking is permitted in peak periods. They are generally applicable where buses operate in median lanes, where signalized intersections are frequent, and where curb parking is permitted throughout the day. Buses stopping on approaches to intersections can use the width of the cross-street to reenter the main traffic flow.

Near-side bus stops can be provided where buses turn right and where right-turning traffic is not appreciable. However, where right turns exceed 250 per peak hour the bus stop should be located prior to the intersection, possibly at mid-block. Near-side bus stops may also be applied in conjunction with median bus left turn lanes on two-way streets.

Mid-block bus stops are generally applicable in downtown areas where a stop serving several routes require long loading areas that might extend an entire block. They can also be used where traffic, physical, or environmental conditions prohibit near or far-side stops, and where large factories, commercial establishments, or other major bus passenger generators exist.

3) Bus stop lengths. Bus stop lengths depend on the number of required bus loading positions, the type of stop (far-side, etc.), vehicle length, and maneuvering requirements. Bus stop capacity (the number of bus loading positions or bays) depends on bus arrivals and service time for loading and unloading passengers. Service time on and off buses are given in Table VIII-1. Required capacity values are given in Table VIII-2.

Table VIII-1. Service Time Per Door

<u>ALIGHTING</u>	<u>Seconds per passenger</u>
Very little hand baggage or parcels-few transfers	1.5 - 2.5
Moderate amount of hand baggage or many transfers	2.5 - 4.0
Considerable baggage from racks (inter-city runs)	4.0 - 6.0
<u>BOARDING</u>	
Single coin or token fare	2.0 - 3.0
Multiple coin fare	3.0 - 4.0
Multiple zone fares: prepurchased tickets & registration on bus	4.0 - 6.0
Multiple zone fares: cash and registration on bus	6.0 - 8.0

Source: Ref. 4

Table VIII-2. Required Bus Stop Capacity
(Number of Buses)

Peak-Hour Bus Flow	Service Time				
	10 SEC	20 SEC	30 SEC	40 SEC	60 SEC
15	1	1	1	1	1
30	1	1	1	1	2
45	1	1	2	2	2
60	1	1	2	2	3
75	1	2	2	3	3
90	1	2	2	3	4
105	1	2	3	3	4
120	1	2	3	3	5
150	2	3	3	4	5
180	2	3	4	5	6

Source: Ref. 1

Where several buses will use the same stop simultaneously, 45 feet should be added per additional bus.

Table VIII-3. Minimum Lengths for Bus Curb
Loading Zones

Approx. Bus Length (ft)	Loading Zone Length (in ft.) ¹					
	One-Bus Stop			Two-Bus Stop		
	Near Side ²	Far Side ³	Midblock	Near Side ²	Far Side ³	Midblock
25	90	65	125	120	90	150
30	95	70	130	130	100	160
35	100	75	135	140	110	170
40	105	80	140	150	120	180

¹Measured from extension building or "stop" line, whichever is appropriate. Based on side of bus positioned 1 ft from curb; if bus is positioned as close as 6 in. from curb, 20 ft. should be added to near-side stops, 15 ft. to far side stops, 35 ft. to midblock stops.

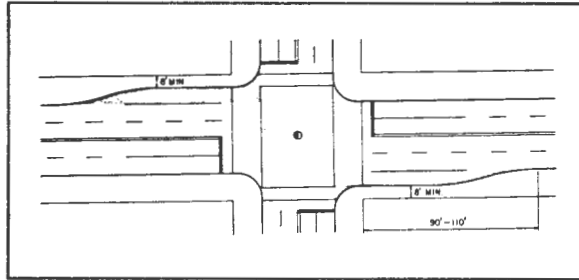
²Add 15 ft. where buses are required to make a right turn. If there is a heavy right-turn movement of other vehicles, lengths should be increased 30 ft.

³Based on roadways 40 ft. wide which enable buses to leave loading zone without passing over centerline of street. Add 15 ft. if roadway is 32 ft. wide.

Source: Ref. 2

Bus stops should be clearly marked. Solid white 6- to 8-inch lane lines should separate the bus stop from adjacent traffic lanes. BUS STOP pavement stencils may be provided in areas of heavy bus flow.

4) Recessed bus bays. These treatments, also called bus turnouts, involve relocating the curb by tapering into the adjacent frontage to allow stopping off the travel lane. A recessed bus bay for a far-side stop is shown in Figure VIII-5.



Source: Ref. 1

Figure VIII-6. Far-side bus turnout.

Bus turnouts are applicable on arterial streets with high traffic speeds and volumes and long passenger service times. Turnouts can be installed under the following conditions:

- . Curb parking is prohibited, at least during the peak hours.
- . There are at least 500 vehicles in the curb lane during the peak hour.
- . Bus volumes are inadequate to justify an exclusive bus lane. At least 100 buses per day and 10 to 15 buses carrying 400 to 600 passengers in the peak hour traverse the street.
- . The average bus dwell time generally exceeds 10 sec. per stop.
- . Right-of-way width is adequate to allow constructing the lane without adversely affecting sidewalk pedestrian flow.

Design guidelines for the turnouts for a single 40-ft bus are:

- . Bus bays should be at least 10 ft. wide.
- . Near-side bus bays should be at least 50 ft. long for a single bus, plus a 60- to 80-ft. transition distance. The curves used should be of 100-ft. radius, separated by a short tangent distance.
- . Far-side bus bays should provide a 50-ft. loading area plus 40 to 60 ft. of transition distance. A 25- to 50-ft. radius curve should be used on the initial exit from the bus bay, followed by a short tangent and a 50 to 100-ft radius curve on entry to the main roadway.

- Midblock bus bays include a composite of transition requirements for near- and far-side bus bays. Total impacted area for a single-bus bay would range from about 150 to 200 ft, suggesting a minimum 400- to 600-ft. block for application.
- Ideally, bus bays should be constructed with contrasting pavement color and/or texture. They should be clearly delineated with a 6- to 8-inch solid white lane line.

For each additional bus, 45 feet should be added.

5) Bus Shelters. Clearly, considerations for making transit use easier and more attractive are very important. Shelters should be used at major bus stops to protect users from weather and enhance the public image of the bus system.

Locations with high passenger demands and low bus service frequency should be given priority. Shelters generally should be provided where there are 100 or more boarding or transferring passengers daily, and total daily passenger waiting times range from 500 to 1,000 minutes. Shelters should also be installed at stops serving the elderly and handicapped, such as at retirement homes, hospitals, etc.

The shelter should have maximum transparency for safety and be visible from the surrounding area. Shelters should have lighting by existing street or commercial illumination. Shelters should be clearly marked with "bus logo" signs.

Modular construction is desirable to achieve uniformity. Shelters can be made of many materials depending on local preference. Overall appearance is important; shelters should be aesthetically pleasing. Shelter openings should be at least 32 to 36 inches wide.

Shelter capacity should be based on the maximum passenger accumulation at the bus stop. Approximately 3 to 5 sq. ft. per person should be allowed in developing shelter size requirements. Shelter modules of 10 to 12 ft. in length, 5 to 7 ft. in width, and 7 to 8 ft. in height (about 50 to 60 sq. ft.) will generally be appropriate.

Benches are essential. Current bus schedules and routing information is important. Telephones, police and fire alarms, trash receptacles and mail boxes may be located near shelters. Heaters at busway stops may be considered in areas of extreme winter weather.

Shelters should have a minimum service life of 15 years. Typical units should have a cost range of \$20 to \$30 per square foot, or approximately \$1,500 to \$2,500 per shelter at 1973 price levels. Annual maintenance and repair costs should not exceed \$300 to \$400.

Close attention should be paid to adjacent areas of bus stops. Sidewalk slabs (hardstands) should be provided along streets, with dirt or grass shoulder strips. Roadway curbs should be of constant height to minimize passenger missteps when alighting from a bus at a lowered or sloping curb. Platforms and ramps may be necessary for service to the elderly and handicapped.

d. Intermodal Transfer Facilities

In bus transit, these off-street facilities serve passenger transfers between bus, auto, and pedestrian modes in central and outlying areas.

1) Central area bus terminals. These terminals serve as an interchange point for intercity, express, and intra-city bus services. They can result in substantial travel time savings compared to on-street distribution. For example, the Port of New York and New Jersey Authority Midtown Bus Terminal saves passengers an average of 20 minutes per trip.

Besides the usual land availability consideration, concentrations of bus volumes and destination accessibility from the terminal must be evaluated. Terminals should be provided wherever on-street operations of terminating buses disrupt general traffic. As a general guide, off-street terminals should be provided wherever there are 20 to 25 peak hour terminating buses with more than 1,000 terminating passengers. This operation would require up to five loading positions and an equivalent holding area.

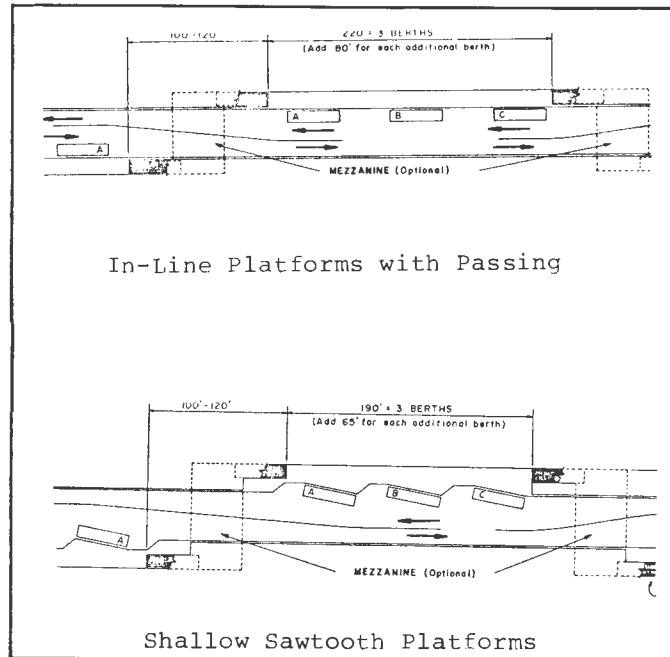
Terminals should be located within walking distance to major user destinations. Transfer to rail rapid transit, light rail, buses, and taxis can also be an important feature in planning and design. (Rail terminals are discussed in a following section.)

Terminals should provide at least five bus loading positions. Most cities typically will find 20 to 30 positions adequate. Design capacity is a function of operating characteristics of bus service and passenger use. For example, fare collection methods and passenger arrival rates are two factors.

For passengers, terminal design should:

- . Separate vehicle and passenger movements, and
- . Provide direct pedestrian connection to other modes.

Passenger platforms can be classified as loading or unloading platforms. Loading platform design features are most critical for peak-hour conditions because of passenger waiting requirements. Loading platform widths for simple operations may be as narrow as 8 ft.; however, platforms involving considerable circulation and queuing of passengers should be at least 12 ft. wide or for sawtooth positions, loading platforms parallel to the bus door should be at least 5 ft. wide. Typical CBD station layouts are shown in Figure VIII-7. Note that sawtooth platform lengths are smaller than in-line platforms.



Source: Ref. 1

Figure VIII-7. Typical CBD Linear Station Layouts

Unloading platform length should reflect:

- . the number of berths required to accommodate peak unloading passenger volume, and
- . bus pull-in, pull-out, and tail-out characteristics.

Queuing is necessary for most rush hour conditions to avoid crowding and disorder and make better use of available space. Queue positioning should be clearly denoted by signs and by chain or pipe-rail barriers (stanchions). Queue arrangements are dependent on passenger volumes, number of berths, and number of routes served by a platform. Patrons standing in a queue occupy an average of approximately 1.67 ft. of linear space each (a queue of 50 patrons will be about 83 ft. long). A single queue can be confined within a space 2 to 2½ ft. wide.

Platform elevations and curb heights of 5 to 8 inches are satisfactory. Passenger access at the ends of raised platforms should be ramped on an approximate 12-to-1 slope. Width should be sufficient to permit free circulation past the exit door of unloading buses where the momentary accumulation of a few passengers may take place. Exit locations in a high-capacity terminal should be balanced to minimize walking distance and conflicting movements under peak-hour conditions.

Passengers should be protected from buses in multi-lane terminals by means of a guard railing. This barrier should have a minimum clearance of 12 in. from the runway. The bottom portion of the railing should be equipped with a continuous shield to protect patrons' clothing from exhaust blast and roadway splash.

Canopy-type shelters over loading areas on open lots are important for patron convenience and protection. They should provide vertical clearance to allow canopies to extend a foot or more over the roof of vehicles for increased protection against rain. Supporting columns should be designed to minimize platform interference.

All vertical access should reflect elderly and handicapped requirements such as elevators, escalators, and ramps. At large terminals, passenger concourses should be enclosed, well lighted, and climate controlled. Restaurants, newsstands, stores, dispatchers' offices, and rest rooms should be provided. Design features include the following:

- . waiting area: 20 to 24 sq. ft. per person represents a satisfactory standard.
- . ticket office: counters should be 42 in. high. Cages or windows are not desirable.
- . baggage room: where applicable, should comprise 10 percent of the total building area or contain 50 sq. ft. for each bus loading dock.

Terminal design should also:

- . Provide grade-separated bus entry and exit,
- . Separate commuter and intercity bus (and rail) levels,
- . Separate unloading and loading areas for commuters,
- . Provide commuter bus loading areas in sawtooth 10 degree angle platforms, and
- . Provide sawtooth 45 to 90 degree angle platforms for intercity buses.

Bus lane widths should be 10 to 11 feet for 8-ft. wide buses. Two lane runways (20-22 feet in width) should be provided for passing.

2) Outlying transfer terminals. Outlying bus terminals serve the transfer of riders from suburban collection-distribution system (buses, autos, walking) and line-haul bus transit. Facility location and design should be compatible with nearby land use.

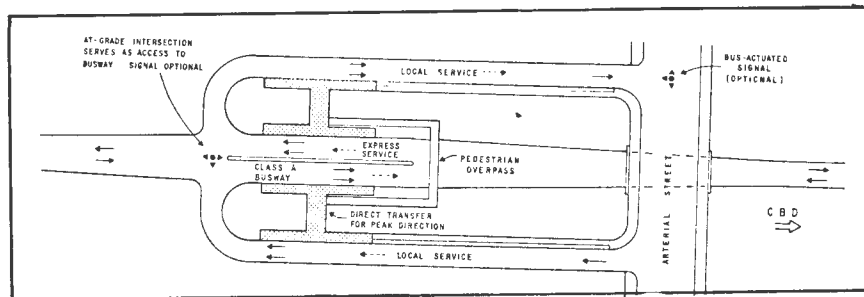
. Local to express bus terminals. Design features should provide direct pedestrian access between local and express transit. Providing park and ride lots may be appropriate.

Off-street bus loading areas or loops should be provided when there are more than 12 to 15 buses per peak hour terminating at a single stop and where the stop serves as a staging area for buses.

There is no typical bus terminal layout. Designs should enable terminating buses to unload without delay, pass through a holding area where they can wait if their normal berth is occupied, and proceed to a loading berth for normal layover and boarding.

The number of bus berth positions should be based on the maximum number of buses in the terminal at any given time. Current experience indicates 20 to 30 bus berths as an upper limit for most urban conditions.

As depicted in Figure VIII-8 local bus service in off-street loading areas generally should circulate counter-clockwise. This will bring bus passengers to major station access point without requiring pedestrians to cross bus routes.



Source: Ref. 1

Figure VIII-8. Typical Local-Express Terminal

Access should be directly from arterial streets. Street widenings, reserved bus lanes, special bus turn lanes and signals, or even bus grade separations, may be provided to expedite bus flow and minimize conflicts.

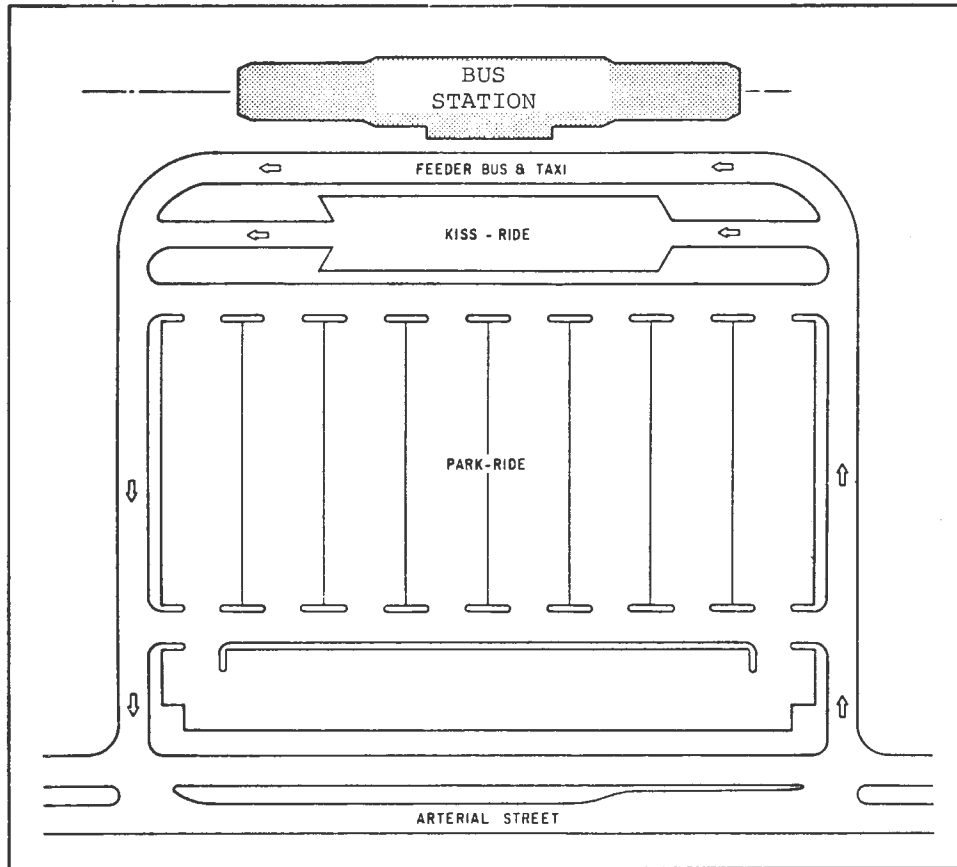
Unloading platforms may be either of the parallel pull-through type or of modified sawtooth design. A primary design requisite is the need for express buses to load parallel to curb or walkways.

Typical of local to express transit terminal designs include:

- . Arterial street bus-rail transfer: most common type involves bus turnouts near express transit lines.
- . Busway-local bus interchange (Fig. VIII-8): local buses circulate in a clockwise crossing the busway at a signalized intersection.
- . Bus terminal with freeway interchange: single bus bridge with bus ramps to frontage roads alongside a depressed freeway provides direct access for arterial and freeway buses.
- . Park and ride facilities. These facilities mainly serve suburban areas in attracting auto users to park and use line-haul bus service. Greatest potential for park and ride service exists in urban areas where commuting to the CBD is inhibited and where average parking costs exceed \$2.00 per day. These terminals should be located at least 5 to 8 miles from the CBD, and

and can be located within freeway interchange right-of-way.

A typical park and ride terminal is shown in Figure VIII-9.



Source: Ref. 1

Figure VIII-9. Typical Park and Ride Bus Facility

Park and ride requirements should be based on approximately 400 to 500 sq. ft. per parking space. These values account for parking stalls, pedestrian paths, circulation roads, and landscaping.

Facilities should be designed for self-parking. Right-angle parking is preferable, although angle parking may be used where space is restricted. Ninety-degree parking spaces should be 9 ft. wide and use a unit parking dimension of 62 to 65 ft.

Kiss and ride facilities should be provided at each outlying parking area. Twenty to 60 spaces represent a reasonable range. The area should involve drop-off close to the station entrance, plus a holding or short-term parking area for passenger pick-up. It should be clearly separated from commuter parking areas.

An optimum size range for bus-oriented lots is 400 to 700 spaces; 1,200 spaces is a realistic maximum. Where facilities exceed 500 spaces, parking roads should be clearly separated from bus and kiss and ride areas. One access lane should be provided for every 400 to 600 spaces.

Landscaping should be massed rather than scattered throughout the lot. Landscaped barriers at least 10 feet wide should separate the parking area from adjacent streets. Landscape spaces and materials should be designed with snow removal, maintenance costs, and vandalism in mind. Parking areas should be fenced, well lighted, clearly marked, and appropriately signed. Illumination should approximate 0.5 footcandles at the ground level.

Pedestrian walking distances from car to bus stop should be less than 400 ft. Walking distances that exceed 1,000 ft. from station entrance points tend to discourage use.

Principal loading areas should be sheltered, and a covered walkway should be provided for the remaining distance to bus areas. Protection against rain, with a 14-ft. clearance over the bus roadway, should be provided. In northern climates, transparent shelters are desirable. Walks across busways and major roads should be clearly marked.

e. Communications

Automatic vehicle monitoring and two-way voice radio communications for buses is becoming more common. Communications have several potential advantages in transit operation:

- . Route supervision - prevent bunching
- . Emergency and special situations
- . Dynamic scheduling - daily passenger counts
- . Management reporting - estimated arrival times
- . Traffic signal priority - preferential treatment at signalized intersections.

In Lansing, Michigan, three terminals in the CBD have been equipped with large electric signs displaying bus routes and times of arrival. Bus drivers activate radio signals to a central computer which controls the sign information. Messages tell passengers that buses are 6, 4, or 2 minutes away or that a bus is delayed. Because of favorable passenger response to the signs, the communications system will be expanded to other terminals by the transportation authority.

3. Rail Systems

This section deals primarily with LRT and RRT systems built as transit systems. Commuter railroads normally use general purpose trackage and intercity stations.

a. Guideway

Light rail transit systems have varying design requirements depending on the nature of the operation. Rail rapid transit, on the other hand, requires a completely dedicated guideway.

1) Right-of-way. Right-of-way (ROW) widths are given in Table VIII-4.

Table VIII-4. Typical Row Width (ft.)

	<u>2-Way Operation</u>	<u>At Stations</u>
RRT	27-40	46-63
LRT	24-35	40

Width values may be higher or lower by grade type, with aerial representing the low end of the spectrum, followed by at-grade and then subway. BART (RRT) subways, for example, have a 40-ft. right-of-way.

Different types of right-of-way for at-grade applications of LRT as noted in Session V, are on:

- . Existing City Streets. Without preferential treatment for LRT, greater delays and more conflicts with other traffic will occur. (Regulatory techniques to minimize conflicts are being implemented between auto and LRT for European systems.) Reserved lanes is another treatment consisting of mountable curbing, diagonal striping (San Francisco), and solid paint lines. LRT-only streets is another option.
- . Arterials and Medians. LRT right-of-way may be obtained from the two center lanes of a 6-lane arterial or an existing median. Separation may be accomplished by the use of full curbs and median areas, bushes and plantings, and fencing or concrete barriers.
- . Freeways. The use of a freeway median or areas beyond shoulders can provide an exclusive right-of-way for LRT. At-grade median width is minimally 36 feet. However, conflicts with freeway design elements exist, such as station requirements, alignments, interchange ramp conflicts and side slopes.

To eliminate conflicts with traffic or other facilities, grade-separation (subways or aerial guideways) is required. The design requirements for these are virtually identical with those of RRT facilities. (Typical cross-sections of RRT, LRT and bus guideways for aerial, at-grade, and subway treatments are presented in detail in Ref. 3.)

Existing railroad rights-of-way may be suitable for LRT systems if located near high density corridors and CBD areas. For example, Washington Metro will utilize existing railroad rights-of-way for part of its system. Consideration should be given to converting abandoned railroad rights-of-way, joint use of tracks, and grade-separated tracks or separate at-grade tracks on common railroad rights-of-way.

2) Tracks. Basic elements of track are rail, rail fasteners, ties, and ballast. There are two types of rail. T-rail and girder rail. The selection of rail weight is based on axle load, design, stiffness of track, electrical requirements, cost and availability. Rail is rolled in a series of sizes, and classified by weight in pounds per yard.

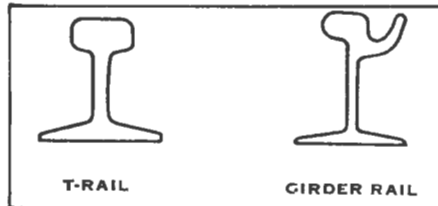


Figure VIII-8. Rail Types

T-rail is normally used on conventional railroads and rail rapid transit systems, and is available in a range of weights. It is used for non-paved track and on structures. The principal variations of girder rail are shallow grooved (for streetcar wheels), deep grooved (for railroad profile wheels), and broad or narrow based. Girder rail is used in pavement. The groove provides a permanent flangeway for the wheel, and the greater depth of the rail provides the stiffness necessary to preserve the pavement.

Modern LRT, rail rapid transit and railroad systems almost invariably use welded rails in track construction. Welded rail provides a quieter and smoother ride, requires less maintenance, and eliminates the need for electrical rail bonding at joints.

Rail fasteners provide stability to the rail. For railroads and transit systems, the most commonly used rail fastener in the United States is the cut-spike, plate-rail anchor combination. It is used to fasten T-rails on timber ties placed on ballast.

For rails supported on a concrete guideway, direct fasteners have been developed consisting of a steel plate supported on an elastomeric pad anchored to the concrete. This fastener provides electrical isolation and vibration dampening, in addition to rail support. Direct fastening is now used on almost all transit systems where track is constructed on structures.

The most common method to support girder rail uses the cut-spike, plate-rail anchor combination. The street pavement is placed on top of the ties and ballast to the height of the girder rail section. In the United States, girder rails are often supported by and fastened to pavement subbase.

Wood and concrete ties transfer the load from the rail to the ballast and maintain the track gauge. Wood ties are most common in the United States, with Europe favoring concrete ties on their new transit systems. Steel ties are generally no longer used. The spacing of the ties on the roadbed is very important since they distribute pressures between track and ballast. At San Francisco, ties are generally 22 to 24 inches apart on the Muni system.

Ballast is a layer of coarse granular material which allows water to filter through and off the track bed. Another purpose of the ballast is to anchor the track.

There are three basic types of track used on light rail systems: open track, fixed track and paved track. Track construction varies widely, depending on the types of roadbed, ties and rail fastening systems. A basic design principle is to incorporate some flexibility in the track structure. This flexibility permits the track to deform under traffic load, and to absorb, rather than transmit, noise and vibrations.

The simplest and most common form of track is known as open track; it is identical to track used on railroads. This track consists of rails supported on ties and ballast. T-rail is normally used. Open track is generally the most resilient, since its construction form makes provision for extensive movement under load. It is also easy to maintain and the quietest form of track. It is used wherever possible on LRT systems, and in some instances may be used on structures and in tunnels.

Fixed track is used only on structures or in tunnels. T-rail is almost always used and is bolted directly to the structure. To dampen the potential vibration, flexible elastomeric pads and special tie plates are placed between the rail and the structure. This form of track construction is used extensively on rail rapid systems, which normally have a higher proportion of their network in elevated or tunnel structures.

Paved track is required wherever LRT shares its right-of-way such as grade crossings, pedestrian malls, and transit ways shared with buses. Paved track is also used on narrow street medians where ballasted track would be untidy and accumulate trash. Such an installation has just been completed on Judah Street in San Francisco, and is also common in Europe.

In North America, paved track is constructed in basically the same manner as open track, using ties, ballast, and generally, girder rail. When the track construction, compaction and alignment is completed, some form of pavement is placed over the ties up to the rail head. The track is rigidly attached to the pavement, and any vibration produced is transmitted to the pavement. The resulting track is somewhat noisy, and if the pavement is of insufficient strength, it may be damaged by the subsequent vibration and movement of the rails.

In Europe, an entirely different form of track, referred to as tieless, has evolved for use in pavement. In conventional track, the function of the ties is to spread the load of the train onto the ballast, to hold the gauge of the track, and to prevent the track from buckling under thermal stresses. Because the axle loads of LRT vehicles are less than those experienced in conventional railroad operation, the load may be transferred to the track base directly, if a rail with a broader base is used (8 inches). To maintain track gauge, a tiebar connecting the rails is installed approximately every 10 feet.

Since tieless track is constructed with rails not rigidly attached to the adjoining pavement, noise and vibration are reduced and pavement life is increased. Support is achieved by "floating" the rails in a jacket of mastic asphalt, which has the property of absorbing vibrations while supporting the weight of trains and thermal expansion stresses without permanent distortion. High friction slag

blocks are placed between the mastic asphalt and the pavement itself.

Track gauge (distance between rails) influences vehicle stability and ride comfort. The standard gauge in rail rapid transit and light rail transit systems is 4 feet, 8½ inches, (1.436 m). This gauge is common in Europe and North America. Many European systems use 1.0 m (3.281 ft.) gauge and a few have adopted unusual widths. In the United States, parts of the SEPTA system, Pittsburgh, BART and New Orleans use non-standard gauges.

3) Alignment. Typical minimum horizontal and vertical alignment parameters are listed in Table VIII- 5.

Table VIII-5. Rail Transit Alignment Parameters

<u>Vertical Curves (Radius)</u>	<u>RRT</u>	<u>LRT</u>
Crest	690-2000 ft.	310 feet
Sag	900-2000 ft.	460 feet
<u>Horizontal Curve (radius)</u>	400-500 ft.	42 feet
<u>Grade (%)</u>	4	4-9

b. Intermodal Transfer Stations

Rail transfer stations play important integral roles in system operation in much the same way as bus terminals. In some cases, rail rapid, light rail, and bus systems may serve one terminal thereby blurring the distinction between bus and rail transfer facilities.

1) Uncontrolled access stations. These serve LRT sections which are at-grade. Because of its grade-separated right-of-way, RRT systems have no uncontrolled access stations.

They can be located within streets or existing railroad rights-of-way. They consist of a raised paved area, a shelter, and passenger amenities such as benches, information displays, telephones, etc.

The simplest station is a designated area in the center of a street. Passengers are not physically protected from traffic, making this type undesirable. Traffic signals can be used to stop traffic prior to the station to permit crossing.

Another type of station within existing streets includes a raised island, with some barrier against oncoming traffic. Typical width of the raised island is about 6 feet, and its length 400 feet. Several variations of LRT at-grade stations are possible through intersection design, signal phasing (particularly for left-turns of traffic moving parallel to the tracks), and location of station (far-side or near-side). In Europe, a number of at-grade stations include an underground pedestrian area with shops, stairways, escalators, etc.

2) Controlled Access Stations, These stations, found on both LRT and RRT systems, serve the rail guideway from existing streets and traffic. Controlled access stations are a necessary and distinguishing part of RRT because of its exclusive right-of-way requirements.

Station platform dimensions vary. RRT stations have high level platforms to match vehicle dimensions. Platform length can vary from 400 to 700 feet. A typical subway station platform length is 500 feet. Side platforms are usually 12 feet wide. Center (between tracks) platforms can vary from 16 to 28 feet in width.

LRT controlled access station platforms are 400 feet in length, 12 feet wide for side platforms, and 24 feet wide for center platforms.

c. Propulsion

1) Electrical distribution systems. A major consideration for a distribution system is that its current carrying capacity must be large enough to power the largest train at the shortest headway expected. LRT, RRT, and some railroads are powered by direct current (DC) at 600 volts or higher.

On systems with direct current, the fixed distribution system is fairly complex involving transformer substations and a substantial feeder system. The onboard power system is simple, because of the DC traction motor's characteristics. It is not practical to transform DC voltage to an AC power supply. As a result, rail systems which are relatively short, intensively used, and operate lightweight equipment with numerous starts and stops are invariably electrified by DC.

Power from the public supply is tapped at regular intervals, generally at several miles. Each supply tap is from a different zone of the public supply system, thereby reducing the chance of multiple supply point losses. The incoming power is transformed to the primary feeder voltage and fed into the primary feeder system for the transit network. The primary feeder typically operates at a relatively high voltage, such as 33 kv. The primary feeder cables can generally be placed in underground ducts. At intervals throughout the systems, the primary feeder connects to transformer/rectifier substations. Here the power is transformed to the operating voltage and converted to direct current, normally 600 volts. There is a tendency to use higher operating voltages on new transit systems, with Metro and Lindenwold designed for 750 volts and BART for 1000 volts.

2) Overhead power supply. LRT requires an overhead power supply system for the at-grade sections of the network. Light rail vehicles collect power from an overhead contact wire by means of a trolley pole or a pantograph. The trolley pole system was used extensively on street car systems, but is now being phased out in favor of the pantograph. A pantograph is a symmetrical diamond arrangement of jointed steel tubing. Many recent LRT designs now use an asymmetric, single jointed arrangement which is less expensive.

There are two basic designs used for LRT overhead: single contact wire or multi-wire catenary. On streetcar systems and on some modern LRT systems a single contact wire is supported every 100 feet. This system is light, simple and inconspicuous (compared with multi-wire catenary), but requires frequent supports and is of limited current carrying capacity. The wire is made of a bronze alloy whose conductivity is approximately 40 percent of that of annealed copper, which is too soft to be used.

The alternative overhead system is the multi-wire catenary. A catenary system is normally used on new installations and on high speed lines, because it has superior electrical properties and requires fewer support poles. The catenary consists of one or more support wires known as messengers which support a contact wire in an approximately level profile. The accepted maximum span length for catenary systems is 230 feet.

The catenary system has some flexibility throughout the length of its span. Catenaries are usually tensioned with weights, which provide constant tension and eliminates thermal sag.

Both single contact wire and catenary systems may be supported by poles placed centrally between the tracks or outside the tracks. When constructing overhead within the street right-of-way, joint use of these poles for both overhead support and street lighting is an important consideration.

Both trolley poles and pantographs are designed to operate over a wide range of contact wire heights. The Boeing LRV pantograph has an operating range of between 12 and 19 feet above top of the rail. The lowest possible contact wire height must be in excess of 12 feet. On the LRT system currently under construction in San Francisco, the minimum design height for the contact wire in tunnels is 12-feet, 7½ inches above rail. Additional height is required for the depth of the catenary itself, and for the catenary support system.

In communities which have operating experiences with electric transit, the presence of the overhead contact wires is seldom perceived by the public as being a major issue. Nevertheless, it is essential that particular attention be directed during the design stage to the appearance of the contact wire system. Developments in electrical conductors and insulators and understanding of the principles of visual design (need for support masts and mast arms) permit a more enlightened approach to this problem than during the streetcar era.

Significant design considerations of LRT overhead power supply include the following:

- . All circuitry non-essential to power pickup should be placed in underground conduits. This generally includes the power feeder cables, signaling circuits and communication lines,
- . Wires and poles are conspicuous primarily in silhouette. Trees and structures that disrupt the silhouette should complement any landscaping concept.

- . It is essential to combine multiple uses for poles to minimize their number. The pole spacing requirements for street lighting and for light rail are similar.
- . The use of existing structures to support the wires can form a cheaper and less conspicuous substitute for poles.
- . Cantilever support arms of tapered design without stays or straps, similar to streetlight arms, are less intrusive.

3) Third rail. Third rail is generally used for RRT but not for LRT operations. Since it is only suitable for exclusive right-of-way installations with high level platforms. Clearance problems may arise on sharp curves with the low level steps of vehicles or their under floor equipment.

The third rail system has certain advantages: it has greater electrical cross-section, and can therefore be used with fewer feeders, or longer trains than overhead systems; and is less conspicuous:

4) Combination overhead and third rail. A few rapid transit systems in the United States operate with both third rail and pantograph equipment, including the Skokie Swift in Chicago and Boston's line to the airport. In Chicago, the transition from third rail to pantograph is made while the vehicle is moving. In Boston, the transition is made at the last station before the train emerges from underground. In both cases, the mixed system is used for historical reasons, and no new installations of this type have been built.

However, there may be advantages in equipping LRT systems for both pantograph and third rail pickup, including lower height requirements for tunnel sections, joint operation on certain sections with rail rapid transit, and more efficient operation. On heavily traveled lines, full grade separation and third rail power distribution can be efficiently used to operate long trains. Where the line has grade crossings and shorter trains are used, a lighter duty and less expensive overhead wire system can be utilized.

5) Diesel power. Some of the commuter rail systems use standard diesel locomotives for propulsion (e.g., Southern Pacific in San Francisco).

d. Control

1) Visual/manual control. Operator control of a train is, of course, the oldest form of control. Streetcars and railroad trains were operated by personnel. With labor recognized as a major operating cost, the trend is toward automatic systems with due regard for safety of operation.

2) Automatic train protection. Automatic Train Protection (ATP) detects the position of trains in successive track blocks, and relays information to the operator so that he may operate the vehicle safely and prevent collisions. In Automatic Train Stop (ATS), the brakes of the vehicle are automatically applied if the vehicle exceeds the safe speed limits signalled to it. ATP is widely used on both railroads and transit systems, and is extremely reliable. ATP is not used generally on LRT shared or reserved lane rights-of-way. It is used predominantly on exclusive rights-of-way. ATP is necessary for LRT subway operations.

ATP may use wayside or cab signals. Cab signals relay the information on block condition to the operator's console onboard the vehicle. With cab signals, the ATP system displays the maximum speed instructions to the operator. The speed is based on the safe braking distance to the preceding car, possible conflicting train movements or turnout alignment, and the safe operating speed for that section of track. The operator remains in control of the car. However, if ATS is included and the prescribed speed is exceeded, the brakes will be set automatically. ATS is also referred to as overspeed protection and is commonly used in rail rapid transit.

A refinement of ATP systems is the use of "permissive close" in operations, which permits the train to close in on the train ahead, provided that it does so at a low, safe speed. It enables operation at very close headways during peak periods or periods of schedule recovery, allowing one train to enter a station immediately behind another. It also permits a train to close in on a disabled train and, thus, to clear the line with little delay. This feature adds to system capacity at critical times by allowing headways slightly greater than the maximum station dwell times. "Permissive close" cannot operate through junctions of two lines, where absolute stops are required.

On dedicated rights-of-way with at-grade crossings, traffic signals at each crossing must be interconnected with ATP. For high performance LRT service on lines with at-grade crossings, interconnection of the two control systems may be essential to preserve adequate traffic flows on cross streets and safety. Preemptive traffic signals can also be tied into an ATP system. Because the progress of each vehicle along the line can be monitored and visually displayed to a dispatcher at a central control station, the ATP system may also be used to monitor schedules.

To improve operations, Automatic Vehicle Monitoring (AVM) may also be provided. With this system, each light rail vehicle is equipped with a train code which actuates a trackside induction detector. This detector identifies the car and the route number, transmitting the data to central control and using it to align turnouts and set passenger information display boards at stations.

3) Automatic train operation. Automatic Train Operation (ATO), is a well established practice on rail rapid systems and has successfully operated on the London, Hamburg, and Lindenwold rail rapid transit systems for several years. The operator is an attendant, who is limited to monitoring vehicle performance and communicating

with central control, closing doors, and responding to emergency situations. Exclusive right-of-way and grade separation are required for ATO. The application of ATO in LRT operations is somewhat limited.

4) Fully automated unmanned operation. Fully automated unmanned operation enables a train to operate without an onboard operator. At present, fully automated unmanned operation is confined to experimental systems, airport shuttles, and industrial rail lines. Full automation requires exclusive and fully restricted guideways and is not therefore applicable to LRT whose distinguishing characteristic is its capability to operate through at-grade conflict points.

4. Summary

Bus and rail design features are the physical characteristics (guideway, terminals, etc.) of the modes and their applications. Overall, design features reflect the changing emphasis of public transportation from design standards to user considerations, (e.g., elderly and handicapped) and from neglect to preferential treatment of transit. Design features are inseparable from a system's manner of operation and can have significant impact on its success. In developing and evaluating alternative systems (as will be noted in Sessions XV and XVI) information regarding design features is a necessary but not sufficient element.

References

1. Levinson, Herbert S., et al., "Bus Use of Highways: Planning and Design Guidelines." NCHRP R-155, (TRB, Washington, D.C.), Wilbur Smith & Associates, New Haven, CT., 1975.
2. Homburger, W., "Notes on Transit System Characteristics," Information Circulation No. 40, ITTE, Berkeley, CA, April 1975.
3. Diamant, E., et al., "Light Rail Transit: State of the Art Review," Final Report for UMTA, U.S. Department of Transportation, Spring 1976.
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Session VIII

Transit Facility Design

The El Monte Busway Station (1)

- (1) Excerpted from Second Year Report, San Bernardino Freeway Express Busway Evaluation, Bigelow-Crain Associates, May 1975.

The El Monte Station is the major terminal and interchange point on the El Monte Busway system (see Figure 1). It accommodates park-ride, kiss-ride, walk-in, through-bus, and bus-transfer patrons. The general concept of the station is illustrated in Figure 2. It is a circular design with buses circling a 10-sided loading platform which facilitates ten loading berths. The buses enter the station via a newly constructed grade separation which connects the adjacent local arterial (Santa Anita Avenue) through the bus storage yard to the station. Buses also enter from the Busway. Buses coming eastward off the busway stop at a stop sign at the end of the busway. Buses exiting the terminal have the right-of-way at this point and cross in front of the buses coming off the busway. (This crossover is related to the station capacity calculations discussed later.)

Buses entering the station wait at a holding point that is monitored by a TV camera. The station director sits in the center of the station at an oval control center and monitors the holding point on a video screen output of the TV camera. He directs the bus at the holding point to an empty loading berth of his choice, notifying both the bus driver and the waiting passengers of his decision through a loudspeaker system. The bus proceeds to that berth, loads and unloads passengers and departs at a scheduled departure time.

Passengers can arrive at the El Monte Station by several modes. In reality hardly any arrive by walking or on bicycles.¹ The vast majority come in on the feeder and through buses and over one-fourth by the park-ride, kiss-ride modes. The parking lot now has 1400 parking spaces. Park-ride, kiss-ride passengers enter the terminal at ground level walking through an underground passage and coming up to the second level boarding area via the escalator or elevator. The elevator is scarcely used; it is primarily used by physically disabled persons.

The station also has a lower level terminal used by intercity carriers for ticketing and passenger waiting. The intercity buses are loaded upstairs, where two of the berths are allocated to these buses (e.g., Greyhound and Trailways).

STATION SURVEY

A part of the overall station evaluation was done through informal face-to-face interviews with users. Interviews were collected in the platform waiting area during peak and off-peak

¹A Note on Bikes: There are also 20 "key" and four coin-operated bike lockers. The former lease for \$5 per month, the latter for 25¢ daily. These are not used to capacity. Around the end of the year, usage had dropped to six leases per month and one coin-operated locker per day. This low usage pattern is dissimilar to the BART experience, where lockers are used to capacity and more lockers are on order.

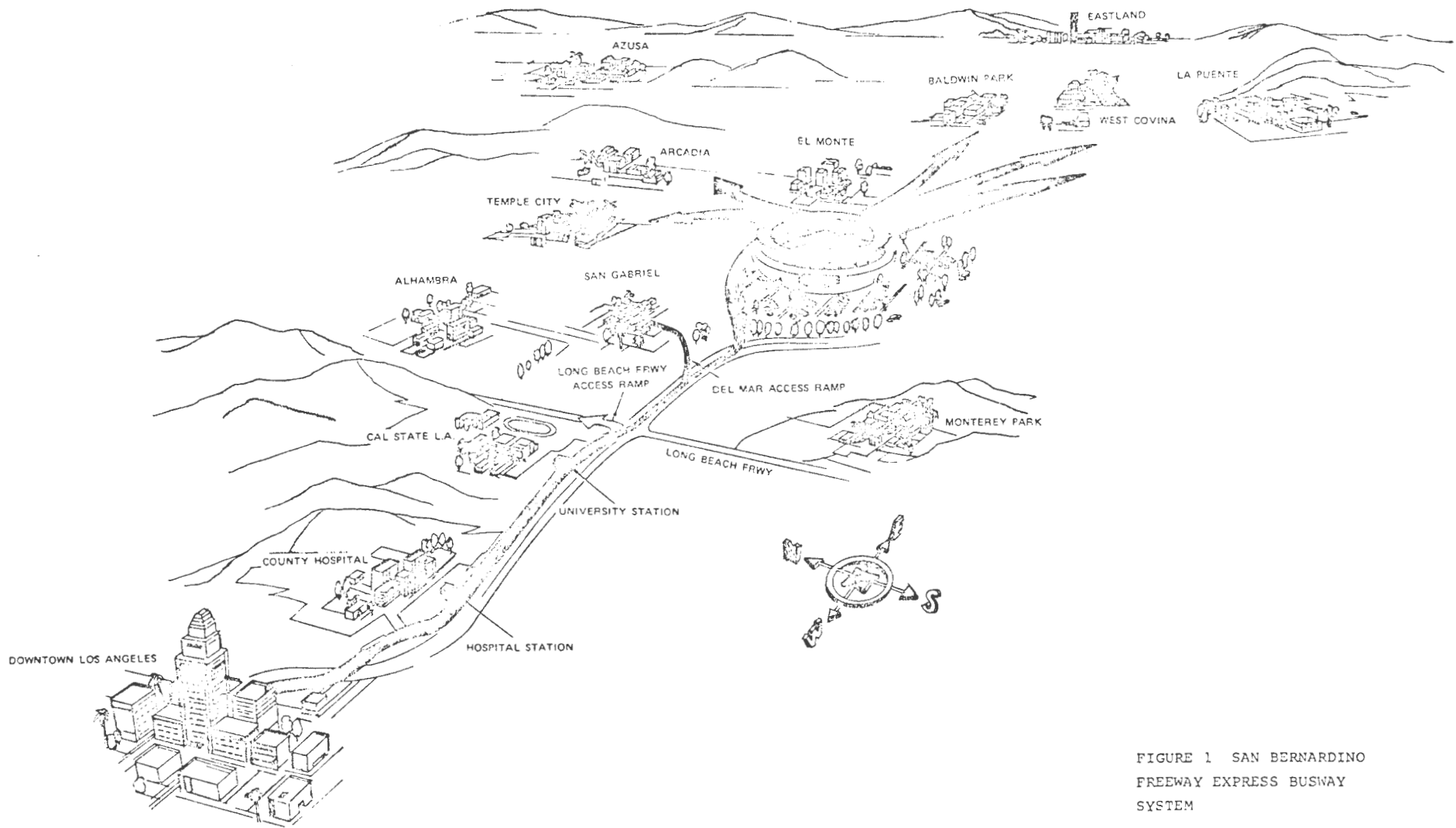


FIGURE 1 SAN BERNARDINO
FREEWAY EXPRESS BUSWAY
SYSTEM

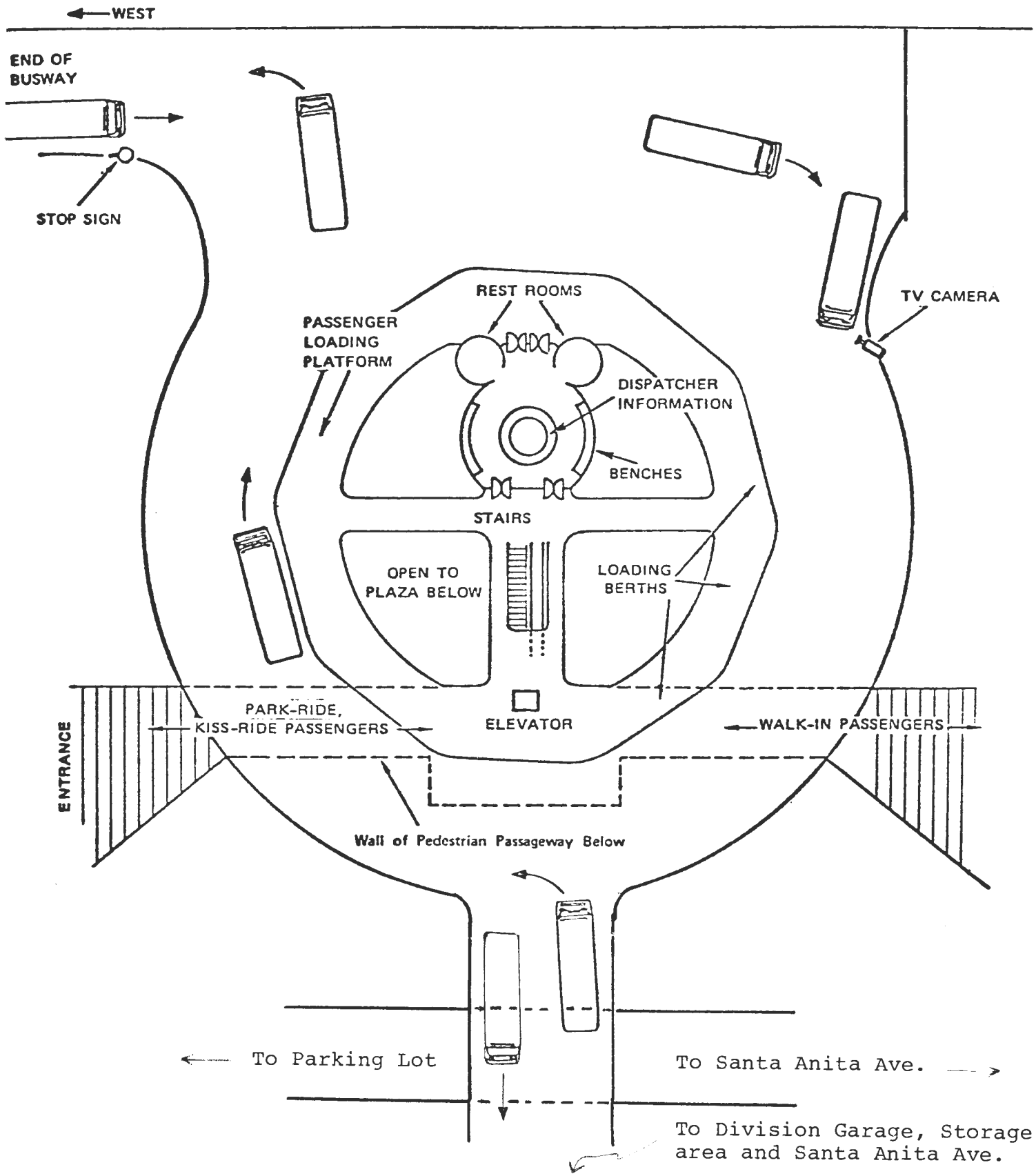


FIGURE 2. EL MONTE STATION, PLAN VIEW

hours on a weekday. A total of 349 people were interviewed at the El Monte station.

Passengers were asked what they thought the station's best features were and what its inadequacies were. (Additional questions were asked, and these are discussed later.) Responses to these two questions are shown in Tables 1 and 2 .

Responses were analyzed not only in terms of their frequencies but also to see if responses varied by sex, by trip purpose, by time of day (peak or off-peak) and by those who use the stations during the day only as opposed to those who use them at night as well (after 7:00 p.m.). Results of this analysis are discussed later. Variations in response by age or race are not significant are are not included in the discussion.

The overall reaction to the El Monte stations is a positive one. When the number of positive and negative comments was compared their ratio is as follows:

	<u>Positive-Negative Ratio</u>
El Monte Station	1.6

At El Monte Station, the most positive reaction comes from off-peak riders and those who use the station during the day only, i.e., not after 7:00 p.m. The most negative reactions come from people who use the station at night as well as during the day -- the only group whose number of negative comments was higher than positive comments -- and from commuters or peak period riders.

Table 1. Station Features Liked Best

	<u>Percentage</u>	<u>Station Features Liked Best</u>
El Monte Station	24%	Prompt frequent service
	21%	Open design, visability
	15%	Speed in moving people, buses
	14%	Just like it
	5%	Clear, frequent announcements
	4%	Lobby
	18%	Other

Table 2. Perceived Inadequacies of Station

	<u>Percentage</u>	<u>Perceived Inadequacies of Station</u>
El Monte Station	36%	No inadequacies
	19%	More parking space needed*
	15%	Vending machines needed
	7%	Personnel rude, unhelpful
	22%	Other

* Survey conducted when lot had capacity of 700 vehicles.

Analysis

The formula for computing the capacity at El Monte Station in number of buses per hour is:

$$8(3600/TT) (1 - \text{discount})$$

where 8 is the number of berths, 3600 is the number of seconds/hr, TT is the total time required to process a bus through the station, and the discount is a fudge factor applied to account for possible irregularity of bus arrivals.

In order to be able to use this formula, values of TT must be computed for each of the policies of boarding/deboarding and bus motion which are to be tested.

The policies relative to boarding which are tested are four in number:

1. The same proportion of people board/deboard at El Monte Station as at present, and the number of people per bus is held constant at the present level. During the peak hour inbound on January 30, 1975, buses carried an average of 45.8 passengers and outbound buses carried an average of 47.1 passengers. Since the seating capacity of these buses is usually 48 to 50, this implies that many of the buses already had standees.
2. Hoey and Levinson suggest that capacity measurements be made with a load factor of 1.00.* This would result in many more buses having standees and would correspond to a circumstance in which the number of passengers grew more rapidly than buses could be acquired. Raising the average number of passengers to 50 implies a 9.2% increase in the number of passengers per bus boarding/deboarding in the morning and a 6.2% increase in the afternoon.

*Hoey and Levinson, Bus Capacity Analysis, p. 15.

3. An additional facility is created east of El Monte so that the percentage of people boarding/deboarding at El Monte Station is decreased by 10%, although the average number of passengers per bus remains at the present level. If the method of responding to patronage growth is to build an additional station, El Monte would grow less rapidly than the system as a whole.
4. With the growth of patronage, some buses bypass Hospital and College stations. This will force more people to transfer at El Monte if they wish to go to these intermediate stops. The increase in the number of people transferring is assumed to be 20%. The transfers are the people who deboard in the a.m. and the people who board in the p.m. In the a.m. the people who deboard are increased by 20%, and the people who board are increased by the same number of people (not by the same percentage). In the p.m. the process is reversed -- people who board are increased by 20%, and people who deboard are increased by the same number. The number of people per bus remains as at present.

There are two policies to be tested as to the handling of the buses in the station.

- A. No bus leaves the TV camera and proceeds to a berth until the previous occupant of the berth reaches the station exit. This is approximately the way berth assignment is treated now when buses stack up.
- B. No bus leaves the TV camera and proceeds to a berth until the previous occupant of the berth is perceived to have left. If this policy were used rather than the above (A), an average saving of 17 seconds might be assumed over the 43.5 seconds average cruise-in/cruise-out time now existent.

Finally, an assumption must be made about the discount. Hoey and Levinson suggest 25%* to cover random variations in bus arrivals. The schedule reliability at El Monte Station through the peak period is excellent. However, under conditions of heavier use the criss-cross flow of buses entering and exiting the station would impose delays in coming to the TV camera. If buses were arriving at five or six a minute, either the fixed use of a berth for a particular route would need to be abandoned, increasing the dwell time, or some unscrambling process from the queue waiting to go to the TV camera would be needed. Either solution would lead to an increase in the total time. In the absence of any other approach to a discount value, that of Hoey and Levinson has been used.

* Hoey and Levinson, Bus Capacity Analysis, p. 14.

Results

Table 3 gives the total time, the discounted number of buses, and the discounted capacity for the four policies of loading, two policies of bus movement, and both a.m. and p.m.

Table 3. Capacity at El Monte Station

Passenger Handling Policies	Bus Handling Policies			
	AM Peak		PM Peak	
	A	B	A	B
1. Present proportions				
Time/bus (seconds)	94.9	77.9	101.6	84.6
Maximum buses/hour	227	227	212	255
Capacity (people/hour)	10,400	12,700	10,000	12,000
2. More standees:				
Time/bus (seconds)	97.7	80.7	104.0	87.0
Maximum buses/hour	221	268	208	248
Capacity (people/hour)	11,100	13,400	10,400	12,400
3. Station east of El Monte:				
Time/bus (seconds)	91.8	74.8	97.3	80.3
Maximum buses/hour	236	280	222	269
Capacity (people/hour)	10,800	13,200	10,500	12,700
4. Bypass intermediate stations:				
Time/bus (seconds)	96.7	79.7	107.6	90.6
Maximum buses/hour	223	271	201	238
Capacity (people/hour)	10,200	12,400	9,500	11,200

The capacity in the afternoon is less than in the morning but by very little. The policy of more standees increases the capacity over the present but at the cost of greater passenger discomfort. This increase is greater in the a.m. than in the p.m. because the p.m. already has a higher average number of passengers per bus.

Building another station east of El Monte will only increase the capacity at El Monte Station a small amount if the share of boarding/deboarding passengers is only decreased by 10%. The policy of more buses bypassing the intermediate stations, which results in more transfers at El Monte, has slightly more impact in the p.m. when more transfers occur. Seemingly, the most effective method of increasing capacity at El Monte Station is to send the bus to the berth as soon as possible, and even that does not make massive changes.

All peak hour capacity figures given in Table 3 are approximately 4.5 to 5 times the present rate of use of the El Monte Station.

Questions - VIII

1. Do you feel that the station is laid out efficiently? Why?
2. Which policy would you favor to increase station capacity?
3. Comment on the perceived inadequacies of the station as noted by the survey.

SESSION IX: TRANSIT NEEDS OF THE ELDERLY AND HANDICAPPED

Objectives of Session IX

- . To be able to identify special requirements and improvements in public transportation to meet the needs of elderly and handicapped users
- . To understand and appreciate the role transit plays in providing mobility to elderly and handicapped persons

Synopsis of Session IX

Characteristics of the elderly and handicapped are described to illustrate the groups' special needs for and of public transportation. Various equipment and system elements designed specifically to handle the special requirements are also discussed.

Outline for Session IX

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Population Characteristics
3	Barriers to Transit Use
4	National Policy and Regulation
5	Providing Transit Service
6	Improvement of Systems
7	"New" Services
8	Funding Sources
9	Summary

SESSION IX: TRANSIT NEEDS OF THE
ELDERLY AND HANDICAPPED

1. Introduction

Growing concern has been expressed for that segment of our population termed the elderly and handicapped (E & H). Mobility is one of the major problems of this disadvantaged group. In many instances, transit may need to accommodate to their specialized transportation requirements.

2. Population Characteristics

Assessing the transportation needs of the E & H requires defining the target group. The 1964 UMT Act as amended defines a handicapped person as "any individual who, by reason of illness, injury, age, congenital malfunction, or other permanent or temporary incapacity or disability, is unable without special facilities or special planning or design to utilize mass transportation facilities and services as effectively as persons who are not so affected.

Schnell (2) classifies the handicapped as:

- . Invalids - persons who are disabled for active service or movement and are virtually confined to bed;
- . Nonambulatory - persons who, for all practical purposes, are confined to wheelchairs;
- . Semiambulatory - persons who, although handicapped to some extent, can walk with difficulty and generally use crutches or canes; and
- . Ambulatory - persons who, although handicapped by age or infirmity, can walk without serious difficulty.

There is some ambiguity in the definitions for the elderly and handicapped. For example, UMTA regulations include "elderly" to the definition given for "handicapped" by the 1964 UMT Act, but gives no specific age. The most common definition is persons aged 65 years or older. One reason for this is the ease of identification with Medicare cards. However, there is no complete agreement. For example, some transit systems define elderly by sex and age. Usually, women are younger: women-60, men-62.

From an UMTA report (3), 1970 population figures for the E & H are given in Table IX-1. E & H persons comprise about 13% of the U. S. population.

Table IX-1. Population Estimates of E & H

Category	Population (Millions)
Elderly who are handicapped	7.0
Elderly who are not handicapped	13.2
Non-elderly who are handicapped	<u>6.3</u>
TOTAL	26.5

Source: Ref. 3

Figure IX-1 classifies the population by area type, driver, transit availability, and ability of using transit. Urban transportation service should be made available for the 8.6 million (In Fig. IX-1: Group 1 - Group 2b and Group 3b = 8.6 million) E & H persons who do not or cannot drive cars. Over the next 30 years, the E & H population is expected to increase by 40% or 37 million.

The elderly with incomes below poverty level are about double the rate of that for the general population: 5.2 million elderly, about 25%. Of these elderly poor, an especially small percentage, as compared to the general population, are located in areas where high transit usage exists and costs are relatively low.

The economic characteristics of the over-65 population imply two important market considerations: (1) the elderly poor are mobility-restricted because of their low income, and (2) the elderly with sufficient incomes represent a large transit market because of their unique combination of sufficient income and leisure time. Their income level, and hence this market, is expected to continue to increase.

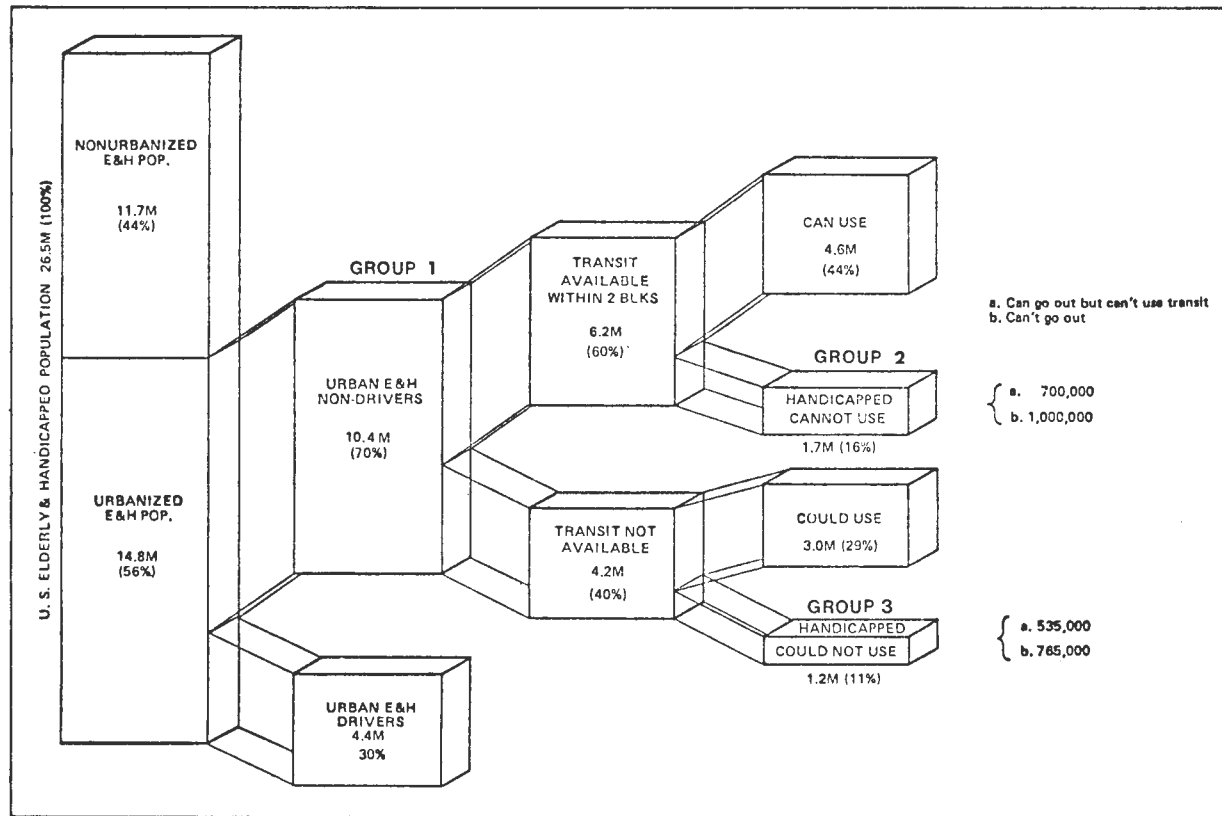
In travel characteristics, the elderly are similar to the handicapped. This is due, in part, to the large overlap in the two populations: one third of the elderly are handicapped and half the handicapped are elderly. Significant numbers of both groups fall in the low income bracket. Both groups have lower than average incidence of licensed drivers. In a society of high mobility and self-service, large numbers of both groups find many amenities and some necessities of life more difficult to attain than other people.

3. Barriers to Transit Usage

Some aspects of transit systems act as barriers in keeping E & H persons from using transit. There are physical, operational, psychological, and economic categories of barriers. Examples of psychological barriers are fear of assault, crowds, embarrassment, getting lost, and asking strangers for help.

a. Physical and Operational Barriers

Table IX-2 lists a number of these types of barriers. Any combination of these transit barriers would be viewed as obstacles making the use of transit inconvenient, unattractive, or impossible for some E & H persons.



Source: Ref. 3.

Figure IX-1. E&H Population Categories.

Table IX-2. Travel Barriers

Physical Barriers	Operational Barriers
<p>VEHICLES</p> <p>High step required to enter Difficult to get into or out of seats Seats not available/forced to stand Difficult to reach handholds Cannot see out for landmarks No Place to put packages Cannot see or hear location information Nonvisible signs</p> <p>TERMINALS</p> <p>Long stairs Long walks Poor fare collection facilities Poor posting of information Poor crowd flow design Little interface with other modes</p> <p>TRANSIT STOPS</p> <p>Insufficient shelter Platform incompatible with vehicle Inadequate posting of in- formation</p>	<p>VEHICLES</p> <p>Frequency of service Driver assistance/attitude Acceleration/deceleration Information presentation Schedules maintenance Inadequate or inappropriate routes Too many transfers</p> <p>TERMINALS</p> <p>Employee assistance/ attitude poor Information clarity and dissemination Length of stops too short Crowd flow non-directed Little or no interface with other modes</p> <p>TRANSIT STOPS</p> <p>Poor location: for safety for convenience Not enough stops Information displayed insuf- ficient or confusing</p>

Source: Ref. 3

b. Economic Barriers

Because of the combination of low incomes and relatively high transit fares, a portion of the E & H population have restricted mobility.

c. Effect on Latent Demand

Table IX-3 contains potential values of increased ridership (latent demand) of the E & H if the transit system were fare and barrier free based on a survey. These increases suggest that physical and economic barriers are significant factors in discouraging the use of transit by these groups.

TABLE IX-3. Latent Travel Demand
of the Handicapped and Elderly

Trip Purpose	Current Travel (Trips/Person/Day)	Additional Travel (Trips/Person/Day)*	Potential Increase
Work/School	.14	.02	14%
Shopping	.17	.14	82%
Medical/Dental	.12	.06	50%
Social/ Recreational	.18	.20	111%
Church	.13	.11	85%
	.74	.53	72%

*Additional trips that respondents said they would take if they had access to a barrier-free system at no cost.

Source: Ref. 3

4. National Policy and Regulation

As a matter of national policy, the elderly and handicapped have the same rights as other persons to use public transit. This policy is stated in Section 16(a) of the UMT Act of 1964, as amended and Section 165(b) of the Federal-Aid Highway Act of 1973, as amended. The above legislation provides authority to and directs the U. S. Department of Transportation to assure that special efforts are made in the planning and design of mass transportation facilities and services which can be used by E & H persons.

Section 5 requires that, before funding is made, applicants agree and assure "...that the rates charged elderly and handicapped persons during nonpeak hours for transportation utilizing or involving the facilities and equipment of the project financed with assistance under this section will not exceed one-half of the rates generally applicable to other persons at peak hours..." regardless of who operates the transit system. Actual E & H rates and regular rates vary by service and route. For example, standard peak-hour fare is 35¢ on a line of the Denver RTD. E & H off-peak hours fare is 15¢ and the standard fee for transfers is 5¢, while the E & H may transfer free.

Special efforts in planning means genuine, good-faith progress in planning of services for the elderly and handicapped (wheelchair users and semiambulatory persons) that meets a significant part of their transportation needs within a reasonable time period. Federal regulations specify the following items should be considered for making special efforts in planning:

- . The location and transportation needs of wheelchair users and semiambulatory persons within the urbanized areas must be identified, possibly through existing information or self-identification means.

- . A range of alternative service improvements, including the use of private carriers, should be evaluated as to coverage, cost, and benefit.
- . Health and welfare agencies and private non-profit organizations should be considered for inclusion in a local coordinated plan.
- . A discussion of the evaluation process and the selection of service improvements should be held as part of the planning process.
- . Elderly and handicapped persons should take part in the planning process. The MPO must describe the ways these persons are involved in the process.

Federal regulations also require that the annual element of the transportation improvement program (TIP)* of an urbanized area contain projects which benefit the E & H. UMTA will approve financial assistance only if E & H related projects are programmed.

5. Providing Transit Service

Difficult policy and implementation questions regarding the way to provide transit service for the E & H have arisen due to the ambiguities of defining the target group and their needs. Another reason is the newness of the mandate to make good-faith planning efforts. Final E & H regulations by USDOT were established in early 1976.

Representing two ends of the spectrum of alternative service types are "separate and specialized" vs. "together and equal." A separate and specialized service can be a door-to-door system with vehicles specially equipped for the E & H. An example of this service type is "Call-A-Bus" in Syracuse, N.Y. serving disabled persons and those 55 years or older.

A "together and equal service" can be a conventional urban bus transit system with retrofitted vehicles and fixed facilities. An example of this type is PAT in Pittsburgh where E & H related modifications have been made to existing buses.

UMTA does not specify a program design to meet the special efforts requirement. However, the following are examples of programs which illustrate a satisfactory level of effort.

- . A program for wheelchair users and semiambulatory handicapped persons that will involve the expenditure of an average annual dollar amount equivalent to a minimum of five percent of the section 5 apportionment to the urbanized area.
- . Purchase of only wheelchair-accessible new fixed route equipment until one-half of the fleet is accessible, or, in the alternative, provision of a substitute service that would provide comparable coverage and service levels.
- . A system, of any design, that would assure that every wheelchair user or semiambulatory person in the urbanized area would have public transportation available if requested for 10 round-trips per week at fares comparable to those which are charged on standard transit buses for trips of similar length

*TIP is discussed in Session XIII.

within the service area of the public transportation authority. The system could, for example, provide trip coupons to individuals who would then purchase the needed service.

6. Improvement of Existing Systems

The goal of improving existing transit systems is to have a "together and equal" system for all users. For the E & H, this means eliminating their difficulties in moving in crowds, standing in a moving vehicle, maintaining balance during starts and stops, etc.

a. Physical Improvements

The physical barriers of transit vehicles and fixed facilities noted in Table IX-2 must be altered or removed to make a system accessible and usable by the E & H. Federal regulations require that:

"...every fixed facility - including every station, terminal, building or other facility - designed, constructed, or altered on or after May 31, 1976, with UMTA assistance, the intended use for which will require either that such fixed facility be accessible to the public or may result in the employment therein of physically handicapped persons, shall be designed, constructed, or altered in accordance with the minimum standards in the "American Standard Specifications for Making Building and Facilities Accessible to, and Usable by, the Physically Handicapped, Number A117.1 - R 1971," approved by the American Standards Association, Inc. (subsequently changed to American National Standards Institute, Inc.) (ANSI).

Consideration should also be given to:

- . travel distance for wheelchair persons, and
- . fare vending and collection systems and areas, and boarding platforms.

Bus design must now provide for a "wheelchair accessibility option" which means a lift or ramp mechanism and a securement device, for future installation. Step design is required as follows:

The vertical distance from a standard 6-inch curb to the first front door step shall not exceed 8-inches; the riser height for each front door step after the first step up from the curb or street level shall also not exceed 8-inches; and the tread depth of steps at both front and rear doors shall be no less than 12-inches.

Priority seats for the E & H should be designated by seating signs for the front seats. Interior handrails and stanchions should be designed for continuous support for boarding and fare payment, safe on-board movement, seating and standing assistance, and unboarding. Consideration should also be given to slip-resistant floors and steps, adequate lighting of step wells, carefully positioned fare collection boxes, and illuminated signs on front and boarding sides of a bus.

Rapid and light rail vehicles should have clear door openings of at least 32 inches. Audible warnings of closing doors must be provided. The gap between boarding platform and rail vehicle must be minimized (e.g., not more than 2 inches) to permit safe passage for the E & H at wheelchair accessible stations. Vehicle considerations similar to the bus such as priority seating signs, interior handrails and stanchions, and floor surfaces should also be made.

In a study by UMTA (3) estimates for upgrading transit systems for E & H considerations are reported as:

- . \$5,000 per urban transit bus,
- . \$800,000 per rapid rail terminal
- . \$500,000 per terminal for new systems (BART, METRO).

b. Economic Improvements

For regular transit service, various funding mechanisms to aid E & H persons are available. These take two forms: user-side or provider-side subsidies. User-side subsidies refer to ways in which money is provided directly to the user for transit fares. This could result in free or partial fares. Provider-side subsidies are ways in which money is given to the provider of the service for equipment and operating costs incurred. The Section 5 stipulation of maximum off-peak fares for E & H persons is a type of provider-side subsidy.

User-side subsidies such as issuing transportation stamps to E & H persons with incomes below a specified point and taxi coupons for specific E & H groups are operating. In Oklahoma City, a provider-side subsidy program has been established. Contracted taxi firms are reimbursed for half the fare for E & H riders who pay the other half. This program is the first in which Federal funds under Section 5 are used to pay taxi companies for carrying passengers.

7. "New" Services

a. Service Characteristics

Much of what are "new" transit services for the E & H fall into the separate and specialized category of systems. Because of the similarity in service characteristics, a number of para-transit modes fall into this category such as demand-responsive systems, taxis, or subscription buses.

Service characteristics of a system depend on the particular need of the service area. For example, whether a system provides door-to-door or feeder service depends on the target group and their transit trip characteristics. Other system characteristics are shared or individual rides and short or long notice of trip desire.

System routing and scheduling also depend on demand. Besides flexible routing and scheduling as in demand-responsive, a service of fixed destinations with limited flexible routing can be devised. Another option is the use of special small buses during the off-peak on certain regular transit routes.

All of these systems include vehicles easily accessible by the E & H, such as taxis or small buses specially equipped with lifts. As such, these specialized systems eliminate or reduce many of the physical and operational barriers listed in Table IX-2.

The trade-off between cost and service aspects of these specialized systems is a major issue. A recent report (7) lists various system characteristics and their costs. For example, the cost of a demand-responsive system of medium quality service is \$12-20 per vehicle hour of operation and a taxi system of high quality service is about \$6-8 per vehicle hour.

b. Coordinated Services

From a management standpoint, it is preferable to provide transit service in an integrated fashion. A relatively new concept is called the brokerage system in which all available transit services are coordinated by the operating transit authority to meet demand. In a brokerage system, E & H services would be coordinated with the existing transportation services.

Related to the intent of the brokerage system in using existing transit service is the use of contracted taxi services to provide a specialized transit system to E & H persons. The subsidized taxi fare program in Oklahoma City is one example of how existing taxi services can be used to meet the transportation needs of an area.

Providing specialized transportation services, the Delaware Authority for Specialized Transportation (DAST) is the first statewide system of its kind in the nation. User eligibility is set by the particular agency sponsoring a trip. For example, the Kent County Office on Aging in Delaware pays for trips of a person 60 years or over and who participates in its programs, regardless of physical, mental, or economic handicaps. Funding sources for DAST are the agencies sponsoring E & H users and the state transportation division, which subsidizes the budget deficit. DAST also incorporates the brokerage concept, since taxis are requested if taxi fare is less than DAST unit costs.

8. Major Funding Sources

There are a large number of federal, state, and local programs for the elderly and handicapped. On the federal level, major programs listed in Table IX-5 are administered by the Departments of Transportation, and Health, Education, and Welfare as established by the Older Americans Act of 1965, Social Security Act of 1935, UMTA of 1964, and Federal Aid Highway Act of 1973. The administration of these programs are not coordinated to any notable degree.

State and local programs vary by source of funding, such as sales, payroll, and gasoline taxes. State and local government agencies such as departments of transportation and welfare administer subsidy programs. Local non-profit groups also administer programs for transportation of the E & H.

Table IX-5. Major Federal Services

Program and Administering Federal Department	Population Served	Transportation Authorities
1. SPECIAL PROGRAMS FOR THE AGING (HEW) A. Title III (OAA) B. Title VII (OAA)	Elderly Elderly over 60	Purchase of vehicles and special equipment, client and staff reimbursement, and purchase of services allowed.
2. TITLE XX - SOCIAL SECURITY ACT (HEW) "Public Services"	Elderly, Blind, Disabled; income eligibility required (SSI)	Purchase of vehicles and special equipment, client and staff reimbursement allowed. Transportation must be in State Plan.
3. MEDICAID-TITLE XIX Social Security Act (HEW)	Income eligibility required-SSI eligibles; no age specified	Purchase of vehicles, prohibited; purchase of services, staff and client reimbursement allowed; income disregard provisions in effect.
4. REHABILITATION SERVICES PROGRAM (HEW)	Employable disabled; no age requirements	Purchase of vehicles not encouraged but allowed; purchase of special equipment allowed; purchase of services allowed; staff and client reimbursement allowed.
5. DEVELOPMENTAL DISABILITIES PROGRAM (HEW)	Disabled, under age 18	Purchase of vehicles and special equipment allowed, staff and client reimbursement allowed, income disregard provisions in effect.
6. PUBLIC HEALTH SERVICES PROGRAMS (HEW)	General population with health needs- includes elderly and handicapped	Vary from program to program.
7. VETERANS PROGRAMS (VA)	Veterans-elderly and handicapped	Stipends to individuals for transportation services and special automobiles.
8. SECTION "147" PROGRAM, Rural Highway Public Transportation Demonstration Program	Elderly and handicapped in rural areas, as well as general population	Purchase of vehicles allowable. Operating costs may not exceed 1/3 of total grant for new projects.
9. URBAN MASS TRANSPORTATION ADMINISTRATION PROGRAMS	General population, elderly and handicapped served	
Capital (Grant Program)		Purchase of capital equipment only.
Section 16(b) (2) (Elderly and Handicapped Transportation Services)	Elderly and Handicapped	Purchase of vehicles only.
10. RETIRED SENIOR VOLUNTEER PROGRAM (Action)	Elderly	Purchase of vehicles allowed. Purchase of services allowed.
11. SENIOR OPPORTUNITIES AND SERVICES	Elderly	Purchase of services and vehicles allowed at the discretion of grantee.

Source: Ref. 8

Since July 1973, Pennsylvania senior citizens (65 years or older) have been allowed to ride free on local transit during weekday off-peak periods and all day on weekends. Approximately 80 public and private transit properties are participating in the program entitled "Free Transit Program for Senior Citizens" administered by Penn Department of Transportation and authorized under Pennsylvania Acts 338 and 339 of 1972. The source of funding is a state lottery.

9. Summary

The Pennsylvania program is one example of the increasingly active roles local, state, and federal governments are playing in providing better public transportation opportunities for the E & H. Their rights are clearly recognized and regulations require that special efforts be made in making public transit more usable by the E & H. The intent of making transit usable by the E & H is clear; the actions to carry it out are not. A concern of local operators of conventional transit is the potential of increased operating costs arising from possible increases in service times at transit stops. Each community will have to decide what combination of services best meet the needs of their own elderly and handicapped.

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Session IX

Transit Needs of the Elderly and Handicapped

"Special People" - Slide Show

"It's Like Being People" - Movie

Questions - IX

1. Which approach to serving the elderly and handicapped would you favor? Why?
2. What costs are associated with each approach?

Session IX

Transit Needs of the
Elderly and Handicapped

The Pennsylvania Program⁽¹⁾

- (1) Source: Pennsylvania's Transportation Disadvantaged Program, Remarks for Secretary Sherlock, National Council for the Transportation Disadvantaged, November 22, 1976.

PENNSYLVANIA'S TRANSPORTATION DISADVANTAGED PROGRAM

REMARKS FOR SECRETARY SHERLOCK
NATIONAL COUNCIL FOR THE TRANSPORTATION DISADVANTAGED
HOLIDAY INN TOWN
NOVEMBER 22, 1976

I want to take the opportunity to thank you for inviting me to speak to you today. I realize that this group represents many diverse interests, but I think we are all gathered here today with the common interest of solving some of the problems that confront the transportation disadvantaged.

Before I begin to discuss some of these problems, I would like to briefly review the programs that we have already underway or are about to start.

The first and probably best known activity of this kind that we have going is the free transit program for senior citizens.

This program began in July of 1973 and is funded with funds from the state lottery. It permits any person 65 or over to ride public transit free during non-peak hours and all day on weekends.

Since the program was started \$35 million has been spent to provide 167 million rides. PennDOT pays the transit operators the loss incurred in providing the free rides.

This year, for example, we are paying \$13.3 million to provide 62 million free rides for senior citizens. A recent study has shown the effectiveness and importance of this program.

The study, conducted by GAI Consultants, Inc., of Monroeville, and funded in part through a UMTA technical study grant, involved more than 2,000 interviews with senior citizens in six Pennsylvania metropolitan areas selected as representative of the state as a whole.

The results indicated that a chief benefit of the program was increased mobility for senior citizens, particularly those with lower incomes.

The study showed that 14.5 percent of the people making use of the free fare program did not use transit before the program started. More than half of these cited the free service as the reason they started riding. It was also found that the average income of new riders was lower than those who rode before the free fare, thus indicating that cost was a reason for not riding.

The study also noted that senior citizens were making more trips than before. Over half of the riders surveyed indicated they saved money other than transit fares by being able to shop at more places and thus take advantage of lower prices. Pennsylvania has moved to the forefront in offering senior citizens the opportunity to get out and see and enjoy all that our communities have to offer.

The report indicated that transit operators, while generally feeling that they were being undercompensated for providing this service, thought the program helped improve their public image and their ridership. Without their cooperation, this program could not succeed.

Another program is the reduced fare for handicapped persons. This program is operated by local transit agencies and coordinated by PennDOT to provide half fare rides for handicapped persons during non-peak hours.

This year we are providing 130 specially equipped mini-buses to 70 non-profit social service agencies throughout the State. These are equipped with either lifts or ramps and are fitted with wheelchair tie-downs.

The \$1.1 million Pennsylvania got this year for this program was actually in excess of our share of the federal money. By aggressively seeking funds, we were able to use some money that other states neglected to take advantage of.

Next year, I'm afraid that we won't be so lucky, but we will have nearly a million dollars available for the purchase of this type of equipment.

Also, under this state's rural transportation program, we will be providing \$140,000 in capital and operating assistance to rural transportation agencies. Next year, with the consent of the legislature, we hope to increase that amount several fold.

We also have a federal grant of \$600,000 to rural public transportation program that provides both capital and operating funds to demonstrate the feasibility of operating rural transit services.

This program is aimed at the establishment of new transit systems and the coordination of existing systems.

Finally, we have a \$250,000 state and federally funded rural regional transit planning program to assist in the planning of rural transit systems through 10 regional planning agencies.

Now that we have looked at what is presently going on, let's take a look at what we should and can do.

When we plan our programs to help the transportation disadvantaged, we must keep one important thing in mind: we have only a limited amount of money and we must spend it carefully. We must get maximum benefit from our dollars. We do not have enough money that we can afford to waste it.

With this in mind, let us take a look at some of the different modes of providing transportation for those with transportation difficulties.

Among all means of travel available to handicapped persons, the most convenient is the private automobile. This means, of course, that the handicapped persons must either have disabilities that do not prevent him from driving or that he have someone to do the driving for him. It also means that he must be able to afford to own a car.

While not everyone can meet these criteria, those who can may achieve a great deal of freedom of travel. Certain simple aids, such as the handicapped license plates that we issue and the designation of special handicapped parking spaces make automobile travel easier for the handicapped.

Not all people can drive or afford to own a car. Most of these are dependent on transit for travel.

Transit actually requires a good deal of independence in moving about. It does not provide door to door service, so the rider must first get to the transit line before he can ride.

Another problem with public transportation is that of entry and exit of transit vehicles. While new vehicles and transit systems can be designed to reduce this problem, we are still faced with the fact that we have millions of dollars invested in equipment that would be expensive to change.

It is not practical to provide total transit accessibility for the handicapped, and I would be foolish to advocate that.

What we can do is provide limited accessibility on our fixed transit routes and supplement this with special transportation services.

We can frequently provide much improved service for the handicapped by adjusting routes and schedules. Special equipment can be added to vehicles when studies show it is justified by need.

Right now an experimental fixed route service for handicapped persons called the magic carpet service is in use in Pittsburgh. This service is provided by a private, non-profit agency under contract to port authority transit.

Also, we are now studying the possibility of setting up a special demonstration service for handicapped persons in cooperation with agencies in the southeastern Pennsylvania. The service would most likely be fixed routes, but the possibility of demand responsive service is also being studied.

We can also improve our facilities in many ways, particularly if they are new.

For persons with sensory limitations better informational and direction services and clearer marking of danger areas using lights, colors, sound and surface texture changes. We can also provide shortened walking distances.

The elimination or reduction of obstacles such as stairs and barricades. Smooth channelization of crowds and alternative paths for people who cannot move as fast as the crowd. Widened doors and turnstiles so persons can pass unimpeded. Provision of ramps for non-ambulatory and semi-ambulatory persons.

Another improvement in transit can be made in the area of driver training. Drivers can be trained to better assist the handicapped rider in such ways as waiting for elderly riders to sit before starting the bus or falling off the names of the stops if a blind rider is present.

Taxicabs are another important means of transportation for the handicapped. They have the advantage of direct door to door service but have the disadvantage of expense.

This problem can effectively be dealt with. For example, Yellow Cab of Lansdale has a shared ride zone system, where, if you reserve the cab 24 hours in advance, rides may be shared at the rate of 50 cents per passenger per zone.

Also, improved taxi driver training is needed so that drivers may be better able to assist handicapped persons.

Social service agencies play a role in that they provide transportation services beyond what all other means of transportation can provide. They go beyond simple door to door service and are uniquely equipped to serve the special needs of the handicapped.

The key to successfully meeting the needs of the transportation disadvantaged lies not in any one of these modes of travel, but in the successful integration of them. We cannot do without any of them.

What we must do is see that all are successfully coordinated into a system that meets the needs of all the people, and see that this system is kept on a sound financial foundation.

To this end, we have prepared a draft policy statement on transportation for the transportation disadvantaged. Copies will be made available for your review during this conference.

I must emphasize that this policy statement is only a draft. I want to hear what you have to say about it before any final decisions are made.

The whole area we are discussing is really so new that no one is expert in it. In fact, our work in this area is really a pioneering effort.

So we're bound to make some mistakes. We're not going to always please everyone. But we must make the effort, and we must have your help and cooperation.

In our modern society, good transportation is a necessity, not a luxury. To deny it to any segment of our population is unjust.

Yet there are many practical problems to be solved to achieve our goals. We have a lot of work ahead of us.

But I have confidence that we can do it.

Thank you.

Questions - Session IX

1. Comment on the statement that it is not practical to provide total transit accessibility for the handicapped. Do you agree?
2. Would the use of shared taxis as described for Lansdale be applicable elsewhere? Why?
3. What is your overall evaluation of the Pennsylvania Program?

SESSION X: SMALL AREA PUBLIC TRANSPORTATION

Objectives of Session X

- . To understand the methods of providing transit service to rural areas and small urban areas in terms of how systems and equipment fill service needs
- . To be able to relate rural and non-urbanized area transit improvements to Federal funding programs

Synopsis of Session X

Federal funding programs for rural and non-urbanized areas will be described. Transit programs and systems applicable to small area public transportation are the major topics of the session.

Outline of Session X

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Market Size
3	Transit Programs
4	Transit Systems
5	System Costs
6	Funding Small Area Transit Projects
7	Transportation by "Human Services" Agencies
8	Summary

SESSION X: SMALL AREA PUBLIC TRANSPORTATION

1. Introduction

Small urban areas (under 50,000 population) and rural areas have always had the least amount of public transportation service. In small urban areas, their size and density characteristics make walking or bicycling a viable mode and auto ownership is high. However, changing lifestyles, economic pressures and greater social and environmental concerns have increased the need for alternatives to automobile travel or in many cases, not traveling at all. This session examines the emerging public transportation function in rural and small areas.

2. Market Size

Table X-1 depicts population categories for urban and rural places in this country as of 1970.

Table X-1. Urban and Rural Population (1970)

	Population (000's)	Percent	# Of Places
Urban	149,279	73.5	7,061
Places of 1,000,000 or more	18,742	9.2	6
Places of 500,000-1,000,000	12,967	6.4	20
Places of 250,000-500,000	10,442	5.1	30
Places of 100,000-250,000	14,285	7.0	100
Places of 50,000-100,000	16,724	8.2	240
Places of 25,000-50,000	17,820	8.8	519
Places of 10,000-25,000	21,414	10.5	1,384
Places of 5,000-10,000	12,936	6.4	1,840
Places of 2,500-5,000	8,041	4.0	2,296
Places under 2,500	722	0.4	626
Unincorporated parts of urbanized areas	15,186	7.5	
Rural	53,886	26.5	13,707
Places of 1,000-2,500	6,659	3.3	4,193
Places under 1,000	3,852	1.9	9,514
Other rural	43,375	21.3	
TOTAL	203,166	100.0	20,768

Source: U.S. Statistical Abstract

In 1970 there were 115 million Americans or 56.6 percent living in areas classified as rural or under 50,000 population. Of this amount, approximately 51 million reside within an SMSA leaving nearly 64 million residents or 31 percent living outside. Of particular importance, besides this large population group, is the vast number of places or jurisdictions which are represented by the population. Over 13,000 places are classified as rural alone!

a. Rural Areas

Rural areas represent one quarter of the U.S. population. Although the median income of farmers doubled between 1960 and 1969, it is still only half the national average. In addition, the number of farm families has declined to the point where they represent only 20% of the rural population. There are significant pockets of rural poverty particularly

in the Appalachian region, the deep South and Southwest. These areas also show high concentrations of both elderly and handicapped. In these areas of rural poor, auto ownership is low and often the auto that is available is poorly maintained and frequently out of use. When the head of the household uses the auto in the journey to work, the remainder of the household is left without transportation. Travel distances to jobs, social services, medical, dental, and shopping facilities tend to be long in rural areas.

b. Small Urban Areas

Small urban areas are considered to be places under 50,000 population which are not a part of an SMSA. The larger non-urban areas have characteristics similar to smaller SMSA's. The smaller ones are more typical of rural villages and towns. In 1975 there were 318 bus systems operating in urban places with populations less than 50,000 outside an urbanized area. These systems carried approximately 100 million revenue passengers averaging a little over a thousand passengers a day per system. (2)

The non-urbanized areas are highly dependent upon the automobile. Since trip distances are short and parking costs often non-existent out of pocket costs are low. While the average person in the U.S. makes approximately 27 transit trips a year, those in non-urbanized areas average under 2. This is still three times as high as was found for the Suwanee Valley (Florida) Transit System where transit trips averaged 0.6 persons per capita on the rural portions of the system.

The smaller the urban area, the more likely it will be that the system is privately owned. Of the 318 systems in places under 50,000, 175 or 55% are privately operated. Transit operations in small cities, as well as in rural areas, can be conducted with significantly higher speeds. For example, Westport, Connecticut, an area of 28,000 operates a minibus system which has average speeds of 15-20 mph in contrast to normal urban speeds of 8-12 mph, thus increasing service area and system capacity.

In many of these small urban areas, taxi-cabs provide the only formal public transportation service or complement existing transit service. There are over 7,000 taxi companies operating in 3,360 communities.

c. Need for Transportation

There are two primary needs for rural and small city transportation. They are to get to jobs and to get to community services. Since both employment opportunities and community services may be widely scattered, travel distances in rural and small urban areas are usually long.

Estimating the demand for rural and public transportation is extremely difficult. There is relatively little data and only limited experience, although there is a growing body of knowledge. In general, early estimates have been high, perhaps because the latent demand has been over-estimated. Often responses to attitudinal questions have been accepted literally. Some have tried to estimate demand based upon the trip making characteristics of the general populace. For example, the national average of

total trips per person per month is 67, according to Burkhardt (4) but in rural areas of North Carolina only 10.1 trips per person are made. When new service was provided in certain rural areas, trip making increased only slightly rather than by a factor of three or more as might have been expected.

In many cases, the high estimates assume large numbers of elderly or handicapped. It appears that many in this category prefer to carpool or not make the trip rather than wait for a bus. A better indication of demand as related to various levels of service should be forthcoming from the Section 147 program. This program requires detailed record keeping and a full evaluation.

3. Transit Programs

Public transportation services in rural and small urban areas have been sporadic and generally single purpose. The auto has been by far the dominant mode. Intercity buses have provided for some of the needs but more so for longer trips.

Informal arrangements are common in rural areas and small cities through various ride sharing techniques including carpooling and hitch hiking. Such arrangements may include financial reimbursement to the driver often at what appear to be exorbitant rates.

Much of the early public transportation services provided in the rural areas has been in association with various social-welfare and anti-poverty programs. Thus, agencies such as the Office of Economic Opportunity and the Department of Labor, sponsored transportation projects aimed at getting the head of the household to and from a job and getting the various members of the family to needed social and health services. The service provided daily journey to work travel but less frequent schedules for other trip purposes. The services that have been provided have been dependent upon grant programs and many have ceased service after several years.

Within the last five years there has been growing emphasis on the transportation needs of the non-urbanized population. Both UMTA and FHWA have expanded their programs to assist in this area and many states are also beginning to enlarge the scope of their transit activities to encompass rural areas.

a. Ride Sharing Alternatives

Ride sharing is the most important public transportation service available in rural America. Hitch-hiking is quite common especially with the younger age group. Hitch-hiking, where legal, is still an acceptable means of transportation in rural areas and small cities.

Buspools and vanpools are growing in importance for the journey to work in rural areas that are within a reasonable driving proximity of major employment centers. With today's high speed highway systems, commute times of an hour or more allow employees to live in low density or rural areas. In such situations, bus and vanpools present very economical means of transportation on a person-mile basis.

Ride matching in which an employer or a community service agency match up drivers and passengers is also common in rural areas. Usually passengers pay a prescribed charge for the ride. Driver reimbursement is the most common ride sharing technique. It is used frequently in the journey to work on a formalized carpooling basis and somewhat less formally or other trip purposes.

b. Automobile Provision

A program in which individuals were provided automobiles free or at low cost was tried by the local Community Action Agency in Mercer County, West Virginia. Those who were given the autos were responsible for providing transportation services for others in their community. They had free use of the auto at other times. Often the provision of the auto enables the individual to obtain a job which he otherwise would be unable to reach.

A quandry many of the rural poor have in buying a car is their inability to obtain a bank loan to finance the auto. No loan means no car, which in turn means no job.

c. Extension of Intracity Systems

Some suggestions have been made to extend city transit service lines into rural areas. This has many disadvantages, largely economical, in that a large number of vehicle-miles are added with few additional passenger-miles. Most urban buses are under-powered for the higher speed rural travel. Such extensions would require additional equipment and would lower overall fleet utilization. Urban transit lines tend to be CBD-oriented which may not be the desired destination for the rural inhabitants.

d. School Bus Usage

School buses have been used to provide rural and small city public transportation in a number of areas. However, school use often precludes the bus from being used for work trips. School buses have been used in Klamath Falls, Oregon, by the Senior Citizens Transportation, Inc., in Rhode Island, and by the Pennsylvania Department of Agriculture System. In general the non-peak period trips are best served by idle school buses.

The use of school buses presents numerous institutional problems. In several states, the law does not allow non-school use of the buses. The physical structure of the bus often limits its use by the elderly and handicapped. Steps are high, doors are narrow, seats are small, aisles are narrow, and there are few amenities. The buses are generally large and in rural areas there is normally little need for a 40 to 60 passenger vehicle.

A commitment by the community and the school system is requisite. Many school officials would rather not get involved in a project which has no direct relation to their primary function. The most practical procedure is to lease school buses that are owned by private operators who want to get greater utilization of their equipment. Simultaneous use of the vehicle by school children and adults is not practical or desirable for either party.

4. Transit Systems

A wide range of systems have been utilized in providing public transportation in rural and small urban areas. They include the following:

a. Conventional bus systems. Full sized suburban or inter-city buses have been used to provide rural service. The buses carry 30 to 50 passengers and operate on fixed routes and a fixed schedule. They have designated stops and also make flag stops. This type of system is most effective for high demand journey to work trips.

b. Minibus systems. The most popular service found in rural and small urban areas is provided by minibuses of all shapes and sizes. Seating capacities are generally in the 12-20 range. The buses operate in various modes but usually on a fixed route, fixed schedule basis. In some instances they act as feeder buses to larger vehicles or to intercity bus systems. Some of the vehicles are especially designed for the needs of the elderly and handicapped. The capacity of the minibus is generally better suited to the demand than the full size bus and is more mobile on narrow, winding rural roads.

c. Ride Sharing Systems. Ride sharing and demand responsive systems have been employed where demand is light and trip origins and destinations are widely scattered. Usually minibuses or small vans are used for such service. In some instances, privately operated taxi firms have been employed to provide the service. This is the case in El Cajon, California where shared ride taxi service is provided under municipal contract by a private operator. Demand responsive systems have also been provided by social service agencies often on a volunteer basis.

d. Jitneys. A form of jitney service has been used in providing rural and small area transit service. It can be formalized on a reserved seat basis or it can be simply flagging down the driver. It is most common for journey to work trips where the driver keeps to a fixed route and schedule on his way to and from an employment center.

e. Combination. In some areas, a combination of services such as a demand responsive system interfacing with a fixed-route "spinal" large bus system provides expanded service. Santa Clara County, California is an example of this concept.

5. System Costs

A number of studies have found operating costs for rural transit systems ranging from 33¢ to 92¢ per vehicle-mile with most falling in a band from 50 to 70¢. Similar costs have been found for the small city transit systems. Wages represent the bulk of this cost even though wage rates are substantially below those for the larger unionized systems.

Operating costs per vehicle-hour are generally in the \$8 to \$15 range. Operating costs per passenger fluctuate significantly. In rural areas a study of 12 systems found the average cost per passenger to be \$6.71 (Ref. 5). A study of 13 small city systems found comparable average costs of \$.82 (Ref. 5). The rural costs appear quite high but the average trip length is long and cost per mile compare favorably with urban systems. However, the high average cost, which can not be covered by fares, results in very high per passenger subsidies. Fares in rural systems have been found to average 2-5¢ per passenger mile.

6. Funding Small Area Transit Projects

a. UMTA Programs

Prior to 1974, there were limited funds available to finance transit assistance for non-urbanized areas. However, the National Mass Transportation Assistance Act of 1974 provided up to \$500 million for exclusive use in non-urbanized areas during the six year period from 1975 through 1980. Such non-urbanized areas include cities, towns and rural places with less than 50,000 population. Funds are available for planning and program development activities, demonstration activities, vehicle acquisition and other capital investments in support of general or special transit services, including those services provided for elderly, handicapped and other transit-dependent persons.

1) Planning Assistance Program (Section 9). A total of \$4.2 million for planning (technical studies) for FY76 was distributed by formula to the State Departments of Transportation or other State agencies designated by each Governor; \$1 million of these funds were apportioned on the basis of non-urbanized area population. These funds may be used to develop the local transit programs required to qualify for UMTA capital assistance. This planning activity may be undertaken by the designated agency on behalf of a capital grant applicant, or by a county, community or other public body.

2) Capital Assistance Program for Public Agencies (Section 3). These funds are available to provide capital assistance to public bodies and private operators (through lease contracts with public agencies) under current procedures for administration of UMTA's Section 3 program. This is a discretionary program with grants made on a case-by-case basis. There is no specific State role in the application process. However, the State transportation agency or the county is encouraged to assist communities in the development of grant applications. In addition, the State or county may submit a joint application on behalf of several communities as such action would assist in making capital resources available to smaller communities.

3) Capital Assistance Program for Private Nonprofit Organizations to Transport Elderly and Handicapped Persons (Section 16(b)(2)). A total of \$22 million was distributed in FY76 by formula, to State agencies designated by the Governor to help private nonprofit organizations provide for the special needs of elderly and handicapped persons in urbanized and non-urbanized areas where existing or proposed services of public and private transit operators are not adequate. Special procedures for project application in non-urbanized areas are available. Local private nonprofit organizations prepare and submit applications to the State in which they are located. The State is responsible for (a) selecting 16(b)(2) applications and (b) submitting a consolidated single Statewide application to UMTA on behalf of all the selected applicants.

4) Service and Methods Demonstration Program (Section 6). UMTA's demonstration program is available to develop, test, and promote innovative and nationally-relevant services and methods relating to public transportation. About \$1 million is committed in FY 1976 for non-urbanized area projects. These funds may cover part of the project expenses involving capital investment, operations, administration, and evaluation during the project's life (usually 1-3 years). Expenses of existing or conventional transit operations cannot be covered with demonstration funds.

b. Federal Highway Administration Programs

Section 147 - Rural Highway Public Transportation Demonstration Program. The 1973 Federal Aid Highway Act authorized a rural highway public transportation demonstration program to be jointly administered by FHWA and UMTA. The program is aimed at innovative transit services for rural areas and small urban areas. Funds may cover both capital and operating expenses for a multi-year period, after which non-program funds must be used to continue services. Sponsors must be public agencies or nonprofit public-purpose organizations.

A total of \$75 million was authorized over a two year fiscal period. Projects eligible include highway traffic control devices, the construction of passenger loading areas and facilities, including shelters, fringe and transportation corridor parking facilities to serve bus and other public mass transportation passengers, the purchase of passenger equipment other than rolling stock for fixed rail, and operating expenses incurred as a result of providing such service. To the extent intercity bus service is provided under the program, preference shall be given to private bus operators who lawfully have provided rural highway passenger transportation over the routes or within the general area of the demonstration project.

The first such demonstration system funded under this program began operations in Michigan's upper Peninsula in the summer of 1976. The Intra-Peninsula Bus System operates five 16 passenger buses which cover 800 miles daily. The region served includes three counties and covers an area of 100 by 185 miles. Trips are from remote areas of the

Peninsula to the cities of Sault St. Marie, St. Ignace, and Newberry. As of January 1, 1977, over 104 Section 147 projects in 48 states had been selected for funding.

c. State and Local Programs

State and local programs for the provision of transit services have generally been quite limited although there is a growing trend to greater involvement by both government levels. Many of the rural oriented states have gotten into the public transportation field by trying to serve those communities that formerly were not eligible for Federal grants. Chapel Hill, North Carolina has a Municipal Transit system which was funded by a bond issue and property taxes. Merrill, Wisconsin's transit system is funded 90% by state funds and 10% by local funds.

State and local human services programs generally follow the federal programs and have the same constraints and limitations. It can be anticipated that both state and local governments will play a growing role in the provisions of rural and small area transit services.

7. Transportation by "Human Services" Agencies

A significant, but little understood source of transportation services is provided by so called Federal, State and local "Human Services" agencies. A recent report (3) by the Department of Health, Education and Welfare catalogued many of these services. The report also defined the nature of the transportation services as follows:

"Transportation expenditures for human services programs administered by HEW, DOL, CSA, USDA, Action, ARC and LEAA, are "support service" expenditures. That is to say, with the exception of the Department of Transportation programs, no other federal programs identify transportation as a primary program service. For example, the U.S. Department of Labor provides funds for employment and training programs under CETA (Comprehensive Employment Training Act) programs (primary program services), but makes funds available for transportation as a support service to assist CETA clients in securing and maintaining employment and/or training.

Therefore, when we talk of coordinating transportation services among federal human services programs, we are dealing with coordinating support services authorized by law and regulation to more effectively carry out primary program services."

Some of the more important human services agencies and programs are listed below.

a. U.S. Department of Health, Education and Welfare

HEW, through several of its offices, can directly provide rural transportation services, can purchase such services or can reimburse clients or workers for such services. The offices within HEW that provide these services are the Public Health Service, the Office of Education, the Office of Human Development, and the Social and Rehabilitation Services.

b. U.S. Department of Labor

Similar to HEW, the DOL also provides transportation services to the rural areas and small cities. This includes the Manpower Administration of DOL through Comprehensive Manpower Services - Title I, Public Employment Programs - Title II, and Summer Program for Economically Disadvantaged Youth and Job Corps - Title IV. DOL's Office of Economic Opportunity (OEO) provides transport services in its Community Action Programs, Emergency Food and Medical Services and Older Persons Opportunities and Services.

c. Federal Task Force on Transportation

An objective of the HEW report was to establish means for coordinating the human services programs. In the southeastern section a number of Federal agencies have created a Southeastern Federal Regional Council Task Force on Transportation. Included on this task force are DOT, DOL, HEW, HUD, and CSA.

Each Federal government agency, along with state and local agencies, is identifying perceived barriers, documenting actual barriers (statutory, regulatory, policy attitudinal) and developing recommendations for removing the duplication and fragmentation of existing transportation services among federally funded human services programs.

d. State and Local Programs

Estimating human services transportation expenditures can only be done with any degree of accuracy at the local and state levels. The states of North Carolina and Kentucky have estimated human services program expenditures for client transportation at \$4.5 millions and \$7.5 millions (federal, state and local dollars) respectively. Each state funds approximately 450 vehicles with human services dollars.

State and local human services programs generally follow the federal programs and have the same constraints and limitations. It can be anticipated that both state and local governments will play a growing role in the provisions of rural and small area transit services.

8. Summary

The provision of public transportation services to the rural areas and small cities has been given a higher priority in the last few years by all levels of government. A number of different systems are currently operating or about to get underway. System costs are high and patronage low but the overall social and economic benefits appear to justify the investment.

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Session X

Small Area Public Transportation

"Descriptions of Projects in
Several States" (1)

- (1) Source: Excerpt from "Nonurbanized Public Transportation: A Federal Perspective," Barbara Reichart, FHWA, U.S. DOT, November 1975.

NONURBANIZED PUBLIC TRANSPORTATION:
A FEDERAL PERSPECTIVE

by

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Prepared for presentation at the Transportation Research Board
Conference on Paratransit, Williamsburg, Virginia, November 1975

Nonurbanized Public Transportation
and its
Implications for Paratransit Service

The 1973 Federal-Aid Highway Act authorized the Department of Transportation to carry out a Rural Highway Public Transportation Demonstration Program in 1975 and 1976, with a funding level of \$9.65 million for the first year. Under this program, the Federal Highway Administration (FHWA) and the Urban Mass Transportation Administration (UMTA) are to fund projects which will demonstrate how the mobility of nonurbanized residents, especially in rural areas, can be improved. The over 350 proposals submitted for first-year consideration, requesting over \$120 million in demonstration funds, attest to two things: (1) the level of perceived need for better public transportation services in our nonurbanized areas, and (2) the apparent lack of available resources to meet this need.

In mid-September, 45 projects spread throughout the country in some 31 States were preliminarily selected for funding. These projects represent a wide variety of transportation schemes ranging from fixed-route, scheduled general services to an assortment of demand-responsive van operations, to an institutionalized "friends and neighbors" concept using volunteer transportation providers. The variety in the kind of organization that will provide the service is equally wide: from the established regional transportation authority to a county government to a consortium of social service agencies. I would like to give you a brief description of

a selected number of these projects, pointing out significant differences in both service types and organizational structures, and then suggest a number of issues which these projects raise with respect to future Federal activity in nonurbanized public transportation.

New York

In New York State, two separate projects illustrate different approaches being taken to provide public transportation.

County supervisors in Chautauqua County, in the most southwest part of the State, will use State, local, and various Federal funds to connect outlying rural residents to existing fixed-route service. The connecting services will be provided by "community transportation contractors" who are local residents, generally retirees or housewives with some spare time, who will respond to individual requests in their service area. The service vehicle will be a 12-15-passenger van.

In mid-New York State, a Chenango County community action council, Opportunities for Chenango, Inc., will operate a unified transportation service designed around the needs of specific users such as elderly persons and low-income families. The program combines automobile-based demand responsive and fixed-route small bus (16-passenger) service. On weekends, the bus will be operated in the demand responsive mode and will be available for charter during the evenings. After initial orientation, the actual coordination of services will be the responsibility of cooperating volunteer groups

such as the Senior Citizen Clubs and FISH (Friends in Service Here) groups. Although the service will be provided by a nonprofit agency, the County Commissioners are supporting the program by encouraging all county agencies to enter into purchase of service arrangements with the integrated service. Future support envisions committing some local revenue-sharing funds to the integrated service.

Pennsylvania

Pennsylvania is a recognized leader in rural public transportation programs and, in addition to a statewide planning and coordination effort to be conducted under the rural demonstration program, is the site of two other innovative projects.

Chester County in the southeast part of the State is fairly well served by public transportation, both commuter bus and rail, which link it to nearby Philadelphia. The need is not to duplicate these services but to provide transportation within the area for transportation disadvantaged people and at reasonable cost. A consortium of 10 social service agencies, with varying service clientele, will form a coordinated system. The service will consist of seven mini vans for demand-responsive service and semi-scheduled long-haul use such as to specialized hospitals or charter trips and 70 volunteer automobile drivers. A limited mileage-subsidy scheme has been prepared to reimburse volunteer drivers for expenses. Dispatching of all services, both to individuals and social service agencies, will be done at a centrally-located

dispatching facility. Each consortium member-agency will be linked by direct telephone to the dispatch center. Potential individual users can contact the transportation service through a toll-free telephone call.

A six-county program in the north central region of Pennsylvania will establish a regional transportation authority to coordinate the existing fixed-route service which uses school buses, mini buses, and station wagons. The program will also establish a small vehicle collector system. Using purchase of service agreements with social service agencies, the transit authority will contract with currently franchised public carriers to operate the vehicles being purchased through this grant, in accordance with expressed local needs. Much of the present administrative responsibility rests with members of the various human resource agencies. This practice will continue during the demonstration program.

Tennessee

One of the most striking projects in self-help is found in Hancock County, Tennessee: the local judge will be the voluntary project director; the county manager of human resources will be the voluntary part-time supervisor. The service consists of contracting with the operators of locally owned school buses to run low-level service along predetermined routes with boarding (and alighting) permitted at any point along the route. Three converted vans will be used in the

demand-responsive mode to service mainly handicapped or elderly persons, with fares reimbursed by the respective agency. All other riders would pay \$.50 for a trip within the county.

The Progress for People Human Resource Agency in the nine-county Southeast Tennessee Development District will integrate and expand an existing multi-agency demand responsive van system. Two aspects of this project are particularly interesting. In Tennessee, as in a growing number of States, State statute requires public school systems to provide educational services to all handicapped persons, aged 4 to 21, living within their jurisdiction. To implement this statute, the legislature also provides funds on a per child basis as a transportation allowance. While most Tennessee school districts have their own transportation capability, they may contract for this special service. The Human Resource Agency provided this service in the past and will continue to provide connector service for the area's most isolated children. Another interesting aspect of this project is the feasibility study and development of a commuter van program running from one of the sparsely-populated rural areas into the Chattanooga urban area. Off-peak service to selected small urban areas to maximize the use of these vans is being developed.

Oklahoma

The Inter-Tribal Council, Inc., in northeastern Oklahoma, will operate a 5-county route deviation van system. A major share of financial support in the first year will be through purchase of service contracts with social service agencies. The more innovative aspect of this project is its plan to organize transportation clubs. Individual groups of people interested in a specific type of service, be it for commuting, recreational, shopping, or other purposes, will be assisted in forming cooperatives which will then negotiate for pre-paid specialized transportation service. This concept also offers the potential of involving employers and shopping center merchants.

North Dakota

One of the more theoretical projects is proposed by the North Dakota State Highway Department. Much has been written and spoken about the suitability of the "grassroots" approach to rural public transportation. One objective of this North Dakota project is to institutionalize the "friends and neighbors" concept through good community organization networks, centering on the nursing and retirement homes, at least initially. A thorough documentation and evaluation of this process is planned. A second objective of the project is the joint effort of the Department of Highways and the State Public Services Commission to review, revise, and update inadequate portions of regulations (both statutory

and promulgated) which prevent or inhibit innovative responses to transportation needs in rural and nonurbanized areas. These two agencies will be documenting their procedure and making model suggestions which we believe may be very relevant to other States facing similar constraints.

California

In Southern California, San Bernardino County will contract with existing bus and taxi operators to provide service in the rural sections of the county. In this respect, the county is following the successful examples of Californian cities like La Habra and La Mirada which provided the equipment and subcontracted the actual operation of the demand responsive system to private operators. In some cases, existing two-door taxis will be replaced by vans to make the service more attractive and accessible to people with a physical disability or restriction.

The Humboldt County Association of Governments and the local transit authority are cooperating in a project to introduce corridor service and advanced scheduled demand service (primarily for handicapped persons) to rural residents in this northern California area. The service will be coordinated to feed into the jitney taxi operation in Eureka, a city of some 24,000 people, and the dial-a-bus system available in Fortuna (4,200 population) for senior citizens.

Oregon

Further north in Oregon, the city of Reedsport will establish a community developed and supported small bus system operating on a deviated fixed-route schedule to three small towns, each under 5,000 population. Because the sponsors believe subsidies are unpopular or distasteful to their residents, they have developed a campaign to sell "certificates of support" to clubs and individuals. As of this date, the community is spiritedly raising funds and pledges for the service. The project may include more than passenger service as the local Post Office has indicated a desire to use the system to deliver mail to nearby communities.

Questions - X

1. Which of the particular state programs do you believe to be most effective? Why?
2. What drawbacks do you see in particular state programs?

SESSION XI: MANAGEMENT

Objectives of Session XI

- . To define basic organizational structures in the transit industry
- . To understand the functions of transit management
- . To be able to relate these functions to planned improvements of transit service
- . To understand the role of labor organizations in the transit industry

Synopsis of Session XI

This session is a general discussion of transit management. Typical management structures and functions are examined for small, medium, and large transit systems. The role of labor is discussed in light of Section 13(c) requirements.

Outline of Session XI

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Organizational Structure
3	Management Functions
4	Personnel
5	Management Tools
6	Summary

SESSION XI
MANAGEMENT

1. Introduction

Transit management has changed significantly over the past two decades as transit passed from private to public ownership. These changes are reflected in organizational structure, personnel and operating practices. Yet despite the changes many of the problems that transit faces today are similar to those that the industry has dealt with to varying degrees of success over the past century. Both the changes to transit management and the constancies are discussed in this section.

2. Organizational Structure

Transit bodies are identified by a number of different names around the country. In many cases, the nomenclature is merely semantic and dependent upon the particular state or local legislation that created the body or franchised its operation. Some of the more common names are:

- . Authority - Normally a state, multi-state or federally created body authorized to provide transit service in a defined area.
- . Agency - Same as Authority
- . District - Same as Authority; the district refers to a specific geographic area which is applicable for voting or taxing purposes
- . Commission - Same as Authority
- . Company - Corporation (Inc.) generally indicates a private firm but may also be a publicly owned entity.

Transit bodies are identified by other names including bus lines, municipal or street railways, department, system, etc. In some instances, a logo type name is used such as "Metro," or "Transpo." In general, all such names have similar meanings and the key differences are those which are defined by the legislation establishing or franchising the operation. In the industry, transit systems are often referred to as "properties."

A large number of organizational structures is found in the transit industry. The structure varies by ownership type, city size, and state and local legislation. The more common organizational structures are as follows beginning with the private ownership entity.

a. Private Transit Systems

In 1975 there were 614 privately owned transit operating systems. These systems carried ten percent of the total revenue passengers. The majority of these systems were quite small averaging about 3,000 passengers per day. These private operations are often family businesses

utilizing non-union drivers and maintenance staff. Management personnel double up to carry out a number of functions. In many instances, management personnel may be substitute drivers or perform certain maintenance functions.

Private transit firms are generally subject to the same rules that any private business faces. The private operator would be governed by the charter granted him by the state or local government. In some instances, the private operator may be provided some relief through reduction or elimination of local taxes or by contractual provisions for school bus service or other profit making services.

The report "Short Range Transit Planning" describes public ownership and management structures found in the transit industry. Much of the material presented below is excerpted from this report (1).

b. Public Ownership Options

1) City Ownership with Operation by Others. This option assumes full ownership by the city, but with management and operation assigned to a non-profit corporation or a private company. The management and operation functions are normally carried out through a city-created non-profit corporation which is charged with full responsibility for the transit system (see Figure XI-1). The purpose of the public corporation is to provide optimum management and operating services without directly involving the city in the public transit function. The non-profit corporation also serves as a useful instrument for financing capital acquisitions.

Under this option, a lease-management arrangement with a private transit company is possible (see Figure XI-2). The city would maintain full ownership but would contract with a private transit company for both management and operation of the system. These options are equally applicable to county governments.

There are a number of privately owned transit management organizations which provide contract management services throughout the United States. As of April 1976, 65 properties were served by five contract management firms. These five firms and the number of properties served are ATE Management (26), and National City Management (16), American Transit Corporation (13), City Coach Lines (7), and McDonald Transit Associates (3). Some of the larger cities which are served by contract management include Minneapolis-St. Paul, Houston, Baltimore, Cincinnati, and Kansas City.

Some of the advantages and disadvantages of city ownership with operation by others are these:

Advantages

As opposed to direct city operation, this method provides a buffer between the council and the people. The council is not required to make operational transit decisions.

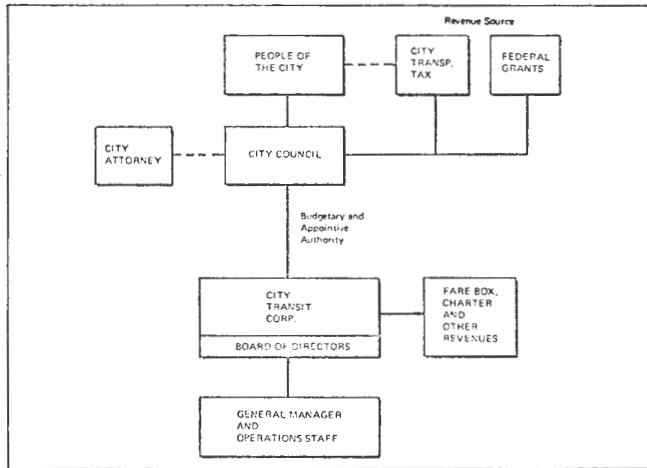


Figure XI-1. Organization of a Non-Profit Transit Corporation

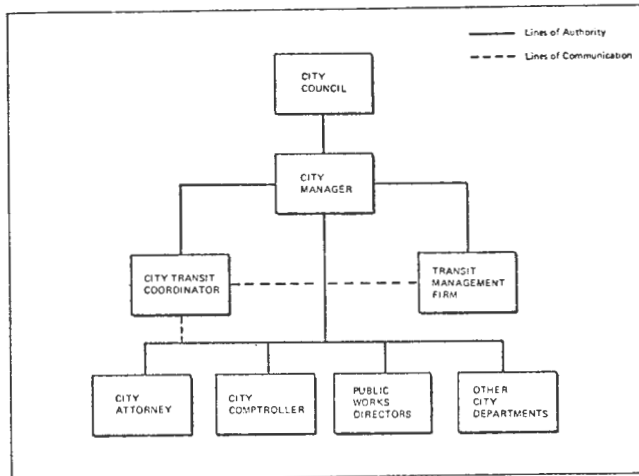


Figure XI-2. Organizational Structure for a Lease-Management Arrangement with a Private Transit Company

- . The city can readily make federal grant applications for the public corporation.
- . Local financing can be secured from a local lending institution, rather than through bond purchase by outsiders -- as might be the case with a district.
- . There is a fairly autonomous policy board and management. Because policy board members are appointed rather than elected, astute leaders with keen business sense and community insight can be selected to serve.
- . The operation is keenly business-oriented, operating on tight budgets. No profits, if any, are used to support other city departments.

Disadvantages

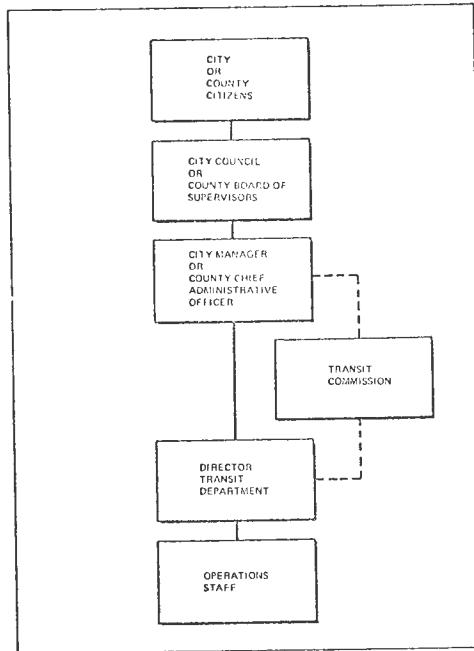
- . If service is to be provided outside the city, an inequity might result since city taxpayers would be subsidizing non-city bus riders.
- . This option requires complicated legal assistance.
- . It lacks a metropolitan nature, needed to serve a widespread urban area composed of several cities.
- . No protection against a labor strike is offered.

2) City or County Ownership and Operation (Transit Department). Under this system, a city or county transit department would be formed and would function as a typical department with city or county employees (see Figure XI-3). It would be part of the regular budget, with any operating deficits financed from general fund revenues (or from a particular tax revenue source earmarked for transit). This would be similar to a metropolitan or district ownership and operation, except that a city would be more limited in its ability to provide metropolitanwide service.

Certain advantages and disadvantages of city or county ownership and operation are outlined below.

Advantages

- . It is a relatively simple, single-agency organization.
- . Fleet maintenance can be unified in city or county shops and performed by city or county personnel.
- . It could receive supplementary support from city or county general funds.
- . It would have flexibility for areawide operation.



Source: Ref. 1

Figure XI-3. Organization for City or County Ownership and Operation (Department)

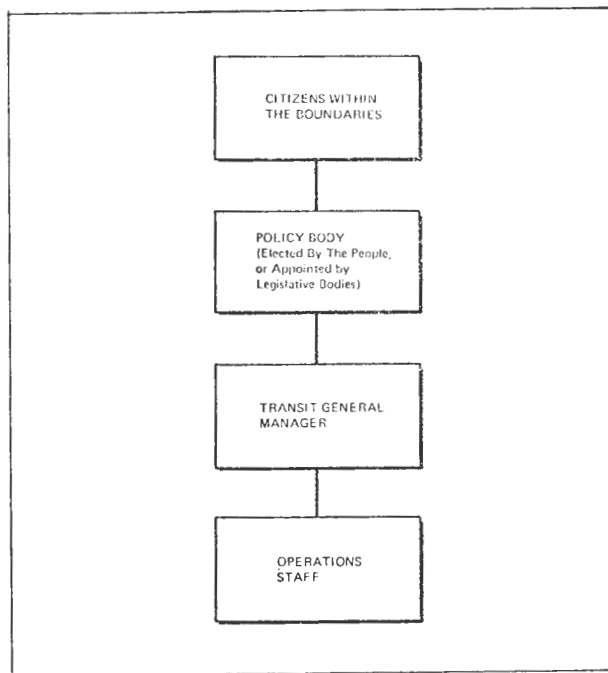
- . It could deal directly with the federal government on grants or loans.
- . It would be in a sound position to perform short-range and long-range planning.

Disadvantages

- . It would put the city council or board of supervisors under direct pressure concerning transit system operation.
- . If the county transit department were partially funded from the general fund, service or tax zones probably would be needed to equate levels of service and financial contributions.
- . It would require inclusion of transit employees under civil service. Salaries and fringe benefits equal to those paid other city or county employees would be required.
- . Under a countywide system, a broad-based transit commission might be needed to ensure adequate representation from all affected communities.
- . Choice of this option would put the county into the transit business -- a public service in which most counties have had little experience or capability.

- . Considerable capital outlay might be needed to purchase equipment and facilities, and bond issuance might be necessary.

3) Metropolitan Ownership and Operation (District or Authority) or Metropolitan Ownership and Operation by Others. Under this option, a transit district or authority would be created and given suitable taxing powers to finance the acquisition and operation of all transit services in the metropolitan area (see Figure XI-4). It would operate the service and facilities with its own employees and would be responsible for metropolitanwide decisions concerning transit service. This method has been used in Boston, Pittsburgh, Toronto, Wichita, and many other cities.



Source: Ref. 1

Figure XI-4. Organization for Metropolitan Ownership and Operation (District or Authority)

The district normally would encompass the total area susceptible to urban development for the long-range future. Development of the full district would come in stages, with the initial effort encompassing only the urbanized areas.

A variation would be for management and operations to be contracted to others. Contract arrangements with private management firms are common. Here, the district would set major policy, establish development plans,

and usually own the facilities, while the private firm would assume management and operational responsibilities. This is the method used in Providence, St. Louis, Memphis, and other metropolitan areas.

A summary of the advantages and disadvantages of metropolitan ownership and operation, including operation by others, is as follows:

Advantages

- . By setting the boundaries of the transit district or authority to encompass the entire urbanized area, those responsible for transit would make metropolitanwide decisions relative to service, based on need for transit and the financial and physical resources available.
- . Transit district planning would be closely coordinated with other regional transportation and planning elements, such as land use, parking facilities, highway facilities, and regional parks.
- . Standards of service with regard to schedules, routes, fares, and transfer privileges could be unified on a regional basis.
- . A higher type management system would be within economical reach, thus making possible a more stable and less expensive operation.
- . Operational benefits would include (1) standardization of fleet elements; (2) full utilization and standardization of facilities and equipment; (3) smaller parts inventory; and (4) no duplication of routes due to franchise restrictions in overlapping areas.
- . Operating on a regional basis, transit would handle existing problems and could also cope with external influences as they develop.
- . Equitable taxation is achieved since central city residents would not provide the sole subsidy support.
- . A district or authority as a governmental entity could deal directly with the federal government on loans and grants.
- . Because the agency would be metropolitan in nature, it would be looked upon more favorably by the federal government.
- . There would be a sound basis and justification for acquiring and operating all transit in the metropolitan area.
- . Should it become necessary or desirable, a district or authority could assume responsibility for all public transportation elements (bus, mass transit, air, water).

A single agency would be in control. Citizens or communities requesting services would deal with only one agency which would be empowered to provide the service requested, regardless of where it was or whom it served.

Disadvantages

- . The concept of and need for a district might be difficult to explain to voters. This would make an aggressive public information program essential long before election time.
- . A new tax zone in areas outside the central area might be required.
- . A new level of government would be created.
- . A large policy commission or board would be needed to assure full and proper representation by all communities.
- . The policy group would be readily accessible to pressure from groups requesting additional transit service. (This could be an advantage.)

3. Management Functions

The function of management in any organization is composed of two parts: (1) policymaking and goal setting; and (2) the management and administration of day-to-day operations.

a. Policy Making and Goal Setting

Policymaking and goal setting are generally accomplished through a governing body. This group makes basic decisions concerning budgets, executive personnel, grants, loans, union contracts, salaries, legal matters, levels of service, expansion of the system, acquisition of new equipment and facilities, fare structures, and financial measures. Once these policies are adopted, the management staff is given the authority and responsibility for implementation. The governing board gives general supervision and holds the management staff accountable for operating the system in accordance with board policies and guidelines. In a publicly owned transit system, the governing body (usually the city council or a governing board in the case of a special transit district) is responsible for policy formulation and adoption. In a private company, the board of directors performs this function.

The carrying out of these policies and the administration of operations are responsibilities of the chief executive officer. In a municipality, this typically would be the city manager, with direct responsibility being delegated to a department head. Where a non-profit corporation has been created by the legislative body of the public agency, direction of the transit system is given to a general manager. This approach is similar to the management structure of a private operation, with its board of directors as the governing body and the general manager as the chief executive officer.

b. Day to Day Operations

The organizational structure for carrying out the policies and the administration of operations -- whether for a private or publicly owned system -- is much the same. Most transit companies are organized according to the following functional departments:

- . Transportation
- . Schedules
- . Maintenance
- . Purchasing
- . Engineering
- . Personnel
- . Comptroller-Treasurer
- . Public Relations (Marketing)
- . Legal, Claims
- . Planning

The magnitude of the transit operation will determine whether these functional departments should be separate entities or can be combined.

1) Transportation. The transportation (sometimes called operating because it consists of all on the road operating personnel) department represents 40 to 60 percent of the total operating expenses. It is administered by a general superintendent and supervisors responsible for executing the daily production plan by dispatching vehicles and drivers. In some companies, this group recruits and trains drivers and often has a statistical section which develops labor and other operating costs per vehicle mile and hour.

The transportation department includes all vehicle operators. It is estimated that there are 70,000 bus operators and 30,000 rail transit operators in the U.S. (2).

2) Schedules. This department prepares the master and daily production plan. Data compiled include vehicle running times, passenger checks at peak-load points for each route, and management policy on loading standards. The analysis of this information is tabulated in the form of a timetable for each route. The timetable is converted into a list of "jobs" called "runs." The production plan (schedule) is the basis for determining future vehicle mileage (timetable) and pay hours (list of runs).

3) Maintenance Employees. Maintenance functions make up the work of about 16% of the U.S. industry work force. Of this amount, more than twice as many are engaged in bus maintenance as in rail maintenance.

Maintenance employees include supervisors, mechanics, service attendants and clerks. Data from a recent APTA survey of bus maintenance requirements (3) found that there was one maintenance employee for every 2.7 buses in the fleet. The ratio ranged from as low as 1.3 to as high as 5.2. An interesting aspect of the APTA survey pertained to the age of the maintenance facilities. The average facility age was found to be 36 years and many were 60 years or older. A large number were originally built for street car use and have been converted to bus maintenance facilities.

Daily servicing accounts for about one-half of all maintenance man-hours. This includes refueling, interior cleaning, exterior washing, and some minor maintenance checks. It may also include revenue removal. Servicing normally takes place at an inspection garage, often called a division garage. Infrequent and major repair functions are done at main maintenance facilities. These functions often require specialized equipment and skills.

4) Comptroller-Treasurer. As a combined function, this department has responsibility for accounting, auditing, cash management, revenue forecasts, financial planning, and the compilation of other cost data.

5) Marketing. The typical transit organization is production-oriented on functional lines. Most activities of a transit agency evolve around transportation and maintenance -- the two basic production functions. However, an emerging pattern is for the adoption of an aggressive marketing program.

6) Planning. Only a few of the larger systems have separate planning departments; however, planning and research are carried out in many departments. In some instances, an administrative assistant to the chief administrative officer will handle the planning function.

7) Other Departments. The other departments are generally small and carry out duties as indicated by their name. The purchasing department would be responsible for acquiring capital equipment and some times for the acquisition of services. Engineering would have responsibility for design or supervising design activities. Personnel is responsible for hiring and training personnel. Legal provides legal consultation to all the operating departments. The purchasing department lets contracts for fuel, tire rentals and spare parts.

The specific organizational structure chosen for any given system to carry out the necessary functions will vary according to the size of the system, the preferences of the top-level policymaking board, and the chief executive officer, and the particular circumstances involved. Organizational structures are discussed in the following section.

c. Organizational Structure

The basic organizational structure for a transit system depends largely on the size of the operation. The larger the operation, the larger the number of operating departments having separate but related functions. Thus, the basic differences between the organization charts for a very small, small, medium, and large size transit system shown in Figures XI-6, XI-7, XI-8, and XI-9 are the grouping of functions within departments. The very small system would be one that operates approximately less than 10 vehicles; a small sized system would be in the range of 11 to 50; the medium system would be 50 to 500 buses. A large size system have over 500 buses/vehicles and may operate more than a single mode. The organizational chart shown in Figure XI-9 is for the Chicago Transit Authority, which operates both bus and fixed rail facilities.

There are numerous variations of these basic organizations found in the real world. Reorganization is continuously occurring but the primary functions of transit operation need to be carried out regardless of the organizational structure.

d. Transportation Broker

A new organizational structure which may become common in the future is that developed around the transportation brokerage concept. The broker would act as an umbrella agency which could provide direct transit service on its own or contract with private or public agencies to provide the service. At any one time it might be providing a variety of transit services to specific market segments utilizing several private and public agencies. This concept is relatively new and specific institutional and organizational arrangements need to be formulated. The city of Knoxville, Tennessee has established a transportation broker organization (See Figure XI-5) while agencies like the Regional Transportation Authority in the Chicago area also are beginning to function as brokers.

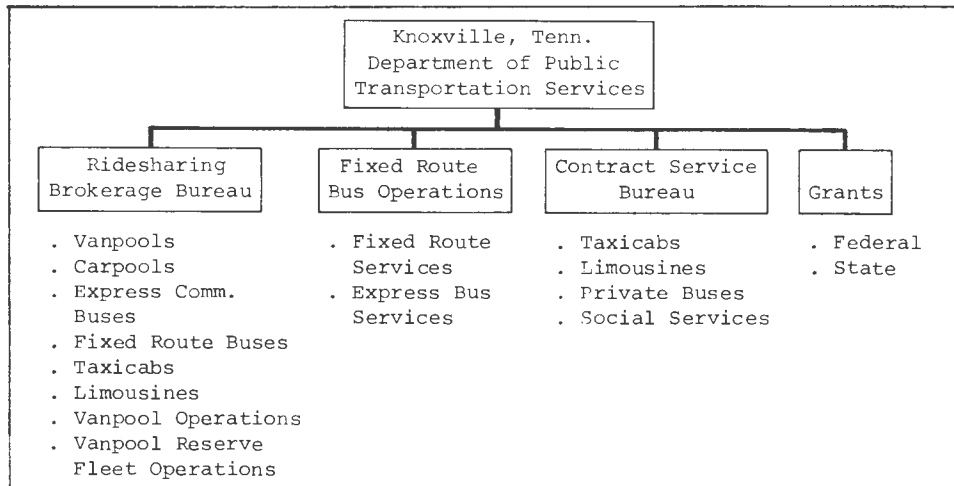
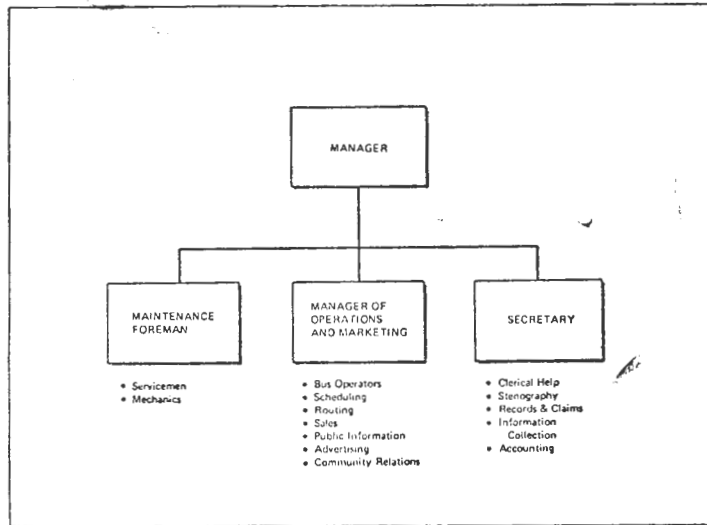


Figure XI-5. Organization of Knoxville, Tennessee Department of Public Transportation



Source: Ref. 1

Figure XI-6. Organization Chart of a Very Small Transit System (10 Buses or Fewer)

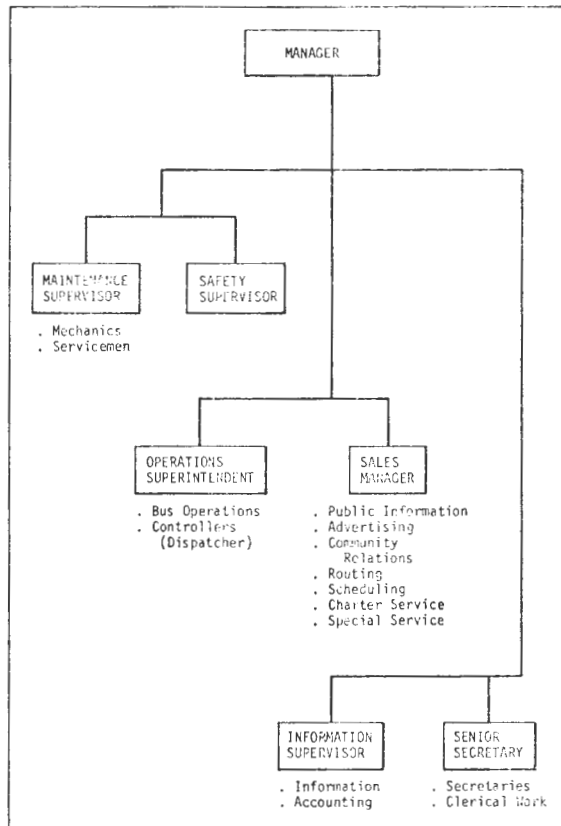
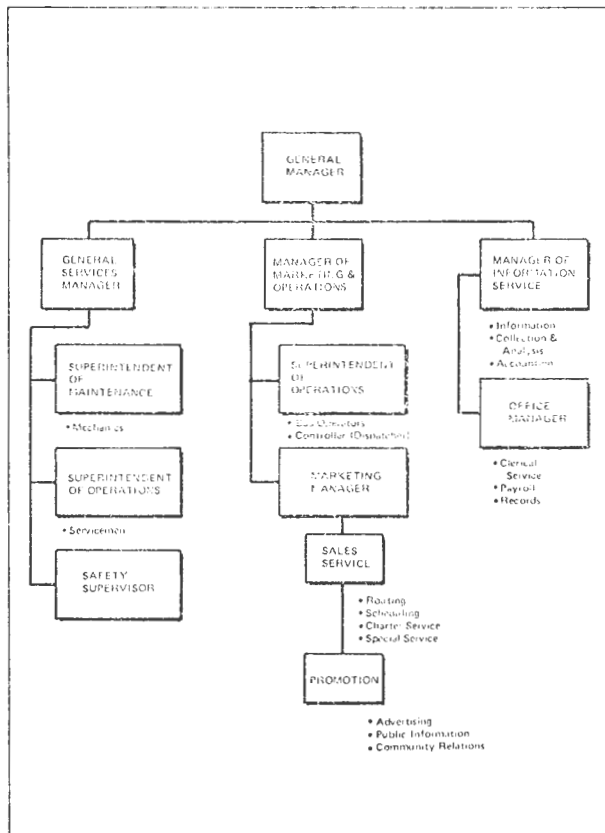


Figure XI-7. Organization Chart of a Small Size Transit System (11 to 50 Buses)



Source: Ref. 1

Figure XI-8. Organization Chart of a Medium Transit System (50-500 Buses)

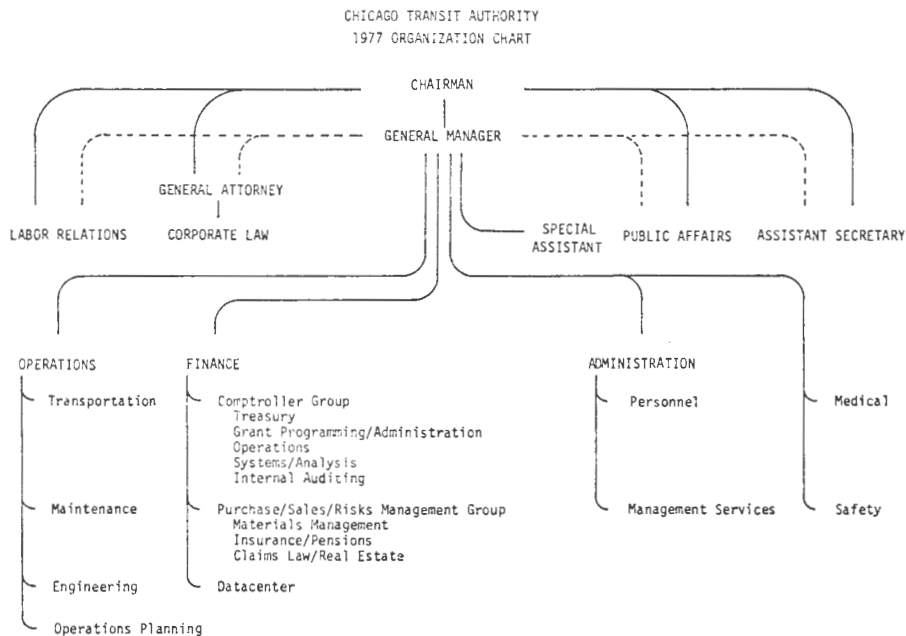


Figure XI-9. Operation of a Larger Transit System

4. Personnel

There are approximately 160,000 people employed in the U.S. Transit Industry. (4) Of this number, 24,000 or 15% are classified as management.

a. Management

The decline in the transit industry has been characterized by an exodus of trained transit management personnel. The exodus began as early as the 1920's, when transit growth peaked, and continued during the Depression. The Holding Company Act of 1935 dealt a sharp blow to the management talent pool by forcing the large, affluent, and well staffed public utilities to divest themselves of their transit arm. Top management personnel who had the choice usually opted to stay with the utility rather than go with transit.

During the war, large numbers of management personnel were drafted into the armed services leaving mostly older men to run the companies. Although most of those drafted returned after the War, a five year absence was hard to overcome. In addition, while other industries were greatly expanding and hiring new personnel, transit was beginning to cut back and looking for ways to trim costs.

For more than twenty years after the war the transit industry continued to lose management personnel through attrition and through movement to other jobs. A study of urban transit managerial personnel, conducted in 1972-73 found the following conditions; (5)

- . There was relatively little formal organization and planning for the development or utilization of human managerial resources in the U.S. transit industry.
- . Usually low executive compensation scales have forced many transit properties to fill management positions with less than qualified individuals.
- . The vast majority of professionally trained industry leaders will retire within the next decade, with few back-up personnel ready to take their place.
- . The average age of middle and supervisory management is, in many transit systems, older than that of top management.

Another report stated that 93% of the management group lacks college education and reiterated that the industry does little to recruit, train and hold talented managers. (6)

This crisis of transit management has been recognized only recently as one of the most significant problems facing the resurgent transit industry. Both the industry and the government have begun programs aimed at improving transit management. In 1970 limited funding was made available by UMTA for management training and in 1973 UMTA established the Office of Transit Management.

Salaries in the transit industry have also increased significantly in the last 5-10 years and with the transit image improving, new blood is beginning to flow into the beleaguered industry.

b. Labor

There are approximately 136,000 non-management employees in the transit industry. The majority of these personnel are unionized and belong either to the Amalgamated Transit Union (ATU) or the Transport Workers Union (TWU).

1) Labor Costs. Labor costs account for approximately 65% of all operating costs. Labor costs have been rising rapidly during the last few years and the average transit employee in a major transit system earns approximately \$14,000 annually in direct salary with another 25% in fringe benefits. Labor costs in non-unionized systems may be half to two thirds those of unionized properties. Labor costs have risen faster than labor productivity in the last decade. A study in New York City found that while real income after inflation had risen 57% labor productivity had remained relatively constant in 15 years.

2) Section 13(c) Labor Rights Protection. The 1964 Urban Mass Transportation Assistance Act contained a clause, widely known as Section 13(c) that effectively guaranteed to transit workers who might be negatively affected by federal grants, that their bargaining rights, compensation and working conditions would be protected. In order to qualify for federal capital grants or operating assistance from UMTA, the transit properties are required to sign a Section 13(c) agreement with employee organizations. The agreement must be certified by the Secretary of Labor

3) Employment Resurgence from Subsidies. Transit employment bottomed out in 1970 and has since begun a gradual increase. This increase can be attributed to the halt in the patronage drop and more importantly to the recent UMTA Acts which provided for federal capital grants and operating subsidies. As patronage increases and transit service expands, the transit labor force should also expand.

c. Labor-Management Relations

Like many industries relations between management and labor have often become strained in the transit industry. Unfortunately strikes have seriously affected the transit industry and to some extent accelerated the post war process which changed the industry from private to public ownership.

As private employees, transit workers have the right to organize collectively without interference. In contrast, public transit system employees are not typically permitted to strike. However, because of Section 13(c) and other bargaining tactics, public transit employees have essentially the same rights as do those in private employment. Laws prohibiting strikes by public employees have generally been ignored by transit unions.

1) Collective Bargaining. In the years following World War II, when price and wage restraints were removed - wage settlements, either through collective bargaining or strikes were one of the ingredients in the constant circle of higher operating costs, higher fares and reduced patronage. Many private operators gave up during the throes of a prolonged strike.

2) Section 13(c). The provisions of Section 13(c) have forced transit management to obtain labor agreement when it requests any federal capital or operating grant. The provisions of Section 13(c) have been very favorable to the labor unions and in many instances have become a heated issue in labor management debates. In many instances, management has blamed 13(c) for the excessive wage increases won by labor in recent years.

3) Model Agreement. To overcome some of the problems generated by Section 13(c) APTA and the transit unions in 1975 prepared a draft model agreement to be used in future contracts. Since the model pact has been arranged more than a 100 properties have become a party to it and a great majority of the operating subsidy grants made by UMTA have been certified by the Labor Department on the basis of the model agreement.

5. Management Tools

In recent years several computerized procedures have been developed to aid management in carrying out its function. Several of the more prominent such tools are described below.

RUCUS - is a computer package developed under the sponsorship of UMTA. RUCUS stands for Driver Run Cutting and Vehicle Scheduling. The purpose of RUCUS is to computerize scheduling and the assignment of operators to gain increased efficiency. Several properties have applied RUCUS but the general industry feeling is that computers will never completely replace the manual scheduling process.

SIMS - is a computerized procedure used for the vehicle maintenance functions. SIMS stands for Service, Inventory, and Maintenance System, and is basically a management information system to be used and operated by individual transit properties. The information developed allows transit properties to plan repairs, avoid road calls, and control expenses. Data can be summarized for individual buses, divisions, and labor utilization. A somewhat similar computer package is BUS, which stands for Bus Utilization System. It is being heavily used in Chicago and several other properties.

Project FARE - is a uniform procedure for financial accounting and reporting, mandated by UMTA as part of the National Mass Transportation Assistance Act of 1974. After July 1, 1978, no grants under Section 5 may be made unless the applicant meets the reporting and uniform system of accounts requirement.

6. Summary

Transit systems across the country depict a variety of ownership and organizational structures. Most of the revenue passengers are carried by publicly owned systems although over half of all systems are still in private hands. The organizational structure of the system largely depends upon its size. There are certain basic functions which must be carried out in the provision of public transportation services and the size of the operation will determine whether these functions are uniquely handled or merged with related activities. It is generally agreed that the transit industry is suffering from the lack of trained transit management personnel. However, this need has been recognized and assistance is being provided both by government and industry.

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Session XI

Management

Section 13(c)
Transit Employee Protections⁽¹⁾

(1) Source: Department of Labor Consumer Information Leaflet No. USDL-32 (LMSA-5), April 1976.

U.S. Department of Labor Program Highlights



Consumer Information Leaflet No.

USDL-32 (LMSA-5)

April 1976

URBAN MASS TRANSIT EMPLOYEE PROTECTIONS

WHAT THEY ARE -- When a mass transportation system is acquired or improved by any state or local public body or agency with the use of federal funds, employee protection arrangements must be made and certified by the Secretary of Labor.

The protective arrangements must include, but are not limited to provisions providing for:

- Preservation of rights, privileges and benefits (including continuation of pension rights and benefits) under existing collective bargaining agreements or otherwise.
- Continuation of collective bargaining rights.
- Protection of individual employees against a worsening of their positions with respect to their employment.
- Assurances of employment to employees of acquired mass transportation systems and priority of reemployment of employees terminated or laid off.
- Paid training or retraining programs.

The contract granting the federal assistance must specify the terms and conditions of the protective arrangements.

HOW IT WORKS -- Copies of applications for federal assistance are furnished by the Department of Transportation to the Department of Labor for review. The applications are accompanied by a request for certification by the Secretary of Labor.

Wherever appropriate the language of the protective agreements is developed as a result of collective bargaining. DOL refers copies of the application to any labor organizations representing urban mass transportation employees in the project's service area who may be affected and solicits their views concerning appropriate terms and conditions of employee protection. The individual parties involved are then encouraged to reach agreement on employee protective terms and agreements. DOL will furnish technical and mediatory assistance to the parties if needed. When an agreement is reached, DOL reviews the agreement to insure that it provides protections meeting the requirements of the law and, by letter to the Urban Mass Transportation Administration, makes the required certification. In the event no agreement is reached, the Secretary of Labor has the authority to determine the terms and conditions he's willing to base certification on.

This is one of a series of fact sheets highlighting U.S. Department of Labor programs. It is intended as a general description only and does not carry the force of legal opinion.

If transportation employees in the service area of a proposed project are not represented for collective bargaining purposes, DOL, in its letter of certification, sets the terms and conditions applying to employee protection.

AUTHORIZATION -- Urban Mass Transportation Act of 1964 -- Section 13 (c).

The Section specifies that:

It shall be a condition of any assistance under Section 3 of this Act that fair and equitable arrangements are made, as determined by the Secretary of Labor, to protect the interests of employees affected by such assistance. Such protective arrangements shall include, without being limited to, such provisions as may be necessary for (1) the preservation of rights, privileges, and benefits (including continuation of pension rights and benefits) under existing collective bargaining agreements or otherwise; (2) the continuation of collective bargaining rights; (3) protection of individual employees against a worsening of their positions with respect to their employment; (4) assurances of employment to employees of acquired mass transportation systems and priority of reemployment of employees terminated or laid off; and (5) paid training or retraining programs. Such arrangements shall include provisions protecting individual employees against a worsening of their position with respect to their employment which shall in no event provide benefits less than those established pursuant to Section 5(2) (f) of the Act of February 4, 1887 (24 Stat. 379), as amended. The contract for the granting of any such assistance shall specify the terms and conditions of the protective arrangements.

Questions - XI

1. Do you believe the provisions of Section 13(c) are reasonable? Why?
2. Should Section 13(c) apply to paratransit services?
3. How can Section 13(c) apply in those states that do not permit public employees to belong to a union?

Session XI

Transit Management

"The UMTA Commitment
to Effective Transit Management"

Source: "Transit Journal," February 1975. Article by Frank C. Herringer, then Administrator - Urban Mass Transportation Administration.

The UMTA Commitment to Effective Transit Management

By Frank C. Herringer

Administrator

Urban Mass Transportation Administration

U.S. Department of Transportation

Attention to the methods and techniques of transit management is a natural outgrowth of the continuing federal commitment to urban mass transportation, now entering its second decade. This attention is reflective not only of the Urban Mass Transportation Administration's (UMTA) commitment to improving transit, but also the industry's own initiatives.

A general definition of transit management might be "... the acquisition, allocation, and control of resources (human, physical, financial, and informational) to achieve given standards and objectives for transit service." This definition could apply to any business—it is the emphasis given to different aspects of the management task that distinguishes one management approach from another.

In this sense, transit management has undergone a significant transformation during the last 10 years. The focus and orientation of transit has acquired a public service dimension that has, in turn, introduced new complexities and demands for the business of transit management. The result of this process represents a new role for the transit manager who must balance the need for efficiency and productivity with a growing public commitment to serve the totality of urban mobility needs.

This expanded view of transit management combines the responsibilities of effective business management and those of public service. It attempts to reconcile the operation of transit with the needs of the marketplace, while seeking to maximize the efficiencies and economies of operation.

The term which has been used frequently to describe the new focus of transit management is "marketing." Marketing, in this sense, implies a concern for and a responsiveness to the current and potential markets of transit users, rather than simply the selling of a product. Marketing, as a basic thrust of transit management, channels the allocation and control of operating resources by recognizing the public service aspect of mass transportation, but without compromising the need for efficiency and economy.

An orientation toward marketing causes a transit manager to concentrate his efforts in these basic areas. First, he recognizes the need to better understand the many markets for transit service, and he attempts to tailor the development and operation of transit services accordingly. Second, he attempts to develop in these markets a disposition to use transit—that is, he "sells" transit services. Third, he continues to try to maximize the efficient and productive utilization of resources which, despite our best efforts, will always remain finite. It is this broadest definition of marketing—as a basic orientation—that is the principal emphasis of UMTA's Office of Transit Management which was established in July 1973, to give visibility and leadership to the improvement of management methods, techniques and tools.

In the context of the preceding discussion, UMTA's objective in establishing such an office is to help transit better serve the needs of its markets by making better use of its operating resources. To this end, UMTA has both reshaped its organizational structure and redirected its activities.

UMTA is now focusing a significant proportion of its resources on management research, development, and demonstration programs in five broad functional areas: operations and maintenance, management and control, marketing, safety, and human and technical development. The following paragraphs briefly describe each of these aspects.

Operations and Maintenance. In this area, attention is given to making better use of human and physical transit resources. For example, computer applications have been developed both to improve the scheduling of drivers and vehicles (RUCUS—Run-Cutting and Scheduling System), and to improve the handling of maintenance information (SIMS—Service Inventory and Maintenance System). An adjunct of the latter program is the development of a Maintenance Planning System (MPS) for rail transit systems. Other examples in this area include efforts to provide operating efficiencies through the development of an automatic fare collector for buses and an automatic passenger counter for improved operational data collection.

Management and Control. This area is concerned with the financial and information resources of transit management. In particular, Project FARE (Financial Accounting and Reporting Elements) represents a major effort to develop standardized financial accounting and reporting elements for the transit industry. The final achievement of this project will be the development of both external reporting and internal management information systems which will offer unique opportunities for analysis and evaluation. A related effort focuses on the development of management performance measures which can express the productivity and effectiveness of both overall and specific operations.

Marketing. This area is focused on the distinct techniques and methods of transit marketing, with emphasis given to improving public awareness, acceptance, and the attractiveness of transit services. In two major UMTA demonstration projects in Baltimore, Maryland and Nashville, Tennessee, the full process of transit marketing is being tested. This includes in-depth market research as the basis for designing service-related, informational and promotional improvements and monitoring their impact on transit ridership. Other research efforts are examining the implications of alternative transit fare policies, techniques for disseminating user information, and the integration of marketing functions in transit management organization structures.

Safety. Efforts involving transit safety deal with both system assurance and passenger security. The former is concerned with performance trade-offs with reliability, maintainability, and availability characteristics and system life-cycle costs as, again, a means of improving the effective utilization of management resources. In terms of passenger security, improved operating techniques are being developed to reduce crime and vandalism and, thereby, to provide a safer and more attractive operating environment.

Human and Technical Development. In this last area, attention is given both to personnel and information resources of transit management. Under a recently completed project, a new test instrument for selecting bus operator candidates was developed for use throughout the transit industry. In the Southern California Rapid Transit District (SCRTD) in Los Angeles, a pilot project is demonstrating the impact of improved training on the job performance of maintenance employees. Technical development programs complement all of the efforts discussed above by providing the mechanisms for information dissemination and technology sharing. This is to insure that the products of management research become widely available for management improvement.

Together, the projects in these basic areas represent UMTA's fundamental commitment to provide the tools for improved transit management.

In addition to these efforts in management research, new emphasis is being placed on site-specific management improvement studies. This program utilizes the Technical Studies resource, provided under Section 9 of the Urban Mass Transportation Assistance Act, by applying it to the special needs of individual transit operators.

Initially, the Technical Studies Program emphasized effective transit planning, in terms of both long-range urban development and near-term transit improvement. Now, these essential areas are to be supplemented by the analysis and evaluation of specific, local management issues.

The new program of Management Improvement Studies serves two basic objectives. First, it provides an extension of the management research effort by allowing individual transit properties to tailor new tools and techniques to their specific needs. Second, it provides an opportunity for individual transit management organizations to assess these needs and to plan for improved operations and management.

Some of the elements which are anticipated to be going into management improvement studies include analyses of management organization, service planning and maintenance policies, market research and marketing program development, safety and security, human resources programs, management information control, and performance evaluation. The first series of pilot management improvement studies was initiated this fiscal year, and steps are now being taken to ensure that such studies will be a continuing element of the UMTA program for transit management by their inclusion in the local unified planning process.

Management research and management improvement studies represent basic resources in the UMTA program. To them has been added a vigorous effort at information dissemination and technical assistance—positive steps that form a linkage between research products and the transit community. These efforts reflect the need for us not only to provide new tools, but also to ensure that the tools are responsive to transit needs and available to the transit industry.

The substance of UMTA's involvement in information dissemination has been an expanding series of conferences, workshops, and seminars in the various aspects of management improvement. This positive relationship with the ultimate beneficiaries of management research and study is fundamental to realizing the objectives which guide UMTA's program.

As is evident from this discussion, transit management has become a major component of the UMTA program. The UMTA focus on transit management—embraced in both its organization and its activities—represents a long-range, continuing commitment.

The future will very likely bring new emphasis to current efforts in several transit management areas. First, greater attention to local management improvement studies is expected. These site-specific efforts will likely focus on both the application of new management techniques and on the assessment and resolution of local management problems.

Second, there is expected to be more emphasis on the monitoring, evaluation, and reporting of local transit management innovations. Particularly in such areas as marketing, local initiatives have provided a wealth of new ideas and techniques which can be applied elsewhere. UMTA has a fundamental interest in seeing that such innovations are evaluated fully and their results documented so that successes can be replicated wherever possible. A recent grant to the Massachusetts Bay Transportation Authority in Boston will provide detailed information on their payroll deduction fare pass system, an innovative marketing technique that is only one of many potentially promising local initiatives.

Third, greater emphasis is expected in the general area of performance and productivity measurement. We need to know more about the components of efficiency at each level of transit operations. Better information and evaluative tools in these areas will provide transit managers with increased facility for isolating problem areas and for developing solutions.

Finally, the future is expected to bring still more emphasis on the marketing dimension of transit management. In particular, this emphasis must recognize the diversity of transit user markets. We can no longer think in terms of users and non-users only; it is necessary to segment the total population and to understand how different groups relate to the attributes of transit service. In addition, just as marketing implies a tailoring of services to meet public needs, it also will require new efforts to affect user attitudes.

The new federal program for providing operating assistance will only add to the growing concern with all aspects of transit management. UMTA expects to continue to work closely with the transit industry to ensure that the public is receiving the quality of transit service that it requires, and that this service is being provided in a manner that efficiently utilizes the resources which are at our disposal. ■

Questions - XI

1. Does management of a transit system differ from management of other major industries? Why?
2. What is the impact on change in ownership on transit management's outlook?
3. How should transit management be responsive to the user?

Session XI

Management

The Fare Increase:
An Opportunity to
Define Markets

Source: Passenger Transport, APTA, May 14, 1976

the fare increase: an opportunity to define markets

At some point in time, most transit agencies will have to increase their fares to the riding public. This action is usually preceded by the politicians claiming operating inefficiencies, and the public demanding subsidies from the state or federal government.

However, the reality of meeting expenses must be made up by either service cuts, subsidies from government or fare increases. Recent history indicates service cuts are strongly opposed by the public and government subsidies are limited. This leaves the inevitable fare increase to make up the difference.

With this in mind then, the purpose of this article is to illustrate how a fare increase can optimize the number of passenger miles per dollar spent and to assist in defining the different markets in urban areas.

Traditionally, when transit agencies have been confronted with a deficit, they have raised their standard fare by a percentage necessary to cover that deficit. This was a relatively simple task because they knew from past experience what passenger losses were incurred by specific percentage fare increase. This ratio of percentage change of fares divided by the percentage change in ridership is commonly known as the shrinkage ratio or loss ratio.

Operators in larger urban areas are familiar with the Simpson and Curtin shrinkage ratio of $-.33$. This ratio, however, is the gross shrinkage ratio of high-speed service, medium-speed service, low-speed service provided during peak and base service periods. In effect, there are at least six shrinkage ratios to consider. The following chart illustrates this point by using a hypothetical system similar to New York, Philadelphia, Chicago, Atlanta or San Francisco.

	Shrinkage Ratios	
	Peak	Base
Low-Speed	$-.2$	$-.45$
Medium-Speed	$-.18$	$-.40$
High-Speed	$-.15$	$-.36$
System		$-.33$

The chart shows that this hypothetical urban area has many different product lines to market. Intuitively, one has to feel that there is a better way of raising fares than across the board when you have such a variety of product lines. What I am alluding to in this article is that your next fare increase should be your first step toward optimizing passenger miles by charging fares that recognize these multiple shrinkage ratios.

In order to provide a working example of two of these six markets, let us assume we have the following problem.

You are the general manager of the urban transportation authority with the following characteristics:

- Fare 40¢ with no transfers
- Ridership 100 million riders per year
- Average ride is five miles
- Peak hour shrinkage ratio = $-.15$

By
John T. Ficarra
Director
Transit Operations and Planning Division
City of Philadelphia, Pa.

- Base period shrinkage ratio = $-.48$
- System shrinkage ratio = $-.33$
- Ridership is divided 50% base 50% peak
 - Revenues \$40,000,000
 - Expenses 60,000,000
 - Deficit (\$20,000,000)
- Passengers x mile = $100,000,000 \times 5 = 500,000,000$
- Cost/passenger mile = $\frac{\$60,000,000}{500,000,000} = 12¢$

The local, state and federal agencies will provide a \$10-million grant for service. Your objective is to recommend a fare increase to make up the \$10-million unfunded deficit. You have instructed your staff to provide two alternatives with fare increments of 5¢. They have presented the following two for your review. The first is a traditional flat increase. The second increases the fare only to the peak hour riders.

Alternative 1—Raise flat fare 10¢

$$\begin{aligned} \text{Ridership loss} &= \text{Shrinkage ratio} \times \frac{\% \text{ fare increase}}{100} \times \text{ridership} \\ &= -.33 \times \frac{25\%}{100} \times 100,000,000 \text{ rides} \\ &= -8,250,000 \text{ rides} \\ \text{Service expense decrease} &= k (\text{shrinkage} \times \% \text{ fare increase}) \\ &= \frac{1}{2} (-.33 \times 25\%) \\ &\quad @ -4.125\% \\ \text{Revenue } 91,750,000 \times 50¢ &= \$45,875,000 \\ \text{Expenses } -4.125\% \text{ decrease} &= \underline{57,525,000} \\ \text{Deficit} &= \underline{(\$12,350,000)} \\ \text{Passengers x mile} &= 91,750,000 \times 5 = 458,750,000 \\ \text{Cost/passenger mile} &= \frac{\$57,525,000}{5 \times 91,750,000} = 12.5¢ \end{aligned}$$

Alternative 2—Raise peak hour fare (morning and evening) 20¢

$$\begin{aligned} \text{Ridership loss} &= \text{Shrinkage ratio} \times \frac{\% \text{ fare increase}}{100} \times \text{ridership} \\ &= -.15 \times \frac{50\%}{100} \times 50,000,000 \\ &= -3,750,000 \text{ rides} \\ \text{Service expense decrease} &= k (\text{shrinkage} \times \% \text{ fare increase}) \\ &= \frac{1}{2} (-.15 \times 50\%) \\ &= -3.75\% \\ \text{Revenue } 50,000,000 \times 40¢ &= 20,000,000 \\ \quad 46,250,000 \times 60¢ &= 27,750,000 \quad \$47,750,000 \\ \text{Expenses } -3.75\% &= \underline{57,750,000} \\ \text{Deficit} &= \underline{(\$10,000,000)} \\ \text{Passengers x miles} &= 96,250,000 \times 5 = 481,250,000 \\ \text{Cost/passenger mile} &= 11.1¢ \end{aligned}$$

The table below summarizes three critical indices necessary for making a decision on a fare increase.

	Existing Fare 40¢	Raise Fare to 50¢	Raise Only Peak Fare to 60¢
Passenger Miles	500,000,000	458,750,000	481,250,000
Cost/passenger mile	12¢	12.5¢	11.1¢
Unfunded deficit	\$10,000,000	\$2,350,000	-0--

This table illustrates how, by recognizing just two markets of at least six, a manager can move toward minimizing the impact of a fare increase to the riding public.

Although this is a simple example recognizing only two of a minimum of six different markets, it could be applied today to most urban transit agencies.

It is hoped that the next time your agency is confronted with a fare increase, that you will look at it as an opportunity. An opportunity to define the many markets that are out there in public transportation and to eventually optimize cost and service to the riding public.

Questions - XI

1. The shrinkage ratio is least for high speed service. Why do you think that is the case?
2. Are there other factors which should be considered in the evaluation of alternative fare policies? What are they?
3. Would you recommend another fare policy in this situation? What is it?
4. What happens to the passengers who are lost by fare increase?

SESSION XII: TRANSIT MARKETING

Objectives of Session XII

- . To understand the need for marketing as a technique for increasing patronage
- . To be able to describe the role of transit marketing and its basic elements
- . To be able to relate community needs with transit marketing concepts such as market research and rider information

Synopsis of Session XII

This session is an overview of marketing techniques applied as an element in providing public transportation. Various marketing concepts as they apply to transit will be discussed.

Outline of Session XII

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Marketing Philosophy
3	Marketing Plan
4	Market Research
5	Service Planning and Development
6	Facility and Equipment Design and Maintenance
7	Pricing Transit Services
8	Rider Information
9	Sales Communication Promotion
10	Ongoing Evaluation and Monitoring
11	Summary

SESSION XII: TRANSIT MARKETING

1. Introduction

Marketing is as much a philosophy of management and operations as it is a word representing specific functions. Marketing can and must ensure that the transit system is providing consumer-oriented service. Each of marketing's seven major activities are geared toward making transit more usable, comfortable, and attractive to the populace served. Transit must overcome its image as a "mass" mode. Marketing can not only promote a better image, but more importantly aid in developing services to fit the new image.

2. Marketing Philosophy

Transit marketing activities are not recent innovations in public transportation. In the streetcar era, passenger markets for travel were actually created by transit firms by building amusement parks at the end of the lines. Transit facilities, as a result, were making money during the otherwise low demand weekends. Streetcar firms were simply following the basic principle of commercial business marketing -- "Find a need, then fill it."

Present-day marketing activities are beginning to reflect the philosophy of consumer-oriented service. This has not been the case in the past, and even now marketing is viewed with skepticism by many in the industry.

The view of public transportation providing a consumer-oriented service has evolved from one of providing a utilitarian service. In the past, streetcar lines gave people more work and home choices, but at the same time, made them dependent on transit. Thus, transit service was a necessity for many persons. With the advent of the automobile, transit changed from a necessary to a competing travel mode for the general urban populace.

The transit industry has been hurt by this competition and subsequent lack of response. Declining ridership and need for public subsidies clearly point out the need to acknowledge consumer desires and needs and develop transit service accordingly. Thus, marketing's consumer-oriented philosophy is a logical basis for operating and managing transit properties. As Weiglen aptly states:

"No study, no checklist, no external pressure or advice, and no standard answers can take the place of a continuing, daily, positive attitude toward the customer, reflected in all management decisions, large and small."

Transit marketing is more than selling a product as in advertising; it is developing and providing products (services) which satisfy consumer desires. An important task of management should be to appreciate the barriers and other discouraging aspects of using transit. Providing passenger amenities such as bus shelters and benches should be a part of the marketing program. In this way, marketing is really a planning process for the near term.

Marketing activities and results can improve management decisions and create opportunities for innovations within an organization. The following sections describe generally the basic elements of transit marketing activity within a transit organization.

3. Marketing Plan

a. Definition

A marketing plan is a written document containing a review of the transit marketplace, an analysis of the situation, a statement of objectives, and a program to achieve these objectives. A marketing plan is the best way to prepare and develop a transit program. It compels thinking on transit service for the long-run rather than relying solely on day-to-day problem solving.

b. Marketing Requirements

The five requirements in developing and implementing a transit marketing plan are:

- . Determine precisely what the market's mobility needs are in terms of service, price, and other attributes.
- . Determine what opportunities for expanding volume exist in the marketplace. Who are the best prospects, and what must be done to obtain their patronage.
- . Initiate a program to fulfill the consumer's needs consistent with available operational resources. This may require some substantial changes in the present operating program and capital investment.
- . Tell the public what transit is doing. Use advertising and publicity to communicate the message. Use promotion to induce initial trial.
- . Evaluate the effectiveness of the efforts and initiate corrective action where appropriate.

Note that advertising and publicity is only one of five major requirements of marketing.

c. Marketing Activities

The five requirements described previously can be translated into seven basic marketing activities for transit. These are:

- . Market research
- . Service planning and development
- . Facility and equipment design and maintenance
- . Pricing transit services
- . Rider information

- . Sales communication and promotion
- . Ongoing evaluation and monitoring

4. Market Research

The transit management must organize and integrate service and promotion efforts so they respond to consumer demands. Market research provides relevant and valid consumer feedback upon which to base their decisions, and goes beyond traditional origin-destination studies and on-board surveys.

Market research seeks to answer the following questions:

- . Who are prospective patrons?
- . What is transit's competition (other modes of travel)?
- . What are the trip making characteristics of consumers in the marketplace?
- . What benefits do consumers seek from transit service?
- . How should the communications to consumers be expressed?

Answers to these questions provide needed information to transit management at key points in developing and evaluating transit service and marketing activities.

a. Define the Marketplace. It is, of course, essential to know the existing conditions in the area where transit serves. Defining the marketplace should minimally entail:

- . Delineating the area
- . Describing the existing transportation systems
- . Outlining the existing road network
- . Defining population data and trends
- . Describing the area's land use

Other items could include the history of public transportation in the area, public institutional relationships, and financial aspects of the transit systems.

b. Define the Market. There are two important aspects of transit patrons -- their travel characteristics and their travel desires. Travel characteristics pertain to the origins and destinations of trips or the movement patterns of existing and potential users. Travel desires pertain to potential user attitudes toward transit service.

Information regarding travel characteristics and desires can be obtained from surveys: telephone, on-board, dwelling-unit, and transit stop or station

interviews. Existing data may be available from various urban transportation planning efforts. Surveys specifically developed under market research usually combine questions regarding trip making characteristics and consumer attitudes toward transit and other travel modes.

Systematic and large scale market research can identify consumer groups or market segments who offer the greatest increase in ridership. This procedure is called market segmentation. With the knowledge gained from market research, emphasis can be placed on particular services which have a strong appeal to certain market segments. It can also identify motivations which will encourage people to use transit.

5. Service Planning and Development

To be useful, market research findings must be translated into services that will induce potential riders to convert auto trips to transit trips. Translating these findings is the responsibility of the service planning and development function. The result is the planned transit product.

Service planning and development depends on market research findings regarding travel characteristics and desires, the marketplace, and system capability. System service is limited by available resources, financing, equipment and manpower. Three basic elements of transit service are: type of service, routing, and timing.

a. Type of Service. Depending on the market demands, the responses can range from basic fixed-route rush hour service to general fixed-route service, special events service, as well as demand responsive variations, jitneys, tie-ins with local taxi concerns and even single-destination passenger-driven vans for work trips to and from sparsely populated areas. Major generators of travel and corridors along with travel characteristics identify express bus potential and supplemental priority treatment.

b. Routing. The routing of any new or restructured service must link origin/destination pairs that have transit potential. The route must minimize walking distances within the origin and destination areas it is designed to serve without being unduly circuitous or time consuming. To the extent possible, a given route or service should attempt to serve a variety of trip types and related origin/destination pairs.

Development of transit routes is basically a trial and error process. Generally, a route should be provided within a maximum distance of 1000 feet from prospective riders. Characteristics of the streets of the route must be considered such as one-way operation, curb radii (Session VIII), etc. Changes to existing routes require careful attention. For example, bus operations may change only after a new schedule is published and released to the news media.

1) Through Routing. This type of routing serves a diametrical path through the CBD, as shown in Figure XII-1. One advantage in through routing is the direct access to CBD points, minimizing the need to transfer onto other lines.

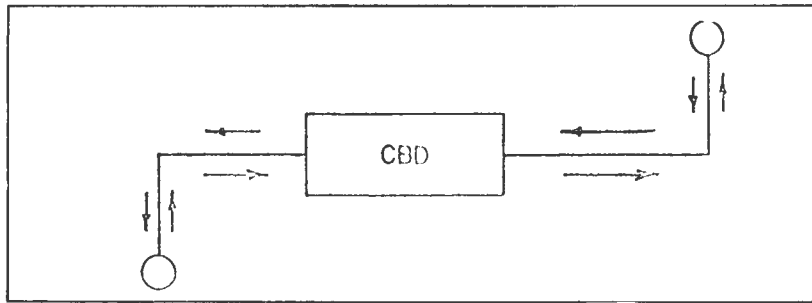


Figure XII-1. Through Routing

. Cycle Routing. Cycle routing serves a radial path with minimal CBD service, requiring transfer to other lines for CBD distribution.

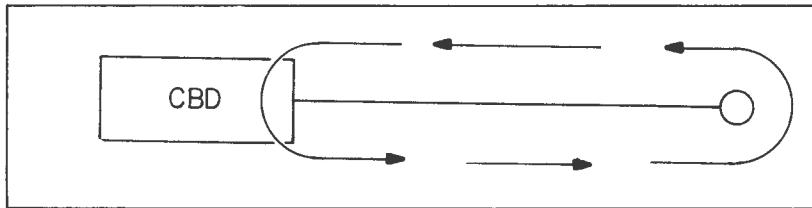


Figure XII-2. Cycle Routing

. Reverse Routing. Reverse routing is similar to cycle routing except there are two separate streets instead of one. Thus, an inbound rider on the outbound street is required to ride a loop before reaching the CBD or line-haul transfer station.

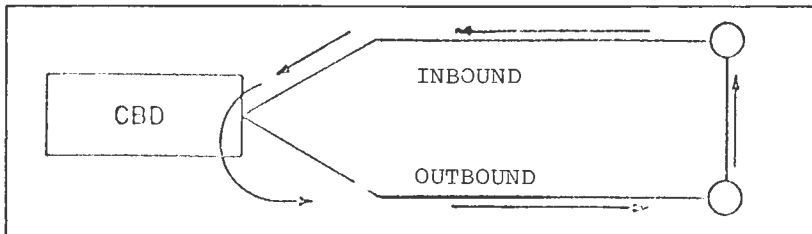


Figure XII-3. Reverse Routing

. Balloon Routing. Used at outlying ends of lines, balloon routes typically serve residential areas in combination with the CBD. A favorable aspect of this routing is the lack of rider transfers before reaching the CBD. Travel times may be too long if stops are made and the distance is large between the residential areas and CBD.

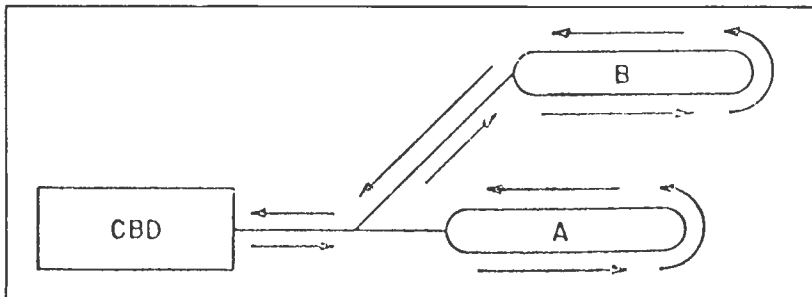


Figure XII-4. Balloon Routing

c. Timing. Certain market segments require service at specific times, while others require frequent service. Each segment has its own unique scheduling requirements.

All transit scheduling, until recently, has been done manually -- a time-consuming and tedious task. Traditionally, the transit industry adjusts schedules four times annually during each of the seasons. Revising timetables (headway sheets) is based on recent ridership patterns.

Scheduling involves allocation of vehicles and drivers to routes as well as determining headways. Vehicle assignments are based on timetables, and driver assignments are based on vehicle schedules.

A recent development is the Run Cutting and Scheduling (RUCUS) package of computer programs which aid in developing timetables and scheduling vehicles and drivers. Since fine-tuning is still necessary, RUCUS does not replace the scheduler.

6. Facility and Equipment Design and Maintenance

These are the aspects of transit which riders come in direct contact. It is clear that bus stops, terminals and vehicles are the transit system to most riders. One function of marketing is to review and evaluate these facilities to ensure that as many user amenities are provided as feasible.

As noted in previous sessions, there are numerous barriers and unattractive characteristics of existing systems which discourage use. Marketing research and common sense can identify correctable elements. Passenger amenities as concrete pads at bus stops, bus shelters, benches, and clean and comfortable buses, do as much for transit's image as promotion efforts. TRANSBUS and standardized shelters are just two examples of consumer-oriented transit.

7. Pricing Transit Services

Traditionally, pricing was the means by which a transit operator levied a charge on each rider commensurate to the amount of service provided. This approach was appropriate when transit systems were privately operated for profit. It also made sense in an era when public transit faced little competition from the auto.

Today, however, public transportation is challenged to meet more goals than simply earning a profit. Within this context, a broad range of fare and fare collection approaches have been developed to attain these goals.

Reduced fares, for example, are instituted to provide increased mobility to low-income persons. Fare-free zones may be established in downtown areas to stimulate business activity and to foster decreased auto use. Premium fares may be charged to cover the extraordinary costs incurred providing deluxe subscription bus services to special groups, such as commuter clubs.

To control the distribution of ridership, pricing policies are instituted with other marketing elements, especially promotion. Typical of these efforts are promotions like Nickel Day, Dime Time, Tuesday Shopper Fare, Big Buck Weekend, Super Sunday, etc.

A significant deterrent to transit usage is that many potential riders perceive the cost of transit as being higher than the cost of operating an automobile. This is understandable since the average consumer pays the auto costs indirectly. On most trips the only daily out-of-pocket expenditure is for parking. The motorist's use of credit cards and monthly bill paying, tend to diffuse or even hide the true operating cost of a car. The transit cost, however, is paid directly upon entering the vehicle and with the exact change. It is usually paid for each trip -- thereby constantly reminding the consumer of transit's cost. Worse yet, the direct cost for transit tends to be higher than the perceived direct auto operating cost.

This unfavorable cost comparison must be overcome if transit ridership is to be increased significantly. There are fare collection approaches that appear to offer relief. Typical examples are a fixed supply of tokens or tickets as well as monthly or even annual passes, and other easy payment plans. They offer the advantage of a one-time charge and help customers avoid the aggravation of paying cash for every trip. Especially promising is the transit pass that consumers can pay for through payroll deduction. This unique approach is already in use in several cities. Another possibility is to encourage employers to give these passes to employees as a fringe benefit or in place of parking facilities.

In planning transit strategy, the marketing program should make use of a broad series of pricing policies to promote the attractiveness of transit.

8. Rider Information

Rider information is needed to make potential patrons aware of existing transit services and to tell them how to use the services.

Many potential users simply are not aware of the transit services available to them. This problem stems primarily from the industry's inability during its decline to conduct effective information and sales communications campaigns.

If people do not know of the existence of transit services, they can hardly be expected to use them. They must also know where the services run, when, how long they take, where stops are, etc. and it must be precise, accurate information. Ignorance about how to get service leads to uncertainty which produces a lack of confidence that discourages use.

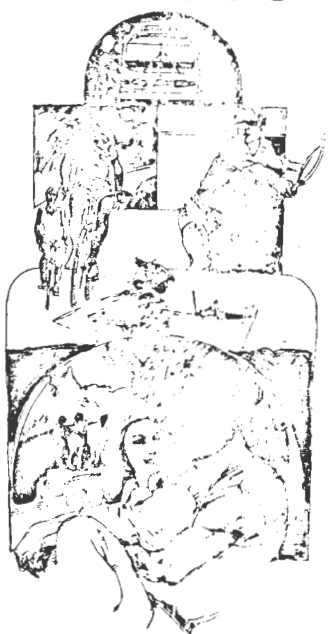
User information aids are used to relay information about transit services to the public. They emphasize the "how to" which distinguishes them from sales communications approaches, such as advertising, which stress

the "why to use it" theme. There are, of course, many instances in which the two function jointly such as in a newspaper ad that, through persuasive graphics and copywriting, attempts to "sell" the reader on using transit services while also providing specific schedule information and even a route map. An effective user information aids program is tailored to the needs of the broadest possible range of potential and current transit riders. Typically, such a program includes signs on equipment, telephone information centers, pocket schedules, system maps, bus stop signs that display transit information as well as door-to-door distribution of information pieces, mobile information booths, etc.


The effort will be most effective when strong, simple consistent information is provided uniformly. Visual communications are especially important, and it is imperative that identification markings on vehicles, timetables, route maps, facilities, etc., be consistent and of high graphic quality.


For the current transit patron, travel on system routes other than his regular one will be encouraged because he is reinforced and assisted by familiar markings and identifications. To the occasional or potential rider, consistent markings and identifications make the system easier to understand and use which encourages ridership.

Fun Book



Hundreds of fun places to go by bus
in Seattle/King County.

METRO  **TRANSIT**



Your tax dollars are helping to make Metro Transit one of the best, most modern bus systems in the nation. As a result, more people—just like you—are discovering every day that bus riding is easier and less expensive than driving. If you would like to ride Metro, but don't know how, read on! This Handbook is for you. Welcome aboard!

Information Available	2
Telephone, Customer Assistance Office, Publications	
Timetables and How to Use Them	2
Route Map, Checkpoints, Schedules, Holiday Service, Night Owl Service, Snow Service, Service Changes	
When and How to Pay	4
Ready Fare, When to Pay, King County Fares, Fare Zones, Transfers, Zone Marker, Magic Carpet, Manual	
Catching Your Bus	6
Identification Signs, Bus Stops, Transfer Point Signs, Shelters, Park & Ride Locations, Flyer Stations, General Tips	
In Transit	11
Boarding, Courtesy Seating, Riding Along, Peak Hours, Driver Assistance	
Changing Buses	12
Transfer Coupon, The Transfer	
Can You Take It With You?	13
Bulky Items, Pets, Guide Dogs, Food and Drink, Unwelcome Aboard	
How to Get Off	14
Stop Signal, Congratulations!	
Things to Do, Places to See!	16
Fun Book, Fun Map, Limited Service	
About Metro	17
Metro History, Metro Council, Citizens Transit Advisory Committee	
King County Fares	18 & 19
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1

Source: Seattle Metro Rider Kit"

Figure XII-5. Rider Information Sample Handouts

Determination of which techniques are appropriate to local needs can be made through analysis of the market research findings. With few exceptions, an effective research effort can pinpoint information needs of each market segment and identify weaknesses in a current user information aids program.

As an example, Seattle publishes and distributes specialized "Rider Kits" containing system maps, specific route schedules, special services, fare information, etc. Selected items are shown in Figure XII-5.

9. Sales Communication Promotion

Sales communication is probably the most familiar marketing element. It is also one of the most important since it encompasses techniques that are highly effective in communicating transit's story to target market segments and persuading them to use transit services. Once the market has been researched and service planning completed, the communications effort begins. Typically it starts with a review of the research findings to determine who the audiences are as well as what is to be said, how, where and when. While there can be many secondary communications goals, the primary purposes almost always are to:

- . Establish public awareness of the programs, operations, and problems of the transit system.
- . Enhance the public's perception and attitudes toward the transit system services.
- . Create public awareness of the special benefits that accrue to the individual, the community and the nation from patronizing public transit.

The purpose of these goals is to enhance the public's attitudes toward transit and to foster its use.

The need to enhance transit's overall image is critical since serious damage was inflicted on transit's image during its period of decline. Consequently, many potential users view transit as undesirable or unattractive. (Their view may be right or wrong which only reinforces the need for marketing research on consumer attitudes to upgrade the system.) Moreover, transit is often viewed as "mass transit" for the disadvantaged, elderly, poor, etc. The potential customer simply does not see these citizens as his or her peers. The potential user may also perceive the available transit service as unresponsive to his or her needs even though they may have been improved substantially. Additionally, an entire generation has grown up that is largely unfamiliar with transit services and their benefits.

10. Ongoing Evaluation and Monitoring

Another essential marketing activity is obtaining information regarding whether the marketing effort has succeeded and which marketing elements contributed to success or failure. This can be accomplished by means

of a type of consumer research called "penetration research" which measures the impact of the program on consumers' awareness of attitudes toward and responsiveness to the program as a whole. To determine the effects of the marketing program on actual ridership behavior, system monitoring is undertaken as well.

Penetration research consists of a series of studies over time. A base study is conducted immediately before the introduction of any service changes and/or the sales communications program, followed at intervals by other studies -- each of which help to track the progress of the marketing effort.

The analytical plan for these studies and the criteria by which results are judged are established according to the marketing goals. In general, the analysis must permit the studies to answer the following questions:

- . Has the plan had an affect on consumers in the appropriate target group?
- . Has the plan also had a positive effect on other consumers who were not originally considered prime prospects on the basis of the strategic research (i.e., in terms of making attitudes toward transit more favorable; an important consideration because of legislation, taxes, other funding issues)?
- . Has any observed positive shift in consumers' attitudes occurred in those identified as being of strategic importance?
- . Which aspects of the plan appear to contribute most to shifts in attitudes and/or behavior, (e.g., service elements vs. communications)?
- . Has the plan resulted in increased ridership from diverted auto user?

The number and timing of penetration studies depends on the marketing plan. It is highly desirable to conduct at least one follow-up study but in general two follow-up studies are the recommended minimum. One of these should be conducted shortly after full implementation of the marketing plan (but after a sufficient amount of time has elapsed to have had a measurable effect); and one after the plan has been in effect long enough to have registered its full impact.

The early measurement is useful because it makes it possible to modify the marketing program by: improving or revising elements of the original service improvement plan and/or the communications campaign; permitting a consideration of additional changes to interest non-key prospects; and evaluating the effectiveness of the communications campaign in terms of creative content, levels of media weight and media mix.

Monitoring transit is necessary to assure that ridership goals are being met or that ridership trends are moving in the desired direction. Monitoring is also employed to determine if service is properly matched to the usage

level. It is used extensively by manufacturers of consumer goods, and has been a standard tool of the automobile industry for years. Since penetration research and system monitoring have an ongoing dialogue with the consumers that transit seeks to serve, these techniques provide input which can be applied to better planning and execution of each successive marketing effort.

11. Summary

The role of marketing has taken on new importance with transit's shift from private to public ownership. Marketing has become the short range planning arm for many properties. Marketing involves a number of functions of which advertising is but one. Marketing should embody a philosophy of providing consumer-oriented service.

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Session XII

Transit Marketing

The First Step Program

Source: Passenger Transport, March 26, 1976, Article by Rosemary Boss, Lane Transit District, Eugene, Oregon.



By
Rosemary Boss
Information Services Coordinator
Lane Transit District
Eugene, Ore.

The First Step Program is the collective title of the personal contact approach developed at LTD for five groups identified as priority target markets for the current fiscal year. Those market groups include seniors capable of using fixed-route service, the handicapped, residents of the district's outlying service areas, major employers and elementary and secondary school students.

The first presentation was developed for seniors who can use fixed-route service. On the theory that more seniors would ride except for their fear of the transfer process and lack of experience with buses, we developed a 10-minute how to ride slide show. It depicts a bus ride which involves transferring to a second vehicle.

The show illustrates all the important steps in bus riding and all the points along the trip where riders can get information: telephone, the central transfer point information booth, drivers, the district's information office, timetables and other customers.

We contacted the Lane County senior services office where a staff member has duties related to the mobility of seniors. He was interested in the project and offered to share costs and take the pictures. For authenticity, we contacted one of the local senior centers and asked the members of a senior drama group to be our models. They also provided us with location technical advice.

We drew a storyboard, scheduled a bus and driver and spent a morning driving all over town photographing the presentation.

Once the slides were processed, intentionally twice as many as we wanted to actually use, we wrote the script and had our advertising agency produce it, complete with sound effects. At this point, total cost for the project was still less than \$200.

Two months after mailing an introductory letter to every senior group in the county, presentations have been made to almost 500 seniors. The complete First Step package includes the slide show, an explanation of how to read timetables, issuance of senior identification cards which entitle seniors to ride for reduced fares, and an optional bus ride using regular route service. At the end of each presentation, participants are

helping the public take the first step

given a First Step Card with two tokens. It's an invitation to try LTD.

Packages are now being developed for other target groups which will include components appropriate to the information needs of the particular group.

For the handicapped, the message will be an introduction of the new dial-a-ride service which will start in July specifically for the handicapped and elderly. The package we will take to outlying communities will be almost identical to that developed for seniors: how to ride information.

The message for employers, who now provide part of LTD's local revenue through a payroll tax, will be the willingness of the district to provide services to large groups of employees and the methods by which the district can cooperate in merchant promotions.

Components of a First Step Program aimed at young students will include study packets, facility tours, boarding passes, speakers and fare policies. We are also developing workshops for special education teachers so that we can work directly with them toward the increased mobility of their students.

The First Step Program, albeit not unlike other marketing representative programs, serves to reach specific potential transit users with specific information. Advertising dollars have been freed for intensive investment in media and production which can be aimed at those demographic groups which generate substantial revenue.

As opposed to an all-purpose speakers bureau, the First Step Program aggressively pursues individuals who are also potential system customers with the information they need to make the transit choice. In each successive year, the target market groups for the First Step Program will be changed or refined. We will return to target groups as the years progress to reemphasize, redefine and repeat messages which are needed for modal choice.

The objective is increased ridership, but the district gains more than riders. Personal contact implies a two-way information process and we get lots of feedback on how we're doing when we take our presentation into the field. We also get a chance to explain why. We can provide personal and instantaneous answers to the questions the taxpayers have accumulated over the years of LTD operation.

And, the participants get an image. Instead of seeing just a bus the next time they encounter LTD, they see a personality. We become just a little more human each time we make a presentation.

Direct contact programs are not really overly complicated. All you have to do is get out into your community and help them take the first step.

Questions - XII

1. What are the advantages and disadvantages of the First Step Program?
2. Comment on the potential demand by each of the target groups.
3. What alternative marketing techniques could be used to reach these groups?

Session XII

Transit Marketing

"Total Market Involvement
is the Key"

Source: Passenger Transport, April 23, 1976, Article by H. H.
Geissenheimer, Chicago Transit Authority.



By

H. H. Geissenheimer
General Operations Manager
Chicago Transit Authority

A balanced program for transit marketing involves the entire management of the system. It is more than an advertising or public relations effort. It is the total involvement of all disciplines with the key emphasis on the close liaison of operations and public affairs staffs. A recommended ridership development program is based on improved service and equipment to the customer at attractive fares with expanded information and promotion.

Product

The improved product phase is based on the assumption as stated by John T. Mauro, general manager, San Mateo County Transit District, that "you've got to do something before people will talk about it."

Thus the first step is to improve both the actual and perceived level of service. This is clearly the responsibility of the various elements of transit operations such as the transportation, maintenance, schedule and service planning departments.

New express trips, improved routings, needed extensions and new lines, direct services to universities, hospitals or other heavy traffic generators and conveniently scheduled runs, are examples of noncapital improvements. Similarly low cost capital items such as passenger shelters or park-and-ride facilities also help improve the service to our customers.

Also needed are transit management programs resulting in improved performance, on-time operation, greater safety and more courteous operation.

Vehicle modernization is also important. Bright new interiors, comfortable seating and colorful attractive exterior

total involvement is the key

styling help sell transit in a most visible way. Older vehicles can often be rehabilitated to supplement new purchases. Improved cleanliness and maintenance also help make the system more attractive. A pride and proficiency program will help increase maintenance department efficiencies.

Price

The second element of the ridership development program is price. Minor price incentives within the framework of established fare structures can both increase ridership and revenue.

Such fare incentives must be designed to attract both regular daily customers and occasional ones as well. Monthly or weekly permits or passes and commuter tickets offer discounts to everyday passengers. Special off peak or weekend rates help increase ridership during hours of available capacity.

Convenient sales outlets and attractive pricing also help merchandise such reduced fares. Special reduced or free fares may be established for senior citizens, college students, youths or the handicapped. Free zones in the downtown central business district or reduced flat fare loop lines may also be established. Such programs should usually be the result of special funding.

In considering transit pricing, it should be remembered that transit fares are lower today than ever before when considered in terms of real purchasing power.

Such pricing of transit service is a function of operations planning. New fares and procedures must be compatible with the everyday functioning of the system. The transportation department must also be involved in the implementation of such new rates and tickets. Rate planning staff must work closely with accounting, budget and finance personnel in the development of revenue projections and fare or ticket accounting.

Promotion

The last element of this three-part ridership development is promotion. Here the traditional marketing, advertising and public relations effort takes place. In addition there are vital new elements involving consumer and community relations.

The public affairs department properly coordinates such important functions. Thomas Buck, manager of public affairs for the CTA states, "Coordination between the various elements of transit management insures the success of the overall program."

The promotion program includes many passenger information services such as timetables, maps, promotion folders and "take ones." Telephone information service and convenient central information and service centers make transit information readily available. Timetable racks throughout the community increase coverage at shopping centers, hospitals and other central points. Car cards, billboards and other graphics increase passenger interest in our system.

The operations planning staff provides passenger control graphics, route mapping, bus stop and information signing as well as timetable service data.

The community relations staff meets regularly with neighborhood groups and other users and helps establish a direct communication with the entire population. A stepped up newspaper, radio and television advertising program adds emphasis to special programs. Press release and media coordination help the public understand our system. The public affairs department would also arrange public hearings and commission meetings and coordinate graphics and visual presentations. These efforts are most important in projecting the policy making structure of transit to both the press and public.

Transit promotion is more than advertising or sales. It is the total image of the transit agency combined with effective passenger information service.

A Transit Management Challenge

With the present emphasis on the energy, environmental and economic crisis, transit operations must not overlook sound management procedures and a total marketing program. The need to maintain high standards of operations and maintenance while controlling costs presents a unique opportunity to demonstrate our professional standing. Concurrent with the before mentioned improved product, reduced price and increased promotion effort; there is a tremendous need for positive management control programs. Passenger acceptance of transit and public support for needed purchase of service

assistance programs or special transit taxes require both high levels of service and management professionalism.

The transportation department is the primary contact with the riders and the community. Increased riding and expanded operating staff require a positive "pleasant attitude today" courtesy effort backed by a sound training program and current information on new fares and service. Long standing fleet safety programs are also an important supplement to good operations.

A new route operations management review will improve on-time performance while reducing delays and service irregularities. Here special attention to running time revisions, unusual congestion and spot schedule adjustments will increase passenger convenience and dependability. An operational program to make full use of the on-board bus two-way radio system has increased operational control, provided immediate response to traffic delays and improved overall security.

Constant reevaluation of routes and schedules by service planning and schedule personnel is required for the most efficient utilization of service. Revenue cost analysis provides current operating data to assist in management decisions. Transit must work with the municipality to develop exclusive bus lanes and other transit priorities.

Good maintenance is especially dependent on quality control. Here a pride and proficiency program can reduce costs and improve reliability. Higher standards and increased inspection set guidelines for employee performance. Operations require a clean, safe, well maintained vehicle while maintenance personnel require up-to-date, clean and safe work areas. These are dependent on individual work performance.

The key to the success of these programs is our first-line supervision and middle management. They need to be adequately compensated and part of the decision making process. Often, the hourly rated employee is eligible for considerable overtime compensation which is not available to these salaried personnel. Decisions made at the operating level must receive the full backing of department management.

Implementing these management programs requires innovation and forward thinking throughout the transit operation. Considering the millions of individual passenger transactions daily, few other industries require this same degree of operational and management control.

Transit marketing is the making of the total transit ride. Only a transit service supported by overall management programs of quality and cost control can provide our metropolitan areas with a viable solution to their energy, ecology and mobility needs.

Questions - XII

1. The article talks about improving both the "actual and perceived" level of service. What is meant by the phrase?
2. How would you rank the factors Product, Price, and Promotion in terms of importance in a marketing program?
3. What areas would you emphasize in marketing transit services?

SESSION XIII: URBAN TRANSPORTATION PLANNING

Objectives of Session XIII

- . To have an appreciation for transportation planning as a method to develop a sound approach to meet transportation needs
- . To be able to describe planning considerations in transportation systems management and long-range planning
- . To be able to identify elements of a Transportation Improvement Program (TIP) and a Unified Work Program (UWP)

Synopsis of Session XIII

This session describes the recently issued joint regulations (FHWA/UMTA) with regard to transportation system management (TSM). The relationship of TSM to the ongoing transportation planning process is defined.

Outline of Sessions XIII

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Planning Process
3	Urban Transportation Planning Responsibilities
4	Summary

SESSION XIII
URBAN TRANSPORTATION PLANNING

1. Introduction

The transportation planning process has changed significantly in recent years as Weiner (1) aptly states:

"The urban transportation planning process has undergone a considerable change over the last three decades. It has evolved from an urban highway planning process which was an extension of rural highway planning activities into urban areas. Gradually, as improved survey techniques were developed, the understanding of the complexities of urban areas grew. The relationship between land development and transportation was recognized in early urban transportation planning studies and conferences, although this relationship is still not well understood.

"In the 1960's, pressures from outside the planning process raised new issues which planners were forced to address. Issues of dislocation and disruption, environmental impacts, citizen participation, social concerns such as transportation for the disadvantaged and most recently energy shortages were added to the range of concerns for the planning process. New issues were being identified at a rate faster than many urban transportation planning processes were able to respond to them.

"Early transit planning developed in a different institutional environment than early urban highway planning. Until 1966, when the Technical Studies Program was created, transit planning was a wholly local matter carried out largely by transit operators. It has taken a decade to bring highway and transit planning under a common set of guidelines and regulations. The impact of these joint highway-transit planning regulations is yet to be seen. "

Until the issuance of these joint regulations on urban transportation planning (see Session III, Part 8b, TSM), transit planning was almost an afterthought in the urban planning process. Now, as transit's role becomes more critical in urban transportation, transit considerations are necessary in developing urban plans. The joint regulations and institutional relationships are the focus of this session.

2. Planning Process

The joint regulations issued on September 17, 1975 resulted in a planning process whose basic steps are shown in Figure XIII-1. The process begins with establishment of agreements between the metropolitan planning organization (MPO) and transit and highway agencies. These agreements between agencies specify cooperative procedures for carrying out transportation planning and programming. The prospectus (Operations Plan) describes the effort in developing a Unified Work Program.

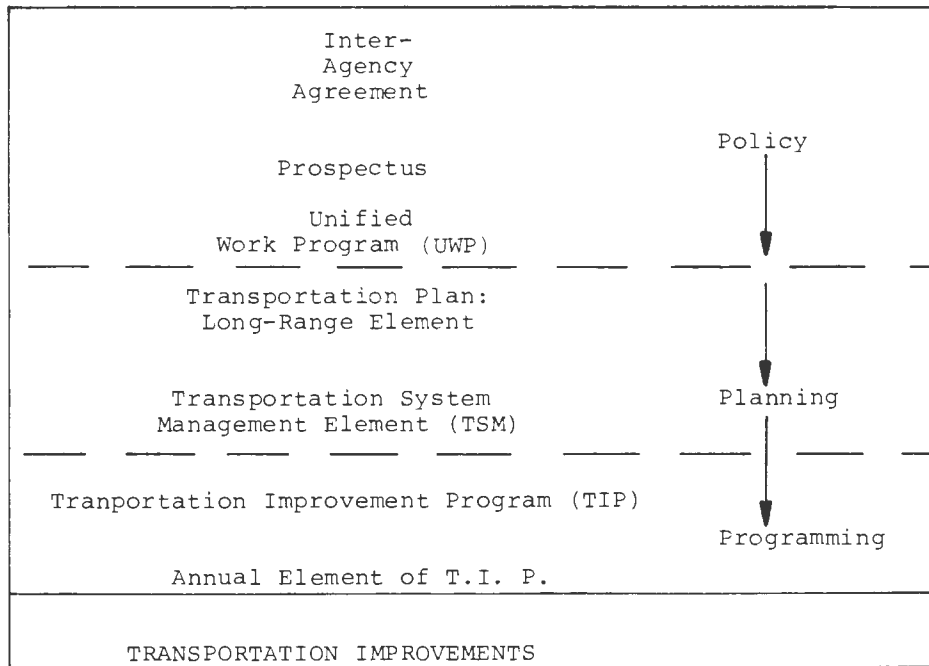


Figure XIII-1. Transportation Planning Process

a. Unified Work Program (UWP)

The UWP is a document describing all planning activities for urban transportation which are anticipated during a one or two year period. It serves as the basis for all U.S. DOT funding for planning activities, and for coordinating and consolidating these activities. It identifies responsibilities at all levels of government. The UWP must also include all elements of the long-range planning effort (initial, continuing, and refinement phases). It must contain descriptions of planning activities for highway, transit, aviation, and railway modes.

b. Transportation Plan

The plan consists of the long-range and TSM elements. The transportation plan must be consistent with the area's comprehensive long-range land-use plan, urban development objectives, and the area's overall social, economic, environmental, system performance and energy conservation goals and objectives.

1) Long-Range Element. This element is intended to provide for the transportation long-range needs of an area by identifying new policies and facilities or changes in existing facilities by mode. The time frame involved in the long-range plan is about 15 years or more.

2) Transportation System Management (TSM). TSM should provide for the short-range transportation needs of the urbanized area by making efficient use of existing transportation resources and providing for the movement of people in an efficient manner. This can be accomplished by identifying traffic engineering, public transportation, regulatory, pricing, management, operational, and other improvements to the existing urban transportation system not including new transportation facilities or major changes in existing facilities.

With these goals, TSM is a planning concept which embraces the view that existing streets and highways, rail, parking, and pedestrian facilities and transportation vehicles -- both public and private -- are elements of a single urban transportation system. The objective of TSM is to organize these individual elements with the help of various operating, regulatory, and pricing policies into one efficient, productive, and integrated transportation system which respects local community needs and objectives and serves the broader national goals of environmental protection, energy conservation and equity for those dependent on public transportation.

The UMTA and FHWA do not set standards or measures that an urbanized area must adopt to meet the requirement to develop a TSM element. Formulation of an overall policy strategy, assessment of candidate measures, and selection, programming, and implementation of actions are clearly a local responsibility to be carried out as part of continuing transportation planning and implementation process. In accordance with the joint regulations, the MPO in each urbanized area in cooperation with the State and operators of publicly-owned transportation services is responsible for the development and periodic updating of the TSM element.

The plan should set forth the underlying goals and policy objectives and the strategy selected to accomplish them. Since the plan will have official status as a product of the areawide planning process, once it is endorsed by the MPO, it should represent agreement on the part of those agencies identified as responsible for carrying out each action. The programming for implementation of TSM projects in the annual element of the Transportation Improvement Program (TIP) represents a commitment for carrying out each action.

Various actions have been identified which may be considered for the TSM element.

Actions to ensure the efficient use of existing road space through:

- . traffic operations improvements to manage and control the flow of motor vehicles, such as channelization, better signalization, computerized traffic control, reversible traffic lanes, other traffic engineering improvements.
- . preferential treatment for transit and other high-occupancy vehicles, such as preferential freeway and arterial lanes, bypass lanes, bus preemption of traffic signals, etc.

- . appropriate provision for pedestrians and bicycles, such as bicycle paths, pedestrian malls, storage areas for bicycles, etc.
- . parking management and controls such as elimination of on-street parking, favoring short-term users, central and outlying intermodal transfer facilities, etc.
- . demand spreading and pricing policies, such as staggered and flexible work hours, reduced off-peak transit fares, peak-hour commuter tolls, etc.

Actions to reduce vehicle use in congested areas through:

- . encouragement of carpooling and other forms of ride sharing diversion, exclusion and metering of automobile access to specific areas
- . area licenses, parking surcharges and other forms of congestion pricing
- . establishment of car-free zones and closure of selected streets to vehicular traffic or to through traffic
- . restrictions on downtown truck delivery during peak hours

Actions to improve transit service through:

- . provision of better collection, distribution and internal circulation services (including route-deviation and demand-responsive services) within low density areas
- . greater flexibility and responsiveness in routing, scheduling and dispatching of transit vehicles
- . provision of express bus service in coordination with local collection and distribution services
- . provision of extensive park-and-ride services from fringe and transportation corridor parking areas
- . provision of shuttle transit services from CBD fringe parking areas to downtown activity centers
- . encouragement of jitneys and other flexible para-transit services and their integration in the metropolitan public transportation system
- . simplified fare collection systems and policies
- . provision of shelters and other passenger amenities
- . better passenger information systems and services

Actions to increase internal transit management efficiency through:

- . improved marketing

- . developing cost accounting and other management tools to improve decision-making
- . establish maintenance policies that assure greater equipment reliability
- . using surveillance and communications technology to develop real time monitoring and control capability

Development of the TSM element may be supported by UMTA and FHWA planning funds for under the UWP planning effort.

c. Transportation Improvement Program (TIP)

TIP is a program covering three to five years describing transportation improvement projects for an urbanized area. It also includes an annual element which is a list of projects proposed for implementation during the first program year. The purpose of TIP is to more closely tie the urban transportation planning process with projects proposed for Federal assistance.

The TIP shall:

- . identify transportation improvement projects recommended as a result of the cooperative planning process for advancement during the program period
- . indicate the area's priorities
- . group projects of similar urgency and anticipated staging into appropriate staging periods
- . include realistic estimates of total costs and revenues for the program period
- . include for information purposes a discussion of how the long-range and TSM elements of the transportation plan were merged into this program

The TIP will be developed and updated annually by the MPO in cooperation with state and local officials and regional and local transit operators.

3. Urban Transportation Planning Responsibilities

a. State and Local Relationships

As noted in the previous discussion, active participation by state and local agencies is necessary as good-faith efforts in the planning process. Working arrangements may take time since the TSM-TIP requirements are fairly recent. However, it is important to understand the roles each particular agency has in the planning process.

The MPO, for example, acts as a forum in which cooperative decision-making can be made by locally elected officials. It has the ultimate responsibility for carrying out the urban transportation planning process, development of the UWP, transportation plan (long-range and TSM elements), and the TIP. As such the MPO must

annually endorse the plans and programs required by the joint regulations.

It is clear that an MPO cannot do this alone. Cooperative efforts and coordinated planning are required from local and state agencies involved in highway planning, traffic engineering, transit operations and planning, and government. In practical terms, this ideal effort has not existed in the recent past. Each agency has more or less independent authority and has developed its own programs and scope of work. Thus, the new joint regulations, in essence, requires some adjustment for the involved agencies which will undoubtedly take some time. The degree of this adjustment will have significant effect on the plans and programs developed.

b. Local Relationships

On a local level, the MPO staff must coordinate efforts with the implementing agencies in order to develop an acceptable working relationship. It is essential that all public transportation services be integrated in the planning process. This, in turn, suggests that city traffic engineers, local taxi operators, local county or city agency representatives, major transit system management, health and social program administrators, and locally elected officials must be identified and included in the planning process.

4. Summary

Urban transportation planning is an established activity in our overall effort to meet the transportation needs of urban areas. However, the planning discipline is now in a transitional stage, moving toward more active participation by those in public transit. The MPO is required by the new joint regulations to take on a more centralized role in acting as a forum where decisions can be made by locally-elected officials. Agreements between agencies must be made to set up a working relationship in developing the area's transportation plan. This plan must now be composed of two elements -- long-range and TSM plans. The basic distinction between the two elements is that TSM concentrates on making use of what exists, while the long-range element identifies new policies or facilities which will be required in the future. The MPO must also develop a TIP, which would logically be based on the transportation plan. The new joint regulations require a somewhat different planning process than that which formerly existed. Some adjustment by planning and operations agencies will be necessary to more clearly define their roles in the evolving planning process.

References

1. Weiner, E., "Evolution of Urban Transportation Planning," Urban Analysis Program, U.S. DOT, April 1976.
2. Transportation Improvement Program," Federal Register, Vol. 40, No. 181, September 1975.

Session XIII

Urban Transportation Planning

The "Top Down" versus the
Bottom Up Approach (1)

- (1) Source: Excerpt from remarks by C. Kenneth Orski, Associate Administrator for Policy and Program Development, Urban Mass Transportation Administration, Before the Conference on Transportation System Management, Minneapolis, Minn., November 7, 1976.

This is not a conference to which you have been invited to listen to Federal officials pontificate on the need for making a more efficient use of existing transportation facilities, or exhort you to place more emphasis on short-range planning. We have had many opportunities to articulate these concerns in the past, and I will not abuse your patience by repeating them here today.

We are satisfied that the rationale for transportation system management is by now well understood and accepted. The question is no longer whether TSM is needed or desirable. The question now before us is how to make it work.

To find some practical answers to this question we have decided to do something we don't do, I think, often enough--and that is, to exercise a convening role, by bringing people with common interest together to share their experiences and their different points of view, to inform each other and to inform us in the Federal Government. This is the reason behind this Conference.

I have been asked to speak about the Federal perspective on TSM. Having been intimately associated with the development of the TSM policy and its implementation, I am tempted to talk about many things: about our assessment of the initial round of the local TSM plans; about the initiatives that have impressed us the most in the early stages of TSM implementation; about some of the concerns that have been expressed to us, too.

But I shall spare you a long dissertation--partly because you will have many opportunities to hear about these matters during the next three days; and partly, also, because I am especially anxious to address and draw your attention to one particular issue which I believe to be of great importance to the future of TSM. The issue is the institutional dimension of transportation system management. I want to focus on this issue and let you know our views on it because I am concerned that unless we reach an early understanding and agreement on the institutional roles and responsibilities, we run the risk of enmeshing TSM in debilitating jurisdictional disputes--the kind of disputes from which nobody emerges a winner.

There are, I suppose, two ways of viewing the institutional roles in TSM planning. The first way is to place transportation system management in the context of the classical systems planning process: a process that begins with the adoption of system-wide goals and objectives; proceeds to the identification of deficiencies in the system; and then leads to the selection of appropriate implementing actions. In this scenario the Metropolitan Planning Organization plays the role of the systemic planner, designing and orchestrating a comprehensive, areawide TSM strategy, with the goal of optimizing the operating efficiency of the transportation system as a whole. The modal agencies in this scenario--the transit operator, the State highway department, the city traffic engineer, the parking authority--are placed in a subordinate role--a role of implementing agents whose mission is confined to executing the individual pieces of the master plan designed by the MPO.

For purposes of characterization, I shall call this the "top down" approach to TSM plan development--an approach that tends to reflect the classical planning style employed by areawide planning agencies in their traditional long range planning activities.

The other model--which I shall call the "bottom up" approach--takes what I believe to be a more realistic view of the real world environment of metropolitan decision-making. This scenario tries not to ignore the hard realities of jurisdictional fragmentation, dispersed implementation responsibilities and diffusion of political power prevailing within the typical metropolitan area. It recognizes the need for sharing power, for a negotiated process of resource allocation, and for some ad hoc responses to local pressures, some willingness for a political give-and-take.

In this model the process of TSM planning is viewed not as an idealized strategy of seeking optimum system-wide efficiency, but as a piecemeal, project-by-project effort that relies heavily on negotiated solutions, that is quick to exploit unique opportunities, and that is not indifferent to public response and the probability of success.

Accordingly, the roles of the various metropolitan actors in this second scenario will be different. The responsibility for initiating TSM actions will rest heavily with the operating agencies--the transit authority, the city traffic department, the police department, the redevelopment agency, the State and county transportation authorities--all the different bodies that have the power to make things happen. The function of the MPO will be to assure that the individual initiatives are consistent with the area's overall transportation plan; that they do not interfere, but hopefully reinforce, one another; and that they are implemented in a coordinated fashion. The MPO will also serve as a forum in which joint TSM ventures between two or more agencies are facilitated, and new TSM initiatives are first broached. The MPO, in other words, will act as a convenor, a broker, a conflict-resolver--but not as an overall architect of an areawide TSM strategy.

These, as I see it, are the two models of the TSM planning process. While the former--the systemic, top-down approach is, I suppose, conceivable, the second model--the bottom-up, project-by-project, incremental approach--is, in my view, far closer to the reality of metropolitan decision-making.

I have serious doubts, in other words, that transportation system management lends itself to the comprehensive approach as practiced by the regional planning agencies in their long range planning process. Those who try to apply the master plan mentality to TSM ignore one key point: that the planning institutions at the metropolitan level are not in a position to make policy trade-offs at the regional or system-wide scale, and that, lacking the power of implementation, their plans will remain the proverbial "wish lists" unless they are supported by the implementing agencies.

What conclusions do I draw from all this for local and federal policy? Let me suggest the following agenda.

To begin with, the MPO's must work ever more closely with the operating agencies and must offer them positive inducements to stimulate TSM planning and implementation. One tangible incentive would be for the MPO's to pass through a portion of the planning funds which they now receive from federal sources. The beneficiaries of such pass-through planning funds could be, importantly, the transit operators, but they could also include city traffic departments and other municipal, county and state agencies that have the power to initiate and follow through on TSM-type actions.

Secondly, the MPO's themselves must develop a greater capability to do short-range operational type planning, so that they may be able to effectively evaluate and coordinate the various TSM initiatives coming up from the operating agencies. We want to see the MPO's devote more of the Section 9 planning funds to operational planning, and we intend to use the annual review of the unified work programs as an opportunity to monitor progress toward this goal.

Thirdly, we need to consider how private transportation service providers can be effectively involved in TSM plan development and project formulation. Such projects would typically involve taxi companies in the provision of specialized services for elderly and handicapped persons, feeder services in low density neighborhoods and shared-ride community transit services to facilitate daytime circulation.

UMTA has taken a significant step in the direction of facilitating private operator involvement by promulgating a statement of paratransit policy. The policy requires that private transportation providers be given full opportunity to participate in the local planning and programming process conducted under the aegis of the MPO, and that they be given the right to propose and participate in the provision of local paratransit services. It is now up to the local private operators and the planning and transit authorities to give effect to this policy.

Fourth, we need to consider how to involve the private sector in TSM plan development. Many TSM initiatives--staggered work hours or vanpooling programs, for example--depend importantly on the initiative of private employers. Today these initiatives, to the extent that they occur, are haphazard and uncoordinated. We need to make a greater effort to integrate them into the urban transportation management process.

We also must open up the TSM planning process to greater public participation. Public attitudes and citizen involvement have played a significant role in the movement away from massive construction projects and toward the philosophy of urban conservation. Their role must also be recognized in TSM planning and implementation, since many types of TSM projects are based importantly on neighborhood initiative and public acceptance.

Sixth, we must make a determined effort, as part of the TSM planning process, to do away with laws, regulations and local ordinances that hinder TSM implementation. Some of the more obvious examples of legal barriers to TSM implementation include zoning laws that require the provision of a minimum number of parking spaces in new buildings, ordinances that prohibit the use of shared-ride taxi service, insurance impediments to cooperative vanpooling, stringent design and construction standards for streets and highways, and the ban on tolls on federally aided highways.

Seventh, we must seriously consider the possibility of TSM-earmarked funding. While TSM project implementation can be supported out of a number of UMTA and FHWA funding sources, the competition from established claimants may be too intense to give TSM projects a fair crack at the money.

While, as a general rule, we should avoid the temptation to create new categorical programs every time we wish to promote a new policy, this is a situation where a modestly funded program could have an enormous pay off in terms of its beneficial impact on the urban environment.

Finally, the MPO must become a true forum for cooperative resource allocation decision-making.

We recognize that the exercise of true programming responsibility is not an easy thing to accomplish. It will be an evolutionary process, and many MPO's will have to mature over time before State and local political leadership will tolerate the exercise of that responsibility at the regional level.

Again, as with the planning function, the MPO will often act only as a referee. The specific project proposals may typically come from local governments and transit authorities. But where there isn't enough money to go around, some tough resource allocation and priority setting decisions will have to be made. Further, when it comes to assuring that certain of UMTA's special policy requirements are met, such as special effort on behalf of the elderly and handicapped, Title VI equity, and private operator involvement, somebody will have to bear the local responsibility. While most proposals for individual TSM projects will be developed on a bottom-up basis, we think the MPO's will have to be the forum in which these requirements will have to be enforced and any competing demands resolved on a top-down basis.

This, then, is our perspective on the difficult and sensitive issue of the institutional roles in TSM planning and implementation.

My intent was not so much to prescribe a particular model of intergovernmental relations as to argue for a balanced allocation of roles and for a sharing of power among the various actors on the metropolitan scene.

Unlike highway building, traffic flow improvements or transit operations, TSM does not have a powerful constituency of its own. If TSM is to succeed it must win the support of a coalition of interest--business, civic, environmental, professional--and the good will of numerous metropolitan agencies that have the power to make things happen--or to block action if they are so disposed.

So, as one who sees great promise in TSM and wishes it well, let me plead for metropolitan and State cooperation, for I see the exercise of shared power not only as the best way, but as the only way for TSM to succeed.

Questions - XIII

1. What do you see as the advantages and the disadvantages to the two approaches? Which approach do you favor?
2. Do you believe there are other more effective approaches to the TSM process? Describe them.
3. Does the TSM process improve the position of transit? Why?

SESSION XIV: ESTIMATING DEMAND FOR
PUBLIC TRANSPORTATION SERVICES

Objectives of Session XIV

- . To be able to describe the methods to estimate demand for transit
- . To be able to identify the magnitude of demand for public transportation including latent demand
- . To identify elements or actions which have been found to enhance demand for mass transit

Synopsis of Session XIV

This session is a review of methods to estimate demand for public transportation. Characteristics of transit demand are described along with factors which affect demand. Attention is given to considerations for special service demand.

Outline for Session XI

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Travel Forecasts
3	Travel Surveys
4	Types of Surveys
5	Latent Transit Demand
6	Modal Split Analysis
7	Land Use Impacts on Transit Demand
8	Impact of Transit Improvement on Demand
9	Summary

SESSION XIV
ESTIMATING DEMAND FOR PUBLIC TRANSPORTATION

1. Introduction

Demand estimates for public transportation modes are component parts of overall urban travel demand forecasts which are basic inputs to the urban transportation planning process. Travel forecasts are used for diverse purposes in planning such as to identify transportation needs, prepare long-term plans, develop air quality control strategies, and evaluate alternatives. The effort in obtaining forecasts may be part of the continuing planning process for an urban area or for short range planning requirements such as instituting a new bus service route or installing a park-and-ride facility. Thus, the demand estimation effort may be quite large or narrow in scope, depending on the purpose of the planning program or project.

2. Travel Forecasts

Developing travel forecasts can be quite complex requiring substantial data, mathematical models, and associated computer use. An important preliminary step is data collection consisting of surveys of actual and latent (present but not active) travel and market segment characteristics. A market segment is a group of individuals (or households) with similar travel behavior.

a. Methodology

Briefly, the methodology of developing forecasts involves describing the transportation network area by zones, travel, population, etc. characteristics, and using the traditional four-step approach to calculate forecasts. The four-step approach, shown in Figure XIV-1 can include the use of mathematical models to predict travel (number of trips) on a network.

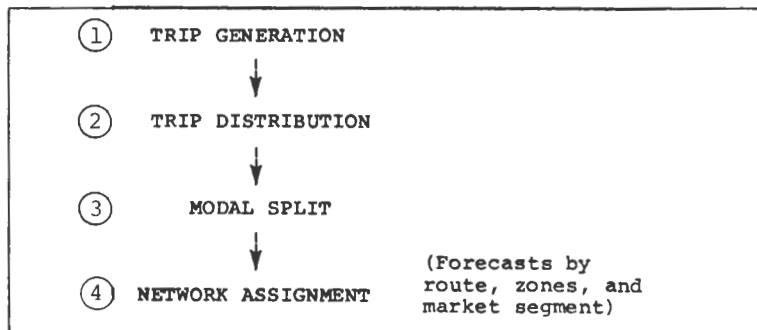


Figure XIV-1. Traditional Four-Step Approach

Basic variables of travel considered are:

- . Frequency of trips (per day)
- . Origin/Destination
- . Mode

- . Route
- . Time of trip
- . Number of autos owned
- . Residential location
- . Employment location

These variables along with activity variables (e.g. trip purpose), economic variables (e.g. out-of-pocket costs) and service-related variables (travel-time etc.) are used in the travel forecasting process.

b. Service Characteristics

The underlying philosophy of the mathematical models deals with consumer behavior. The decisions made by individuals will determine the effects of changes in the transportation system. The basic decisions are whether, where, when, and by which mode and route to make a trip. These decisions depend on many factors such as trip purpose; others are too subtle and numerous to be yet considered in modelling. An important factor group consists of service-related characteristics, as given in Table XIV-1.

Table XIV-1. Service Characteristics

<u>TIME:</u>	Total trip time can be divided into the following components:		
		excess time	in-vehicle time
	access time	walk time wait time	time in auto or bus to mainline transit
	line haul time	transfer time	mainline transit time auto driving time
	Reliability - subjective estimate of variance in trip time		
<u>USER COST:</u>	Out-of pocket costs (fares, fuel, parking, oil, toll charges) Transportation overhead (cost of acquiring, maintaining, etc.)		
<u>SAFETY:</u>	Probability of fatality Probability of accident Perceived security		
<u>COMFORT & CONVENIENCE</u>	Walking distance (< ¼ mile) Number of changes of vehicle Physical comfort <ul style="list-style-type: none"> ● temperature ● humidity ● cleanliness ● ride quality ● exposure to weather Psychological comfort Amenities (ease of taking packages)		

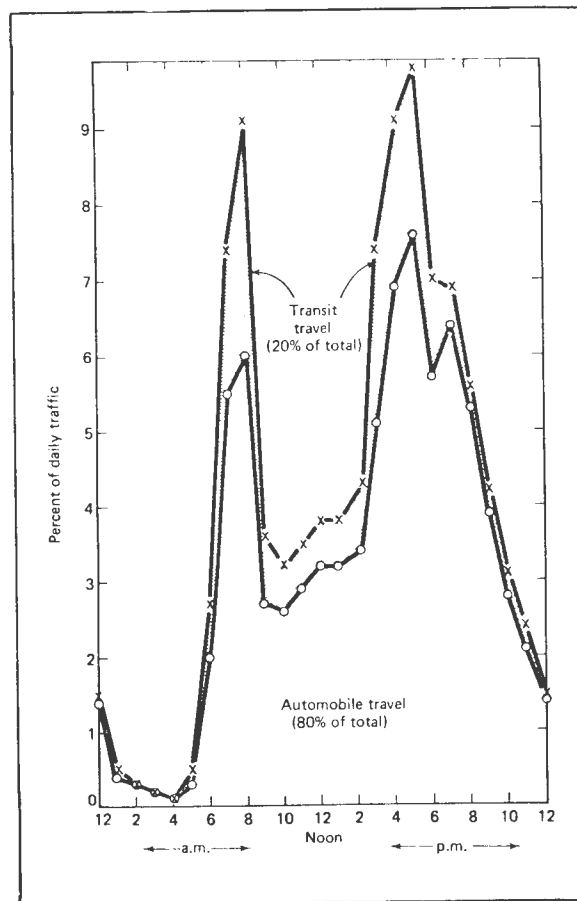
Source: Ref. 1

For predicting demand for conventional transit service along a single route the primary service variables have been travel time, wait time, and fare. For a project of larger scope (such as corridor service or rural area-wide service), more service variables would be needed to forecast demand. The competition between auto and bus or rail is a critical aspect and is included in the forecast methodology (modal split analysis). It is necessary in forecasting travel demand to consider consumer behavior through an understanding of choices available to market segments and the characteristics of the choices represented by their service variables.

An understanding of modal service characteristics is also essential in other planning activity such as evaluating alternatives.

c. Trip Characteristics

Trip-making is a function of the various purposes of trips and when they are made. An hourly pattern of transit travel is shown in Figure XIV-2.

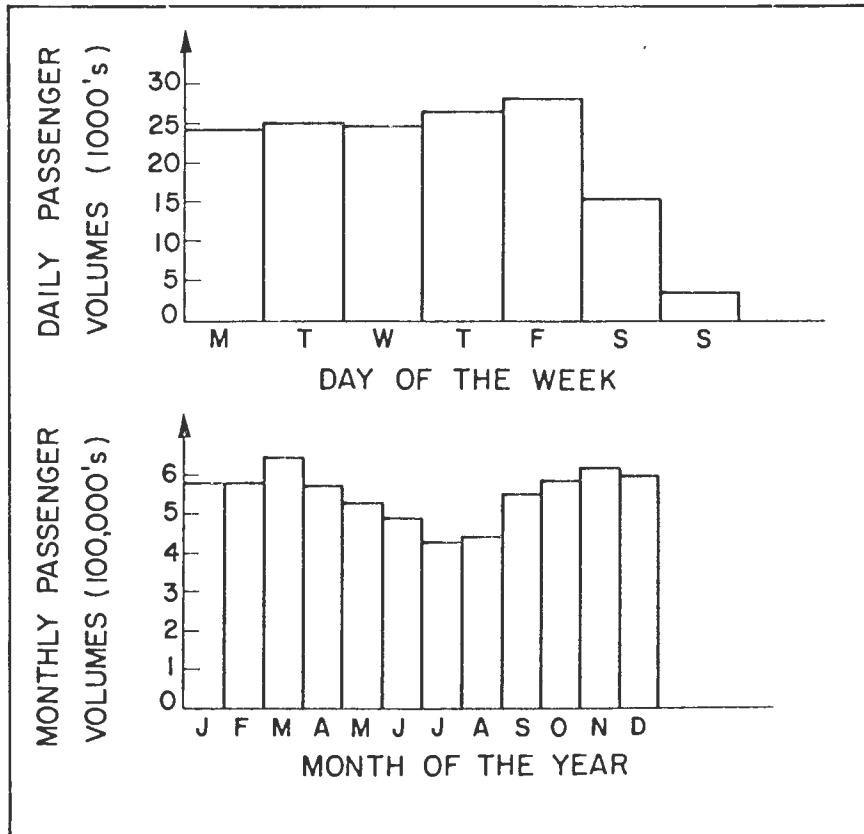


Source: Ref. 3

Figure XIV-2. Typical Hourly Urban Travel Pattern

An important aspect of the figure is the large demand occurring only over short periods (peak periods) of time. This peak demand requires a certain number of vehicles and drivers which are not all required during the off-peak hours.

Transit demand also varies by day and month as shown in Figure XIV-3. Weekends have low demand, with Saturday higher than Sunday because of shopping trips. Summer months are lower (school vacation, other vacations, etc.) and winter months are somewhat higher (resistance to drive cars or walk in bad weather, etc.).



Source: Ref. 4

Figure XIV-3. Typical Daily and Monthly Transit Demand

Trip lengths vary by mode. As noted in reference (3) ranges of trip lengths (given in Table XIV-2) by mode show some difference basically because of their service characteristics.

Table XIV-2, Typical Trip Length Ranges

Auto (driver)	3.4-4.0 miles
Auto (passenger)	3.4-4.5 miles
Taxi (passenger)	1.9-2.1 miles
Bus, Streetcar	2.5-4.0 miles
Rapid transit	5.8-7.2 miles
Commuter railroad	10.2-17.6 miles

Source: Ref. 3

Table XIV-3 presents the percentage of urban travel by mode and trip purpose. Note that transit use is comparable to other mode percentages for all trip purposes except social and recreation.

Table XIV-3. Percentage of Urban Trips by Mode and Trip Purpose

Mode of Travel	Trip Purpose (percent)					Total
	Work and Business	Social and Recreation	Shop	Miscellaneous	Home	
Automobile drivers	32.3	9.5	8.0	13.4	36.8	100.0
Automobile and taxi passengers	17.2	24.5	7.9	7.9	42.5	100.00
Transit passengers	29.5	7.2	6.8	12.5	44.0	100.00
Total	27.9	12.0	7.5	11.8	40.8	100.00

Source: Adapted from Ref. 3

d. Trip-Maker Characteristics

The image of the typical transit user is a poor, elderly, and auto-less person, who has no choice but to use transit. It is true that auto-less persons use transit for that is one of public transportation's objectives. But it is also true that transit can and does attract and serve people who have high incomes and have more than one family auto. The Shirley Highway Express Bus Service, for example, serves commuters who do not fit the typical description.

The El Monte Busway serves a ridership with similar characteristics.

Bus transit can attract and serve persons who are not transit dependent when the service offered is equivalent or better than that provided by the private auto.

For transit demand estimation, the discussion will include travel surveys, latent demand and modal split analysis. More detailed discussion of travel forecast methodology such as the UMTA Transportation Planning System (UTPS) is contained in Reference 1.

3. Travel Surveys

Travel surveys are the tools for data collection. The level of effort depends on the objectives of the overall planning effort.

a. Survey Design

Certain organizational steps are essential in preparation for travel surveys. The following groups should be included in planning the survey.

- . Affected State and local government agencies
- . Local and regional planning groups not included in previous group.

Table XIV-4. Shirley Highway Bus Rider Characteristics

CHARACTERISTICS	BUS PASSENGER		DRIVER ALONE (ALL)	CARPOOLER	
	BUSWAY	NON-BUSWAY		BUSWAY	NON-BUSWAY
	Percent	Percent	Percent	Percent	Percent
Household Income					
< \$5,000	0%	2%	0%	0%	0%
\$5,000 - \$15,000	21	37	23	7	18
\$15,000 - \$30,000	61	44	45	61	51
> \$30,000	18	17	32	32	31
	100%	100%	100%	100%	100%
Age					
< 21 yrs.	3%	5%	1%	1%	2%
21 - 39 yrs.	59	53	47	46	45
40 - 65 yrs.	37	41	51	53	52
> 65 yrs.	0	14	1	0	1
	100%	100%	100%	100%	100%
Sex					
Male	62%	51%	73%	85%	65%
Female	38	49	27	15	35
	100%	100%	100%	100%	100%
Auto Ownership					
0	5%	15%	0%	1%	2%
1	51	56	35	30	40
2	37	24	55	56	47
3	6	4	9	11	9
4	1	1	1	2	2
	100%	100%	100%	100%	100%
Mean Autos per Household	1.47	1.20	1.76	1.83	1.48

Source: Ref. 5

Table XIV-5. El Monte Busway Rider Characteristics

	Pre-Busway	Early (Pre-El Monte)	Recent (Since El Monte)	All 1974 Riders
Percent male	34.5	41.1	49.3	45.9
Average age	40.1	39.5	36.2	37.5
Average income	11.1	16.6	18.3	17.5
Percent completed high school only	N.A.	43.1	26.8	33.9

Source: Ref. 6

- . Transit companies to be included in the survey
- . Transit unions
- . Sources for hiring temporary help, if such assistance is necessary.
- . The news media, to assist in publicizing the survey.
- . Federal agencies that might be involved.

Input from these groups may be used to develop and organize a survey schedule.

b. Data Requirements

The type, amount, etc. of data required clearly depends on the analysis for which it is gathered. Some general considerations are:

- . Goals and objectives of the study
- . Types of analysis and planning models
- . Types of survey constraints
- . Data tabulating
- . Sample sizes, statistical considerations
- . Types of surveys available

c. Available Data

To avoid duplicative efforts, an investigation of existing data sources such as those given in Table XIV-6 should be made. The investigation should determine the type, quantity, and reliability of the data.

Table XIV-6. Typical Data Sources

<u>Data Type</u>	<u>Source</u>
Social and Economic	U.S. Bureau of the Census City or County Clerk State Department of Labor State Department of Internal Revenue City or County Planning Board
Motor Vehicle	State Highway Department, DOT or Motor Vehicle Dept. U.S. Census (Journey-to-work) Local Traffic Department Earlier Travel Surveys State Registration Records Gasoline Tax Collection Records
Mass Transportation Travel	Local Transit Companies State Highway Department (or State DOT) Local Planning Agency U.S. Census (Journey-to-work) Earlier Travel Surveys Regional Transit Authority
Travel by Intercity Modes (air, rail, bus)	Federal Agencies such as: The Civil Aeronautics Board The Federal Aviation Adm. The Interstate Commerce Comm. The Federal Railroad Adm. State Regulatory Agencies Earlier Travel Surveys Private Carriers
Land Use Characteristics	City Directories Local, Regional, and State Planning Agencies Tax Assessor's Records

Source: Ref. 2

d. New Data

Data to be collected can be identified after an examination of analysis requirements and existing data. The specific information needed is a function of unique conditions of the planning effort. Typical types of transit related data include the variables listed on page XIV-1 and XIV-2. Additional variables include trip-making characteristics (transfers, fares, round-trip, home address, etc.), socio-economic data (driver's license, number of autos, family size, income, ages, sex, etc.), and attitudinal data (reasons for using transit, route and schedule convenience, fares, drivers, vehicles, etc.). In combining attitudinal and factual data on one questionnaire, extreme caution must be used to avoid impairing the validity of responses. Market research uses attitudinal data to assist in identifying consumer-oriented programs for increasing ridership.

e. Development of Survey

1) Survey Form Design. The survey forms must be easily understood by the interviewer and respondent, and fully compatible with data processing requirements. Pre-testing the forms is essential, by using them on a few random samples of transit users.

2) Accuracy Checks. Independent data sources exclusive of the travel survey must be used to check the completeness and accuracy of the travel data. These typically are passenger counts or other statistics available from the transit property.

3) Personnel Requirements. There can be sizable manpower requirements for data collection, editing, coding, keypunching, hiring and training.

4) Public Relations. The cooperation of the public is essential for a successful survey. People should be made aware of the survey by a communication effort which reflects the funding and manpower limits of the overall project. Placing notices on transit vehicles and advertising through radio, television, or newspapers are typical media efforts.

5) Cost of survey. The costs of a proposed survey effort should be determined and conform to the available funds. Tradeoffs can be made, but made without impairing the quality of data collected.

4. Types of Surveys

There are two basic survey types. The first type is comprehensive, involving collecting data where trips begin and end to obtain information on all trips by all modes. The second type is to collect data while users are making trips.

Surveys consist of the following basic techniques:

- . Personal interview
- . Telephone interview
- . Mail-back questionnaires by mailing or hand distribution

There are various advantages and disadvantages associated with each type. A basic factor of which type to use is the tradeoff between cost per completed survey form vs. the number or percent of responses required. Personal interviews will normally be more complete and accurate and mail-back forms will have a much lower response rate. Selecting the best technique for a specific data collection effort involves an analysis of the aspects of each technique and the costs, time, and manpower requirements.

a. Comprehensive Surveys

1) Dwelling Unit Surveys. This survey includes identifying a statistical sample of dwelling units and scheduling each household for personal or telephone interviews. Dwelling unit surveys provide information not obtainable through transit user interviews, which is the travel characteristics of non-users of transit.

2) Employee Surveys. This survey involves interviewing employees at concentrated employment centers (airports, factories, etc.). Questionnaires may be mailed or distributed by employers. Personal interviews would involve a random sample of employees at various businesses.

3) Employer Surveys. Employer surveys are used to identify the need or possibility for a full-scale employee survey. Basic information would include items as number of employees, working hours, transit services, parking supply, etc.

4) Shopping Center Surveys. These surveys can be done by road-side interviews of those arriving or leaving a shopping center by all modes. Personal interviews or mail-back questionnaires may be used. Another technique is to personally interview shoppers or distribute mail-back questionnaires within the shopping center.

b. Transit User Surveys

Transit user surveys can be administered on-board vehicles or at transit stops and terminals. Personal interviews would be carried out much like those for comprehensive surveys except with less questioning. Survey forms (mail-back type) may also be distributed to the users, requiring slightly different information items. If additional questioning is required subsequently, follow-up home interviews can be administered by personal or telephone interviews.

5. Latent Transit Demand

Latent demand represents the potential trips that could be made by people who cannot or will not make these trips because of inconvenience, or absence of service, or by people who would make more trips than they are taking now.

a. Latent Demand Groups

Latent demand includes the potential ridership shift from auto to transit. Special groups representing other categories of latent demand are poor, elderly, handicapped, auto-less, and young persons.

Past sessions on transit marketing and the elderly and the handicapped point out the need for identifying latent demand to provide an attractive and usable service. Transit, meeting the needs of latent demand, groups, may increase mobility and accessibility, and attain such national goals as energy conservation, pollution control, and better quality of life.

b. Surveys

By definition, the surveys used to identify latent demand must be comprehensive surveys (Section 4a) for identifying characteristics of transit non-users and unattractive transit aspects. Surveys measuring latent demand fall into the scope of transit's market research activities.

Market research activities, especially market definition, are capable of identifying latent demand for new services. These services, of course, could range from new systems (e.g. paratransit or demand-responsive services in small areas) to route modification.

6. Modal Split Analysis

Modal split analysis, which is one step in the traditional four step forecasting procedure, consists of estimating the portions of travel which will occur on various alternative modes. Basic methodologies are based on analysis of how demand might change with transit service improvements (routes, schedules, etc.) and policy mandates (congestion pricing, auto-free zones, etc.).

a. Demand Function

In quantifying demand, the relationship between consumer desires and service variables of alternative modes (auto transit, etc.) is estimated. This relationship is termed the demand function. Trip, tripmaker and service characteristics are variables in the function. Such variables as auto availability, parking charges, fares, travel time, etc. can be considered. Other variables such as consumer perception of safety, comfort, etc. cannot be quantified as easily as service characteristics. In essence, the function answers the question, "What mode will be used by certain users?"

b. Models

There are basically two types of models. One model is the trip-end modal split model which estimates portions of total person-trips by auto-transit, etc. before the trips are distributed by route from zone to zone. That is, trips are assigned to modes before the trips distribution step. Another model is the trip-interchange model which estimates trips after trip distribution, yielding internal transit and auto trips.

Another approach was developed by Ferreri and Cherwony for Miami. In this approach, choice rider modal split is calculated by the trip interchange modal split model, but captive rider trips are "generated" from zonal land use, demographic and accessibility data. (9)

7. Land Use Impacts on Transit Demand

As noted previously, land use characteristics are an important variable in demand estimation. Land use policies (e.g. constraining the commercial floor space) of an urban area are becoming recognized as potential and perhaps meaningful alternatives to improve urban transportation.

One recent study (7) estimated the effects of various land use policies on transit demand. The report states:

- . Clustering or dividing nonresidential space. Say 10 million square feet are to be added to a growing urban area. One option is to put the non-residential floorspace into two spread clusters, each five million square feet in size. Another is to create a new downtown of 10 million square feet. In the second case, per capita trips by transit within a 3 to 5 mile radius will be 50 to 70 percent higher than in the first case, keeping residential density the same.
- . Enlarging downtown size or raising nearby residential density. Say the options are to double the size of a downtown from 10 to 20 million square feet, or to double the residential density within a few miles of it from 15 to 30 dwellings per acre. The former will increase per capita trips by transit in the vicinity of that downtown three to four times more than the latter.
- . Increasing residential density near downtown or farther away. Say the options are to double residential density from 5 to 10 dwellings per acre either within one mile of a downtown of 10 million square feet or at a distance of 10 miles from it. In the first case, public transit trips per capita in the affected area will increase seventeen times as much as in the second case.
- . Scattering apartments or concentrating them near transit. Say a rapid transit station is located five miles from a downtown of 50 million square feet of nonresidential floorspace (the size of Newark, New Jersey). At a density of 15 dwellings per acre, the square mile surrounding the station will send about 620 trips a day to the downtown by transit. Suppose speculative development scatters apartments throughout the square mile, raising its density by 20 percent. That will increase transit ridership at the station by about 24 percent. But if the apartments are clustered within 2,000 feet of the station, preserving the rest of the neighborhood intact, transit ridership will increase by 34 percent or more; at least a carload of 62 people a day will be added not from any increase in average density but only from a different arrangement of the new development within the square mile.

The estimated impacts suggest that more transit use will occur if residential areas are closer to downtowns which are made larger and more compact.

8. Impact of Transit Improvements on Demand

The same study (7) reports various effects of improvements to transit service on demand. For example, the report states:

- . " Fare reductions. Cutting fares by 50 percent tends to increase the number of transit riders anywhere from 7 to 45 percent, depending on the type of trip and on the size of the urban area. Non-work trips are more sensitive to fares than work trips, and small places with sparse transit use are more sensitive than large cities. However, this does not mean that fare subsidies are better spent in small, low-density places. Riders are concentrated in large and dense cities to such an extent that, with an equal subsidy per rider, the absolute gain in ridership will be much greater there.
- . Reductions in travel time. Cutting running time by 50 percent tends to increase ridership by 14 to 20 percent, while doubling service frequency (thereby cutting waiting time by 50 percent) tends to increase ridership by 24 to 77 percent, depending on existing service frequency. On the whole, passengers are more responsive to travel time reductions than to fare reductions. However, this does not mean that money is necessarily better spent on service improvements than on fare reductions. For example, if the cost of service improvements is high, situations can arise when more riders per dollar of subsidy can be attracted by lowering fares.
- . Improved amenity. Ridership response to improved amenity is not well quantified, but both the assurance of a seat and air conditioning appear important. Also evidence suggests that fixed rail systems do attract more riders than buses under comparable conditions.
- . Diversion from the automobile. In practice, new bus and rapid transit systems have increased transit ridership in the affected areas by 50 to 100 percent, rarely more. Typically, about half the new trips represented trips not made before, indicating that the systems did indeed expand mobility. The other half were trips diverted from the automobile. This is significant from the transit viewpoint, but from the viewpoint of overall auto use, the reductions were small. Given the preponderance of auto travel, even a 50 percent increase in transit use nationwide would cut urban auto travel only about one percent. Of course, in specific places, such as entrances to a downtown, the reduction can be much greater and forestall the need for building new freeways.
- . Auto restraints. Depending on how severe they are, auto restraints can have more of an effect on both reducing auto use and increasing transit use. For example, gasoline rationing in World War II cut urban auto travel as much as 25 percent; about one-third of the foregone auto travel

showed up on public transportation, raising its use about 55 percent. On a much smaller scale, the 1974 gasoline shortage had a similar effect."

Eliminating fares is another possibility which may have some application. One study (8) presents estimates of gains in ridership for a free-fare transit system.

Table XIV-3. Gains in Free-Fare Transit Ridership

<u>Current Transit System Average Fare</u>	<u>Ridership Increase Resulting from Free Fare</u>
10¢	13%
15¢	20%
20¢	28%
25¢	36%
30¢	45%
35¢	54%
40¢	64%
45¢	75%
50¢	86%

Note: Average fare defined as total farebox, token and ticket receipts divided by total boarding passengers.

9. Summary

Estimating demand for transit is, above all else, a consideration of consumer desires and available modal choices. In urban planning efforts, direct estimation of forecasted travel is made through the use of modal split analysis and mathematical models. As only one step in the planning process, there are basic requirements of data collection in the form of travel surveys. There are two types of surveys: comprehensive and transit user surveys. An important aspect of estimating demand is the consideration of latent demand, the potential trips not currently served by existing transit services. The significance of latent demand is marked by its component groups such as the poor, elderly, handicapped, and diverted auto users. The estimation of transit demand is still more of an art rather than a science; simply because it is difficult to represent the very large number of trips, tripmaker, and modal characteristics. Moreover, we are still learning the effects that transit improvements and urban land use policies may have on transit demand.

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Session XIV

Estimating Demand for Public Transportation

The Experience of Seven Cities in
Increasing Transit Ridership (1)

- (1) Excerpt from "Increasing Transit Ridership: The Experience of Seven Cities," UMTA, November 1976.

UMTA recently released a report describing seven cities that have experienced major increases in transit usage since 1971. Factors that have played a significant role in stimulating ridership are described below.

A. The Climate in Which the Use of Transit Expanded

All of the cities were characterized by a common factor that was essential to their success in increasing ridership: Strong public and political support which resulted in the availability of substantial and stable financial resources.

Public Support resulted from concerns such as the environment and the need to improve public transportation. In most cases transit service had been in a state of decline and deterioration. Eventually however, after service improvement and large ridership increases, public support was sustained, because transit was considered to be a popular and well managed public service. In almost every case, there were local organizations and individuals with a strong commitment to transit who galvanized local support.

Political Support followed public sentiment and support. It was directed by influential and persuasive public figures, ranging from State legislators to mayors, councilmen, transit boards members and a city traffic engineer.

Substantial Stable Financial Resources were available for operating assistance, as well as for capital assistance for all seven systems. Transit service was supported by various sources of local and State funds. These included both general revenues and earmarked revenue sources, although the latter appeared to be more prevalent. These included sales, property and payroll taxes.

All six U.S. cities used UMTA Section 3 capital grants extensively (Table 1), especially for transit system acquisition, vehicle replacement and fleet expansion. In most cases the capital plant appears to have been modernized to the extent that there will be a de-emphasis in capital investment relative to operating expenses. (It was too early to note a significant effect of Section 5 formula grants, which first became available in Fiscal Year 1975, during the study period, 1971-75).

B. Major Factors Responsible for Ridership Increase

1. Service Expansion

Most ridership gains are in large part attributable to service expansion, especially the expansion and addition of routes in areas that previously had been poorly served. Service expanded significantly in each system in terms of vehicle miles of service, fleet size, route miles and area served. As measured in vehicle-miles operated, the changes in service offered from 1971 through 1975 were:¹

Eugene	260.5%
Salt Lake City	117.8%
Madison	91.9%
San Diego	81.0%
Vancouver	77.6%
Portland	59.6%
Minneapolis	47.3%

Elasticities of demand, relating ridership increases to service expansion, cannot be accurately calculated for these systems, due to the limitations of data and inability to isolate the effects of service expansion from other influencing factors that occurred simultaneously. Within the transit industry any expansion of service with an elasticity of demand greater than 0.7 is considered to be quite favorable. If everything else were constant, a direct comparison of increases in vehicle miles operated and ridership would indicate that this has happened in all seven systems (Table 2).

While direct comparison is made difficult by the presence of other factors, these favorable ratios of change are probably an indicator of the successful combination of service expansion with such other factors as good management, planning and marketing. Ridership in Eugene, San Diego and Madison increased proportionately much more than vehicle miles. In Salt Lake and Portland, ridership increased at about the same rate as vehicle miles, while in Minneapolis and Vancouver, the increases were at a smaller rate than vehicle miles. Compared with the national average for bus systems, all of these cities had much larger percentage increases in both vehicle miles operated and ridership from 1971 to 1975.

¹ Transit vehicle miles operated for Madison are for 1970 through 1975; in 1971 they increased by 52 percent.

Table 1. UMTA Capital (Section 3) Grant Approvals
(1966-1975)

City	Public Takeover	Section 3 Grants Approvals Thru 6-30-75 (\$000)	#Buses Purchased	Section 3 Funds Per Capita (\$)
Salt Lake City	3/70	18,458	300	38.50
Madison	4/71	6,302	102	30.74
Portland	12/69	21,687	430	26.29
Minneapolis	9/70	42,252	856	24.78
San Diego	7/67	17,390	298	14.57
Eugene	11/70	1,898	45	13.65
National U.A. average (bus)				12.11
National U.A. average (bus & rail)				36.01

Table 2. Increases in the Amount of Service Offered
and Ridership

City	Vehicle Miles (000)			Ridership	
	1971	1975	% Increase	1971-1975	% Increase
Eugene	800	2,884	261	411	
Salt Lake	1,904	4,146	118	118	
San Diego	7,587	13,731	81	114	
Vancouver	16,030	28,466	78	57	
Portland	11,477	18,315	60	57	
Minneapolis	18,600	27,400	47	40	
Madison	2,745	3,465	26	49	
National average ¹ (Bus)	1,375	1,528	11	8	

1. American Public Transit Association, Transit Fact Book,
1976, Washington, D.C.

The expansion in transit service resulted in increased aggregate service frequency in four of the seven systems. The reduction in vehicle miles per route miles in three of the systems can be attributed to route expansion with emphasis on peak period service relative to off-peak and weekend service and to new routes at lower average frequencies (Table 3).

Route Expansion

The type of service expansion that appears to have been a primary cause of the large ridership increases in these seven cities was route expansion into areas that were previously unserved or poorly served. Over the five year study period, 1971-1975, four of the seven cities increased route mileage over 80 percent. The route mile increases ranged from 145 percent in Vancouver to 35 percent in Portland with an average increase of 86 percent (Table 4). In systems that already have extensive area coverage, similar ridership increases may not be as readily attained.

2. Fares

Fares remained constant or were reduced in all cities (Table 5):

- San Diego and Salt Lake City had large fare reductions although San Diego later raised fares;
- Four cities reduced the number of zones, in effect providing a fare reduction for longer trips;
- Special senior citizen and student fares were common; five of the six U.S. systems had reduced fares for the elderly before it became a Federal requirement;
- Five systems had monthly or other special passes;
- Free fares were tried on a limited basis in two systems for the elderly, youths and trips within the downtown area.

Although two system managers reported that fares played an important role in stimulating ridership increases, the reduction in fares appeared to be less significant than service expansion. In most systems the ridership increases that were directly attributable to fare reductions and their elasticities could not be calculated because of concurrent service expansion and limitations of available data. In Minneapolis-St. Paul, some direct impact on ridership could be estimated. In 1975 free fares for youths 18 and younger were tried from January 30 to June 7 and replaced by reduced fares for the rest of the year. During this period (1975), rides by youths rose by 3.8 million over 1974 figures, 21 percent of the change in annual ridership. Free fares were also established for the elderly during the off-peak period in the Twin Cities and on weekends in Portland. A free fare zone in the downtown area was also in operation in Portland. Although transit system managers estimated that the impacts were considerable, data was not adequate to permit their isolation or accurate measurement;

Table 3. Aggregate Frequency Increases

City	Annual Vehicle Miles per Route Mile (000)		
	1971	1975	% Change
Eugene ^{1/}	6.30	9.93	+ 58
Salt Lake	14.27	17.26	+ 31
San Diego	9.83	11.61	+ 18
Portland	9.52	11.22	+ 18
Minneapolis	28.5	22.2	- 22
Vancouver	42.58	30.89	- 28
Madison	14.08	10.01	- 29

^{1/} For a more accurate estimate of urbanized area service 1974 statistics are used, since Eugene implemented a very large amount of rural service in 1975, much of which operates infrequently.

Table 4. Route Extensions

City	Route Miles ^{1/}		% Increase
	1971	1975	
Vancouver	376	921	144.9
Eugene ^{2/}	127	273	115.0
Minneapolis	653	1,233	88.9
Madison	125	229	82.8
Salt Lake	133	240	80.1
San Diego	762	1,199	57.4
Portland	1,205	1,632	35.4

^{1/} Route miles include routes with all day service as well as peak period routes.

^{2/} For a more accurate estimate of urbanized area service 1974 statistics are used, since Eugene implemented a very large amount of rural service in 1975, which operates infrequently.

i.e., there is no record of elderly ridership prior to free fares and no count was made of free riders in Portland.

Passes

Four of the cities offered monthly passes; another offered a 20 ride adult undiscounted convenience pass. Passes were considered to be a convenient way to increase ridership and speed boardings. Managers assumed that the loss in individual fares was compensated by an increased volume of riding, especially during periods when there was excess seating capacity.

Trend Toward Flat Fares

Most of the systems adopted a flat or less graduated fare structure during the study period. The number of zones was reduced in four systems, in Portland from 13 to one, in San Diego from seven to one, in Minneapolis from eight to three and in Salt Lake City from three to one. Only two of the systems, Eugene and Vancouver, increased the number of zones, while Madison retained a flat fare.

This trend has serious implications for revenue generation and may also have equity implications. The action is the result of political acceptance of operating assistance from the entire transit district, even though this heavily subsidizes long distance trips relative to short distance trips.

Fare Reduction as a Temporary Promotional Device

Only two systems, San Diego and Eugene, increased their base fares during the 1971-75 period, but neither to a level that was higher than fares in 1970. In July 1975 the base fare was raised from 25 to 35 cents in San Diego; it is remarkable that aggregate ridership has continued to increase since the fare increase. Although the San Diego system did not reduce fares with a deliberate plan of a subsequent fare increase, their experience suggests that fare reduction has potential as a temporary promotional device.

Table 5

Fare Level and Structure

	1970	1971	1972	1973	1974	1975
San Diego-Adult Base	.40	-	.25	-	-	.35
Increment (#Zones)	.10(7)	-	0(1)	-	-	-
Monthly Pass	\$16-36	-	\$10	-	-	\$6-14
Student (<18 yrs.)	.25	-	-	-	-	-
Senior (peak/Off- Peak)	.40/.25	-	.25	-	-	.15
Salt Lake City-Adult Base	.30	-	-	-	.25	.15
Increment (#Zones)	.10(3)	-	-	-	-	0(1)
Monthly Pass	\$12	-	-	-	\$10	\$6
Student	.20	-	-	-	.15	.10
Senior	.20	-	-	-	.15	.10
Portland-Adult Base	.35	-	-	-	-	-
Increment (#Zone)	.05-10(13)	-	-	-(8)	-	0(1)
Monthly Pass	-	-	-	-	-	\$13
Student	.25	-	-	-	-	-
Senior (P/O-P)	.35/.25	-	.25/.25	.25/.10	-	-
Minneapolis-Adult Base	.30	-	-	-	-	-
Increment (#Zones)	5-10(8)	-	-	-	.10(8)	.10(3)
Monthly Pass	-	-	-	-	-	-
Student	.20	-	-	-	-	.20/.10
Senior (P/O-P)	.30/.30	-	.30/0	-	-	-
Eugene-Adult Base	.30	-	.25	-	-	.30
Increment (#Zones)	NA	-	-	-	-	.10(8)
Monthly Pass	NA	-	-	-	-	\$12
Student	.30	-	.25	-	-	.20
Senior (P/O-P)	.30	.20	0	0	.10/0	-
Madison-Adult Base	.25	-	-	-	-	-
Increment (#Zones)	5(2)	-	-	-	-	-
Monthly Pass	NA	-	-	-	-	20 ride adult convenience pa
Student	.15	-	-	-	-	-
Senior	.25	-	-	.15	-	-
Vancouver-Adult Base	.25	-	-	-	-	-
Increment (#Zones)	.15(5)	-	-	-	-	.15(12)
Monthly Pass	NA	-	-	-	-	-
Student	.15	-	-	-	-	-
Senior	.15	-	-	-	-	-

3. The Energy Crisis

The energy crisis was credited as having an immediate positive effect on transit use, especially in Portland and Eugene where the fuel shortage was severe. Many people who used transit for the first time apparently continued to use it after the 4-month crisis. This is noteworthy, since service quality decreased during the energy crisis because of overcrowding. In Eugene, continued use of transit was attributed to the concern of riders for air quality, energy conservation and the environment in general. Although most of the areas had begun service expansion and improvement before the fuel shortage occurred, the shortage nevertheless is credited with increasing public willingness to support expansion and public financing of transit.

C. Techniques That are Applicable to Other Systems

Since the impacts of the actions described in this section are generally indirect, their role in stimulating ridership is usually not measurable. Nevertheless, they are important, not only because they were used successfully, but also because they can be used in other cities.

1. Transportation System Management (TSM)

The use of TSM devices and policies to give priority to transit or restrain auto use varied among the cities. They were used extensively in the Twin Cities and Madison, moderately in Vancouver and Portland, and to a lesser extent in Eugene and San Diego.

The extensive use of TSM techniques and policies in Madison is worth special attention for it suggests that there are considerable opportunities for the expansion of TSM techniques in small as well as large cities. Beginning in 1955 the city traffic engineer began assist the private transit operator by supplying bus stops, prohibiting left turns, removing parking at bus stops and constructing 30 foot corner radii. In 1964, stop signing began to be based on the flow of people instead of vehicles. Implementation of these techniques was accelerated in the early 1970's. In 1970, for instance, the city restricted auto flow through a residential renewal area near the central business district (CBD) to eliminate through traffic. In 1975, signals were progressed around the Capitol building to reduce auto flow in the inner loop used by transit and speed auto flow around the outer loop. This resulted in a 25 to 30 percent reduction in in autos around the inner loop.

Madison also has a parking policy which replaces on-street with off-street parking with rates set to encourage short-term shoppers and discourage long-term commuters. In 1973, Madison persuaded the State government, located in the CBD, to begin charging for employee parking. Another TSM technique used successfully in Madison to manage commuter flow and increase transit efficiency was staggered work hours. State and local government agencies were concentrated in the CBD with working hours from 8:00 to 4:30. In 1971 a staggered work hour program was established with work endings divided into 15 minute increments between 3:45 and 5:15. Dismissal times are determined on an individual rather than agency basis so an agency might have its personnel arrive over a 1½ hour period. People interviewed believed there is widespread satisfaction with this arrangement.

2. Route Structure

The route structure of four of the systems was less CBD-oriented than most U.S. systems in order to deal with diffuse origins and destinations as well as local trips. Three of these systems have introduced the timed convergence and departure of vehicles at designated focal points. These systems tended to have lower peak-to-base ratios than the ones which were more CBD-oriented.

3. Operational Planning and Evaluation

Most of the cities had a good operational planning program with extensive data collection, systems analysis, and market-area analysis. In San Diego SDTC was especially thorough in using planning analysis techniques for routing, scheduling and evaluation of bus operations.

UMTA's RUCUS computer program package is used for scheduling; it is paying off in efficiencies in use of both operators and the bus fleet. This is one of a handful of properties in which RUCUS is already operational.

4. Marketing

While approaches to marketing varied among the systems, they all had strong advertising programs. In most of the cities, information about using the system is readily available.

5. Organization

While there was no standard organizational structure for transit planning, policy making, marketing and management among the cities, most of the arrangements are examples of effective operation under varying circumstances. They ranged from the concentration of these functions in Portland and San Diego to wide separation in Vancouver and Salt Lake City.

The concept of a city department of transportation also deserves comment. In Madison, the City Department of Transportation sets policy and proposes service changes which Madison Metro, the transit management firm, implements. Madison Metro appears to be primarily concerned with efficient operation while the city transit planner is primarily concerned with improved service.

Madison's DOT is also in charge of parking, traffic operations, traffic engineering, bicycle and taxi regulations. This organizational arrangement resulted in a unified transportation policy and program which city officials believe to be effective.

This study did not find that one organizational arrangement was best. It does conclude however, that a prime ingredient in the success of both transit operations and transportation system management was the cooperation and mutual support of planning agencies, transit management, departments of transportation, traffic engineering departments and others. This occurred even though political and organizational arrangements varied among the cities.

Questions

1. What factors would you consider most important in increasing demand? Why?
2. Do you note any similarities among the seven cities that could be related to increased demand?
3. Do you think that an elasticity of demand greater than 0.7 is good? What would you recommend for a favorable elasticity?

Session XIV

Estimating Demand For
Public Transportation

"Estimating Ridership on
Small Systems"

Source: Passenger Transport, January 2, 1976. Article by Carl T.
Buttke, Consulting Engineer, Portland, Oregon.

Hillsboro



By
Carl H. Buttke
Consulting Engineer
Portland, Ore.

Today, even with highly advanced technological and sophisticated tools for problem solving in most businesses, no reliable technique exists for estimating the effect of installing or improving a bus system in a small city. I feel that a technique must be developed for both the transportation engineer and the transit system operations personnel to estimate how many trips can be expected to be attracted to a new bus line or line extension, a line with increased frequency of operation or the effect of relocating an existing line. Other important considerations are that this technique must be simple to comprehend, sensitive to system characteristics, and can be performed in a short period of time—hours, not days or weeks. The results also must be simple for decision makers and persons other than transportation specialists to comprehend.

Past techniques have generally utilized systemwide factors such as passenger trips per mile of bus operation, annual trips per capita or combinations of annual bus miles per capita resulting in annual rides per capita. The results of increasing the frequency of operation were calculated by the increase in bus miles. However, one was unable to estimate the effect of changing the location of a line or the effects of large, one-way loop operations, which are so common in small city systems. Those techniques approximated average results for the entire operation, but could not be used to determine the effects of change by bus line, or an analysis of alternatives.

The following is a suggested technique developed about three years ago to estimate ridership on alternative bus operations so that a community could decide upon an appropriate course of action in developing or improving a bus system. (From *Boise Metropolitan Area Public Transportation Plan, Phase I, Analysis of Alternatives*, De Leuw, Cather & Co. Jan. 12, 1973).

General Characteristics of Small City Bus Systems

An understanding of the general characteristics of small city bus systems is essential in estimating the ridership on such a system.

Generally, we are talking about bus systems in cities with less than 100,000 people. The size system ranges from two or three buses to 30 or 40 buses. Service is generally provided between 6 a.m. and 7 p.m. Monday through Saturday. Evening service might be provided on shopping nights. Normally, service is offered on an hourly, half-hourly and sometimes on a 15- or 20-minute basis. Most systems provide 20 or 30 minute service during peak periods and then reduced service during the midday.

As indicated in Table I, between 35 and 50% of the transit trips are made for work purposes, and nearly 75% or more of

estimating ridership on small systems

the riders are female. Generally, about 45% of the ridership is made by retired people, housewives or students. (From *Plans for Improved Bus Operation, Boise Metropolitan Area*, De Leuw, Cather & Co., December 1966; *Salem General Neighborhood*

Table I
TRANSIT USER CHARACTERISTICS

	Boise City, Idaho	Eugene/ Springfield, Oregon	Salem, Oregon
Trip Purpose			
Work	50%	34%	41%
Shopping	19	23	33
School	13	16	8
Personal Business	10	18	12
Social-			
Recreational	4	6	3
Other	4	3	3
TOTAL	100%	100%	100%
Sex of Rider			
Female	79%	73%	84%
Male	21	27	16

Renewal Plan, Research and Analyses Technical Memoranda, De Leuw, Cather & Co.; Lane Transit District Transit Surveys, 1972.)

In most cases, 80 to 85% of the transit users either do not own an automobile or do not have one available for their use and are therefore dependent on the bus system or another driver for their mobility. Table II indicates the reasons for using transit in three Northwest U.S. small cities.

Table II
REASON FOR USING TRANSIT

	Boise City, Idaho	Eugene/ Springfield, Oregon	Salem, Oregon
No Driver's License	29.0%	39.4%	47.6%
No Automobile Available	51.0	42.1	38.7
Other	20.0	18.5	13.7
TOTAL	100.0%	100.0%	100.0%

On well-operated systems where coordination is maintained between buses to facilitate transfers, one can generally expect approximately 20% of the riders to transfer to other lines.

Transit trips in these small cities usually account for less than one percent of the total city-wide trips. Therefore, these

systems, by virtue of their size, and the level of traffic volume and congestion in the small cities, provide transportation for those who cannot drive because of age, lack of a driver's license or because they cannot afford to own and operate an automobile. These systems usually are planned and operated to serve the nondriver as a community public service and generally are not designed to combat traffic congestion or parking problems.

Service into Previously Unserved Areas

Public acceptance of new bus service into residential areas without previous service or into developing residential areas has been varied as proven in numerous demonstration projects.

In estimating the ridership of a new line or an extension of an existing line, it is best to know the number of people, automobiles owned, number of employed people and the income per household within walking distance of the proposed bus line. This information is generally known by census tract at 10-year intervals, at times of special census counts, or at the time a comprehensive transportation study was made. However, using this detailed information also produces varied results, is very time consuming for the results produced and usually cannot be done by most transit system personnel. Consequently, a simple method was developed utilizing a transit trip rate so one could easily and quickly estimate the expected annual ridership on an entire system, a new line or line extension.

Research in the suburban areas of Portland, Ore.; Salem, Ore;

and Boise City, Idaho indicates with a high degree of reliability that a bus system providing service at one-hour intervals between buses would carry an average of 32 annual rides per dwelling unit located within ¼-mile walking distance of the lines.

Table III indicates the measured annual trips per dwelling unit located within ¼-mile walk of a bus line. Examination of the results by line indicates some variation in the measured trip rate. However, an analysis of each line was made to determine the causes of a significantly higher or lower trip rate.

It was found that for individual lines, the average transit trip rate was affected by large one-way loops, the ability of passengers to transfer conveniently and the capability of delivering passengers to their jobs on time.

Circuitry Factor

A factor multiplied to the average transit trip rate was developed to estimate the effect of one-way large loops. It was determined for lines with large one-way loops where over 50% of the area is serviced by one-way loop service, the annual transit trip rate could be as low as two-thirds of the average. On the other hand, it appears that a line which is entirely two-way providing direct service on an arterial street could attract up to a 50% higher ridership than the average.

Therefore, if a line contains a large one-way loop where over 50% of the residents are served by the loop, then a factor of 0.66 should be multiplied to the average transit trip rate. If no loop exists, and service is two-way on an arterial street, then a factor of 1.50 would be appropriate. A factor of 1.0 seems appropriate where approximately 30% of the residents served are located on a one-way loop.

Transfer Factor

Since one could expect approximately 20% of the bus riders on a well serviced system to transfer between lines, the factor to be applied to the average trip rate would vary between 0.80 and 1.0. If the system operates such that transfers are impossible, one could anticipate a drop in trips by 20%. If transfer conditions are good, but not coordinated between all lines, a drop by 10% might occur. A factor of 0.90 would be used in this case. If all lines are scheduled so that transfers are convenient with little waiting between buses, no decrease would be expected, for a factor of 1.0.

Peak Period Factor

The average transit trip rate could be reduced by the lack of the capability to deliver workers to their jobs at a reasonable time. Since work trips on this size bus system vary between 35 and 50% of the total transit trips, this factoring could be quite significant. At this time, little is known concerning this factoring process. However, the following logic is offered as a beginning to explain the variance in the transit trip rate and how to calculate it.

If the work trip cannot be accommodated on a bus line, then one could expect a drop in ridership by approximately 42% (average between 35 and 50%). Therefore, a factor of 0.58 would be used. In reality, this condition would not be realized unless it is a line designed specifically for certain riders. On the other hand, if 15-minute service were provided on the line, then one could expect that work trips could be conveniently served and no reduction in the average trip rate would be warranted.

For 60-minute service, only a portion of work trips are conveniently served because of the low probability of delivering a person to work at a reasonable time. Therefore, a judgment

Table III
MEASURED ANNUAL BUS TRIPS PER DWELLING UNIT

Bus Line	Annual Trips	Dwelling Units Within ¼ Mile Walking Distance of Line	Annual Trips Per Dwelling Unit
Portland, Oregon			
Suburbs			
Cedar Mill Line	71,630	3,193	22.4
Glencullen-Beaverton	149,480	4,721	31.7
Glisan St.-Gresham	134,680	4,272	31.5
Lake Grove	92,350	2,369	38.9
Oregon City-Oatfield Road	157,420	4,935	31.9
Somerset West	52,000	1,383	37.6
Boise City, Idaho			
N. 8th St.-Depot Vista	98,770	3,490	28.3
South Boise-Collister	104,370	2,690	38.8
Salem, Oregon			
No. 4	34,110	1,464	23.3
No. 5	60,720	1,265	48.0
No. 7	53,960	1,635	33.0
No. 10	84,510	2,855	29.6
Nos. 11 & 12	71,300	2,300	31.0
TOTAL	1,165,293	36,572	31.9

was made to assume a factor for 60-minute service. It was judged that a 25% reduction (0.75) from the average was appropriate for 60-minute and a 10% reduction (0.90) for 30-minute service.

It is reasoned that even though this type of system serves primarily those who cannot drive, or captive riders, if the service for a worker is poor, that person will seek a ride with another driver. As indicated previously, more research in this area is necessary to more accurately define this relationship.

Effect of Increasing Service Frequency

Study results on the effect of service increase have had varied impact on ridership. (From *Mass Transportation Demonstration Project*, Commonwealth of Massachusetts; Grand River Avenue Transit Survey, Detroit, Mich.; Alameda-Contra Costa Transit District.)

Overall, one can generally expect a 10 to 25% increase in ridership for every 100% increase in service up to, say, five-minute to seven-minute intervals between buses. This is illustrated graphically in Figure 1. (From *Immediate Improvements in Public Transportation, Portland-Vancouver Metropolitan Area*, De Leuw, Cather & Co., June 1973.)

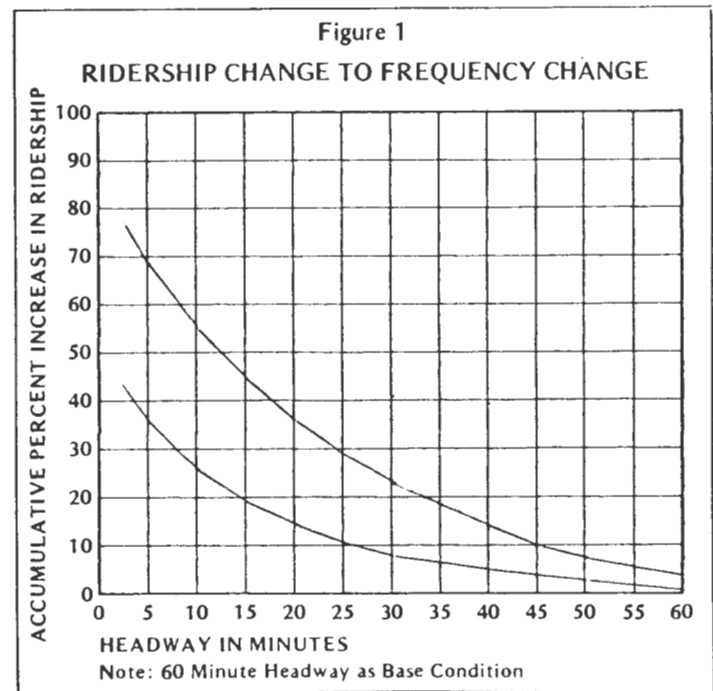
An example best illustrates the use of the curves. Assume the base period headway on a line will be decreased from 30 minutes to 20 minutes. Reading the low curve and then the high curve indicates the following:

Headway	Low Curve Percent	High Curve Percent
30-minute	9	25
20-minute	15	37
DIFFERENCE	6	12

Therefore, one could expect, at the very least, a six-percent increase in ridership and, at the very most, a 12% increase in ridership. The low curve is used for a line with low potential; that is, one with low density, single unit, detached housing with families having high auto ownership. Conversely, the high curve is used for a line having high potential; that is, one passing through neighborhoods of high density, multi-family dwellings and low auto ownership. An average of the two curves is used for a line having average potential. Judgment and knowledge of the area and line are required in determining which curve to use, or the location between both curves. Additional data from the results of service increases throughout the U.S. should be added to these to verify or modify the shape of these curves.

The average transit trip rate of 32 annual trips per dwelling unit within ¼-mile walking distance of the bus line can then be factored for frequencies of operation less than 60 minutes between buses by use of the curves in Figure 1.

For 30-minute service on a line, the average transit trip rate would be increased by a factor of 1.10 to 1.25 depending on the characteristics of the neighborhood through which the line is to pass.



Time to Achieve Results

Research on other systems in the United States indicates that one could expect 70 to 80% of the maximum monthly passenger volume during the first 90 to 120 days of new operation. (From *Chesapeake Va. Mass Transportation Demonstration Project*; *Redwood City (Calif.) Municipal Transit System*; *Mass Transportation Demonstration Project*, Commonwealth of Massachusetts; *St. Louis Metropolitan Area Mass Transportation Demonstration Project*, and *Memphis (Tenn.) Transit Authority Mass Transportation Studies*.)

After six to 18 months, the passenger volumes level off near the maximum attainable ridership for a given level of service. Consequently, on any new service, one could estimate with a fair degree of reliability the maximum ridership at the given level of service after three to four months of operation.

Calculation Form

A form for estimating the ridership according to the relationships previously described is shown on Figure 2. Also shown on this form is the calculation for a line having 30-minute bus service serving 3000 dwelling units, providing a coordination with half the other lines and a 20-minute wait for the half, and a small, one-way loop at the end of the line serving approximately 20% of the residents within one-quarter mile walking distance of the line. The result of this calculation indicates for these conditions an average transit trip rate of 36.4 trips per dwelling unit located within one-quarter mile walking distance of this line.

Conclusion

By use of this technique, the appropriate curves on Figure 1 and the form on Figure 2, one can very quickly estimate the ridership on a line with a reasonable degree of accuracy. One is

Figure 2 CALCULATION FORM AND SAMPLE ESTIMATE							
Line	1 D.U.'s Within ¼ Mile Walk	2 Bus Headway	3 Headway Factor	4 Circuitry Factor	5 Transfer Factor	6 Peak Period Factor	7 Annual Trips = 32 · col's 1·3·4·5·6
1	3000	30 min.	1.20	1.17	0.90	0.90	109,170

not required to utilize sophisticated mathematical models which only are understood by the user and only vaguely described to the decision maker. However, one is required to know the characteristics of small city bus systems, the number and characteristics of dwelling units to be served and to use judgment.

This technique can then be used by the transportation planner in developing or improving a transit system and then left with the local transit agency operating people for their continual monitoring and improving the system. Since the data presented here have come from only a few small city transit systems in the Pacific Northwest and some of the characteristics from a limited number of demonstration projects in the United States, it is hoped that others with similar data will add to this data to further strengthen the technique and logic behind it, or modify it where necessary.

Also, because of the variation in trip making, I believe a range of at least plus or minus 10% of the final result be stated when estimating the effect of a change in service. In this manner, it becomes apparent to others that these estimates are not precise but are a realistic range based on the characteristics of the area being served by public transportation.

Questions - XIV

1. Do you think that the proposed procedure is a valid estimating technique? Why?
2. Are there other factors that should be included in the procedure? What are they?
3. What is the effect of being off in an estimate by 50%?
4. Would this procedure be applicable in a larger city?

SESSION XV: EVALUATION OF PUBLIC
TRANSPORTATION ALTERNATIVES

Objectives of Session XV

- . Describe methods of evaluating public transportation alternatives
- . Describe the factors and criteria that need to be included in the evaluation
- . Indicate the importance of non-monetary factors in the evaluation process

Synopsis of Session XV

Sessions XV and XVI discuss the evaluation and decision making process in public transportation. Both the methodology and criteria used to evaluate alternatives are presented. The difficulty of quantifying non-monetary factors are emphasized as is the fact that there is no standard evaluation technique. The cost effectiveness approach is presented as an accepted procedure.

Outline for Session XV

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Goals, Objectives, Criteria, and Standards
3	Evaluation Method
4	Summary

SESSION XV
EVALUATION OF PUBLIC TRANSPORTATION ALTERNATIVES

1. Introduction

In the past, evaluation of public transportation projects were mainly highway-related and fell under various public works, civil engineering-oriented agencies. Evidence of this exists today in the makeup of public agency organizations of many smaller municipalities. With the advent of "3C" procedures for urban transportation planning, the transportation discipline began to focus on coordinated planning and multi-disciplinary concerns. Since then, bitter lessons have taught not only the engineer, but the local official and federal government that environmental impacts, social and neighborhood disruptions, and economic impacts of transportation projects are meaningful and necessary considerations in evaluation. In short, the engineer can no longer develop and in effect, decide which alternative is to be adopted. His role has evolved to a consulting role in which he still develops alternatives but goes farther in examining and clarifying the issues, involved with each alternative for the real decision-makers. Now, the burden of decision is on the citizens and their elected officials of a community.

It is important to realize that an evaluation process, while systematic, is not entirely technical in nature and therefore has many variations. One of the major reasons is the fact that all urban areas (and their component parts) which exhibit similar transportation problems and have similar goals do not have exactly the same conditions of political institutions, land use, required system size, etc. There is no standard evaluation process. As Deen and Skinner (1) state, evaluation is "a process of adapting existing work to suit the particular needs of the study in question."

There is an increased emphasis to consider all transport modes in providing transportation systems as evidenced by recent U.S. DOT policy on LRT systems. More importantly, federal regulations (2) on major urban mass transportation investments (also called the "Alternatives Analysis Requirement") specify that:

"... any metropolitan area which intends to apply for Federal assistance for a major mass transportation investment must undertake an analysis of transportation alternatives with regard to any corridors in which fixed guideway facilities have been proposed for implementation. The analysis should consider a range of alternatives, including improvements involving better management and operation of the existing street and highway network e.g., through provision of reserved lanes for buses and other high occupancy vehicles.

This analysis should assess each alternative's capital and operating costs; ridership attraction; capital and operating efficiency and productivity; effects on modal choice, level of automobile use, environmental impacts and energy consumption; impact on land use and development patterns; extent of neighbor-

hood disruption and displacement; job creation impact; and such other factors as are considered important by the local community.

The analysis should also compare the relative costs and effectiveness of each alternative, where effectiveness is measured by the degree to which the alternative meets the locality's transportation needs, promotes its social, economic, environmental and urban development goals, and supports national aims and objectives.

As part of the analysis of alternatives, a draft Environmental Impact Statement shall be prepared jointly by UMTA and the applicant in accordance with published guidelines."

Equally important considerations for fixed guideway systems are:

- . Consistency with an area's long-range plan and goals.
- . Required incremental or staged development.
- . Required TSM actions to enhance the system.
- . Necessary public involvement in the alternatives analysis' process.

These regulations clearly reflect the inadequacy of evaluating alternatives by cost analyses alone.

Many of the actions required by federal regulations for major investments can be applicable to evaluation of other lower cost systems. However, the success (economic, social, goal attainment, etc.) of a system becomes much more critical with high initial and operating investments/commitments. Washington Metrorail (RRT) capital costs, for example, may be as high as \$5 billion for a 98 mile system. Even with Federal support, the cost to local governments is quite substantial in relation to their operating budgets. And the demand for federal monies is increasing.

This session is a general overview of developing alternatives for public transportation systems. Session XVI describes the decisionmaking process involved in selecting a particular system. While these topics are discussed separately, they are not in reality, mutually exclusive processes.

2. Goals, Objectives, Criteria, and Standards

These are essential elements in alternatives evaluation and urban transportation planning. Their definitions and interrelationships are described below.

a. Goals

Goals are idealized ends or aims toward which individuals, urban areas, businesses, etc. strive. Goals are value-based statements, e.g. "to enable persons and goods to move safely, efficiently, and economically, making them vague and general. This in turn, makes it difficult to measure how well they are being achieved. Goals for urbanized areas are a product of long-range planning efforts.

b. Objectives

Objectives are derived from goals. They are more specific statements of desired results of projects or services intended to reach a goal. These statements also suggest criteria (measures and tests) which can be used to determine the extent of attaining an objective. For example, an objective which intends to meet the goal ensuring social and physical welfare of citizens is to provide elderly and handicapped persons with access to a community's medical and social services. Objectives should be attainable by representing some measurable achievement. This is not always the case unfortunately. Many objectives are subjective in nature, particularly those dealing with community values and aesthetics.

c. Criteria

Criteria are the rules, measures, and tests which indicate how well objectives are attained. They indicate how well each alternative can meet particular objectives. Criteria for measuring subjective objectives are difficult to define, and must be estimated by basically qualitative criteria. An example of a criterion is "the number or percentage of elderly and handicapped served by a transit system."

d. Standards

A standard is a certain value of a criterion which sets a level of acceptability. For example, in the criterion "at least 85% of the elderly and handicapped must have access to social services," the value of 85% sets a standard.

The purpose of these elements in evaluation is to better understand how various alternatives relate to an urban community's goals by analyzing more understandable elements such as criteria. However, while these elements might be quantified, the effort to do so can be quite complex.

3. Evaluation Method

As stated previously, there is no standard method for evaluating alternatives. There are, however, basic stages of evaluation as given in Table XV-1.

The emphasis of this discussion is on criteria, identified in Stages 1 through 4 rather than detailed analysis techniques.

Table XV-1. Evaluation Stages

<u>Stage</u>	<u>Alternatives</u>	<u>Activities</u>	<u>Participants</u>
1	> 100	Opportunity search	Individual planner
2	25-100	Mapping, sketch planning	Technical staff
3	10-25	Initial public involvement Refined sketch planning	Technical staff Officials Citizens
4	3-10	Detailed evaluation Public involvement	Technical staff Officials Citizens
5	1	Policy determination	Officials Citizens

Source: Ref. 1

a. Identification of Alternatives

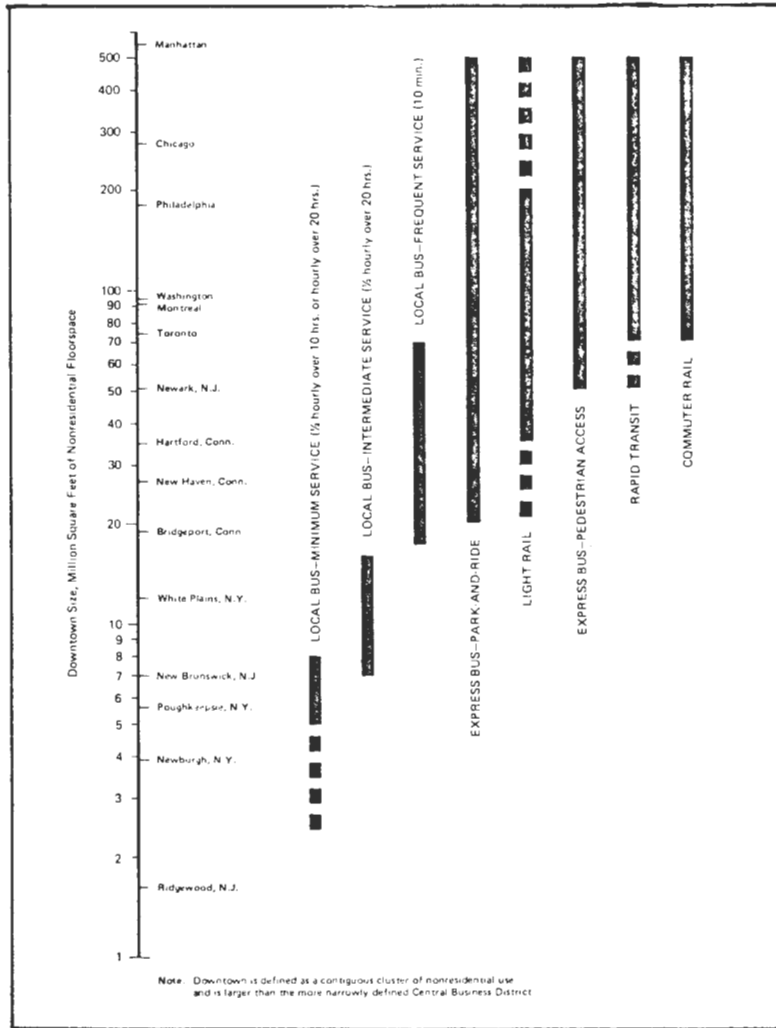
Alternatives should meet objectives which reflect goals of an urban area. In any evaluation, information on existing conditions of the urban area must be available. These conditions include:

- . Population characteristics
- . Land use characteristics
- . Existing transportation facilities and services
- . Travel characteristics
- . Institutional factors
- . Resource availability

Identifying alternatives at this stage is keyed primarily on the type of area and service needs. For example, the system may be intended to serve only one major corridor or several, or a whole region consisting of a CBD, several major corridors, and their surrounding areas. A service objective may be to provide primarily express line-haul transit service in a corridor. For a small urban area, one objective might be to provide a low cost limited route transit system. The service needs and requirements of each area type suggest different systems.

For major urban areas, the number of conceivable alternatives is very large. This is due to the availability of various modal technologies (LRT, RRT, conventional bus, preferential bus facilities, paratransit, etc.), the range in possible investments, TSM strategies, and market characteristics. For smaller areas, the number of feasible alternatives is often more limited. Figure XV-1 shows the suitability of various modal systems related to downtown size of a city.

As indicated in the Figure, there is considerable overlap in suitable modes for large urban areas. While paratransit is not shown, many of its basic types can and do serve all urban areas. It is quite important to realize that the purpose of an evaluation of alternatives is not to determine whether a mode will work, but which mode or combination of modes, treatments, institutional arrangements (brokerage concept), etc. will work best.



Source: Ref. 5

Figure XV-1. Suitability of Transit Modes

During Stage 1, the planner sketches alternative systems on a base map showing major physical, social, economic, land use, etc. factors. As Deen and Skinner (1) state:

"In preparing the sketches the planner must simultaneously be accepting some and rejecting countless others based on his knowledge of cost, performance, demand and other factors which are important. Clearly, he will look for opportunities to use surface right of ways instead of tunneling, other things being equal; he will try to serve, for example, high activity centers versus low density areas. He will sketch alternatives that are within the operating limits (e.g. grades, curvature and general capacity limits and so forth) of the various technologies."

The null or do-nothing alternative would usually be included.

b. Narrowing Process (Stages 2 through 4)

As the evaluation process moves forward, alternatives are eliminated or modified, with little detailed analysis at first. Public involvement increases as the number of alternatives grows smaller.

It is at these stages wherein criteria to compare and evaluate alternatives grows progressively more detailed. There are two important aspects of criteria in evaluation: their nature and number. In combination, these aspects can make the results of the analysis of numerous alternatives very difficult to judge by citizens and public officials.

Major categories of criteria are:

- . Transportation service and usage
- . Economic impacts
- . Community and social impacts
- . Environmental and aesthetic impacts
- . Institutional impacts

Table XV-2. Alternatives Criteria

OPERATIONAL IMPACTS				
NETWORK	FACILITY	SERVICE BY MODE		
NETWORK INTEGRATION SYSTEM OPERATION EFFECT ON ARTERIAL AND LOCAL STREET SYSTEMS SAFETY	SHORT RUN OPERATING CONDITIONS LONG RUN OPERATING CONDITIONS RELATION TO FUTURE TECHNOLOGY PLANS AND DEVELOPMENT SAFETY MODAL COORDINATION	ACCESSIBILITY PUBLIC SERVICES JOBS RECREATION COMMERCIAL INDUSTRY CHURCHES MEDICAL SHOPPING CULTURAL FRIENDS RELATIVES SOCIAL SERVICES	USER TOTAL TRIP SPEED TRAVEL TIME TRIP LENGTH ACCIDENT RECORD OPERATING COST TRIP RELIABILITY COMFORT, CONVENIENCE, & OTHER QUALITATIVE FACTORS LEVEL OF SERVICE USAGE PARKING	GOODS GOODS DISTRIBUTION FREIGHT COSTS DELIVERY SERVICES TERMINAL LOCATION AND OPERATION
ACTIVITY DISTRIBUTION IMPACTS				
LAND USE	DEVELOPMENT TYPE		DEVELOPMENT OPPORTUNITIES	
PARKLAND OPEN SPACE RESIDENTIAL COMMERCIAL INDUSTRIAL INSTITUTIONAL	POPULATION EMPLOYMENT INDUSTRY PRODUCTION MARKETS		JOINT DEVELOPMENT SHORT TERM LONG TERM REZONING CAPITAL PROGRAM	
MONETARY IMPACTS				
AGENCY COSTS	USER COSTS	NEIGHBORHOOD COSTS	COMMUNITY COSTS	DISPLACEE COSTS
RIGHT-OF-WAY CONSTRUCTION AUXILIARY FACILITIES REPLACEMENT HOUSING REPLACEMENT OF FACILITIES MAINTENANCE REVENUE SOURCES RELOCATION SERVICES COST OF CAPITAL	OPERATING MAINTENANCE PARKING INSURANCE ACCIDENT TIME FARES	PROPERTY VALUES RENTS ASSESSMENTS TAXES POLLUTION BLIGHT ACCESSIBILITY	INCOME PRODUCTION VALUE JOBS ASSESSMENT, TAXES PROVISION OF SERVICES REGIONAL ECONOMY	REPLACEMENT COSTS MORTGAGES AND INVESTMENTS RENTS TITLE FEES MOVING EXPENSES CLIENTELE LOSS OR GAIN
SOCIAL IMPACTS				
COMMUNITY BOUNDARIES	COMMUNITY CHARACTER	COMMUNITY FUNCTION	COMMUNITY ECONOMY	COMMUNITY ACCESSIBILITY
RELIGIOUS SCHOOL POLITICAL WARD ETHNIC DISTRICT NEIGHBORHOOD	COHESION AND STABILITY STRUCTURE IDENTITY GOALS ATTITUDES POPULATION COMPOSITION	SAFETY HOUSING QUALITY PUBLIC SERVICES EMPLOYMENT LEVELS INDUSTRIAL AND FARMING PROCESSES PEDESTRIAN CIRCULATION	HOUSING SUPPLY EMPLOYMENT LAND VALUES ZONING	CHURCH SCHOOL ENTERTAINMENT FRIENDS RELATIVES SHOPPING RECREATION PARKS JOBS COMMUNITY SERVICES

ENVIRONMENTAL IMPACTS			
EFFECTS OF TRAFFIC		EFFECTS OF ROADWAY STRUCTURE	
AIR POLLUTION REAL ESTATE VALUES MATERIAL DETERIORATION POWER DEMANDS MENTAL DEPRESSION BALANCE OF NATURE DUST	NOISE PSYCHOLOGICAL EFFECTS ABILITY TO CONCENTRATE SLEEP NUISANCE	WATER DRAINAGE DIVERSION EROSION ACCESS TO LIGHT	NATURAL RESOURCES ANIMAL LIFE ANIMAL MIGRATORY PATHS PLANT LIFE CULTIVATED AREAS UNCULTIVATED AREAS ACCESS TO LIGHT GLARE SOILS ENERGY CONSUMPTION
ESTHETIC IMPACTS			
VIEW OF THE FACILITY	VIEW FROM THE FACILITY	NATURAL BEAUTY	
LIGHTING DARK AREAS COLD LIGHT MONOTONY LOCATION OBSTRUCTION OF SUNLIGHT CHANGE OF AIR CURRENTS VISUAL BARRIER ARCHITECTURAL QUALITY IMAGE - ABILITY DIMENSIONAL BALANCE BEAUTY ORIENTATION PSYCHOLOGICAL BARRIER	LOCATION PERCEPTION SEQUENCE DESIGN RHYTHM SIGNING	OPEN SPACES GREENERY PARK SYSTEM BOULEVARDS OR GARDENS LAKES WILDLIFE HABITATS	
INSTITUTIONAL IMPACTS			
ADMINISTRATIVE		COMMUNITY	
GOVERNMENTAL	PRIVATE	HISTORICAL SITES	CULTURAL SITES
BUDGETS REVENUES COMMITMENTS PRIORITIES LAWS ORDINANCES BY LAWS GOALS AND PROGRAMS (NATIONAL DEFENSE, CONSERVATION, RECREATION, ETC.) REGIONAL ACCESS	EDUCATIONAL RELIGIOUS MILITARY CORPORATE INDUSTRIAL		

Source: Ref. 4

Even more difficult is the comparison of alternatives, particularly in identifying a technique to compare alternatives based on qualitative criteria. Input from the public is also required. Previously, the indicator of the worth of an alternative was the benefit/cost ratio. Benefit/cost analysis placed various criteria on a common dollar basis. Then, the alternative with the highest ratio was recommended or approved.

Benefit/cost information is still used as one input in the evaluation process. Table XV-3 is a summary of the Alternative Systems Comparisons recently conducted by the Denver Regional Transit District (4). The evaluation reviewed five systems in addition to the baseline bus system. The light rail alternative, although having a lower benefit/cost ratio than other fixed rail guideway systems was selected by Denver but was rejected by UMTA (See Session XVI). In addition to cost, the table indicates some of the other factors that Denver considered important in the evaluation. These factors largely included the percentage of population, transit dependents and employment within a 40 minute transit travel time of various activities.

Table XV-3. Alternative System Comparisons

	Base-line	Advanced Bus	Light Rail	CRT	ART	DRT
Miles of Exclusive Right of Way	0	70	70	46	80	93
Fleet Size						
Rapid transit vehicles	0	745	230	105	400	816
Background bus	800	801	649	794	571	651
Cost (\$ millions, yr. 2000)						
Total capital	10.3	1,125	1,315	1,027	1,418	1,769
Annual operating	34.3	79.6	54.5	48.2	57.0	63.4
Patronage - yr. 2000 (daily; thousands)						
Line haul	0	157	209	146	281	284
Total	227	425	444	424	496	496
Capital Cost Per Mile (\$ millions)	0	16.0	20.4	22.4	18.6	19.0
System Operating Cost Per Trip	.49	.60	.39	.36	.50	.41
Operating Cost Per Line-Haul Trip	0	.91	.42	.35	.33	.41
Percent of Population Within 40 minutes of transit travel time of activity centers						
Central Urban Centers	70	35	35	30	40	40
Suburban Centers	5	20	20	25	30	30
Percent of Transit Dependents Within 40 minutes transit travel time of central urban activity centers						
Low Income Households	25	50	50	45	55	55
Elderly Population	10	70	70	65	75	75
0-Car Households	60	75	60	75	85	85
Percent of Employment Within 40 minutes transit travel time of residential neighborhoods						
Central Urban Neighborhoods	10	50	50	55	60	60
Suburban Neighborhoods	5	15	20	30	25	25
BENEFIT/COST	-	1.03	1.15	1.37	1.40	1.16

CRT-Conventional Rapid Transit; ART-Automated Rapid Transit; DRT-Demand Responsive Transit

Source: Ref. 4

Placing dollar values on environmental or community impacts is extremely difficult at best. Ranking schemes in which criteria are assigned some relative weight have been suggested. Each alternative is given a score based on the relative weights of the criteria and a subjective value of their individual impact which is used to rank each alternative. While the technique provides a single indicator representing relative ranks, it involves complex and subjective assessment of each criterion.

A comparison of costs and effectiveness for each alternative is specified in the alternatives analysis requirement (Introduction). A cost-effectiveness approach separates costs from the capabilities each alternative has in attaining the objectives (effectiveness). The decision-maker can then examine the two sets of descriptions of costs and effectiveness and select the most appropriate alternative. In this fashion, cost-effectiveness reflects the role of the engineer as a technician and reinforces the role of the decision-maker.

Cost elements can be relatively simple to identify. One report (3) identifies a cost framework as presented in Table XV-4. However, the task to quantify these elements may be quite difficult, depending mainly on the system complexity.

In order to describe the effectiveness of each alternative, various criteria (other than cost elements) need to be identified and described in some way. In some instances, non-technical or non-system considerations such as community impact may result in significant resistance by concerned groups. Thus, public involvement during these stages is essential in the process to identify relevant objectives and criteria.

The output of a cost-effectiveness analysis is two sets of descriptions for costs and alternatives criteria. It's the responsibility of the decision-maker to evaluate and weigh the tradeoffs among/between alternatives in arriving at a selection. Ideally, the information provided is sufficient to make a decision. In weighing the various alternatives, the nature of the decision-maker's evaluation is much like a ranking technique but in a personal thought context rather than an equation format.

Quite possibly, the decision-maker has considerations other than those identified in the analysis. These will be discussed in the following session, since for the most part, they fall outside of the scope of "rigorous" analysis discussed here.

4. Summary

There is no standard technical method in evaluating public transportation alternatives. Rather, it is a process involving planners, transportation engineers, citizens, public officials, etc., striving to identify the most promising candidates for decisionmakers to examine and select the most appropriate. In an evaluation

existing conditions, objectives and criteria must be identified and quantified to the extent possible. Costs of alternative plans alone no longer suffice. Social and environmental considerations for example must be evaluated by first identifying objectives/criteria through a public participation effort. The state-of-the-art suggests that a cost-effectiveness approach is compatible with most current evaluation/decision making responsibilities. The results of a cost-effectiveness analysis should identify and clarify major issues of the proposed alternatives for the decision maker.

Table XV-4. Cost Elements

INCIDENCE ACTIVITIES COMPONENTS INCREMENTAL BREAKDOWN	ANNUAL COSTS FOR TWO ALTERNATIVES					
	I			II		
	LINE HAUL	FEDLR	TOTAL	LINE HAUL	FEDLR	TOTAL
Centralized costs						
Research and development						
Planning and design						
Construction and purchases						
Right-of-way						
Purchases						
Relocation						
Legal fees						
Construction						
Traveled way						
Special structures						
Terminals and yards						
Purchases						
Rolling stock						
Special equipment						
Financing charges						
Operations						
Transport operations						
Energy costs (fuel, power)						
Materials and equipment						
Durable						
Nondurable						
Wages and benefits						
Overhead						
Safety Services (policing, etc.)						
Materials and equipment						
Durables						
Nondurables						
Wages and benefits						
Overhead						
Accident costs						
Maintenance						
Materials and equipment						
Durables						
Nondurables						
Wages and benefits						
Overhead						
Management and administration						
Monitoring system performance						
Decentralized costs						
User costs						
Operations						
Usage-based						
Depreciation						
Fuel and oil						
Parking						
Tires						
Insurance						
Accidents						
Time costs						
General usage-based maintenance						
Nonuser costs						

Source: Ref. 3

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1. Deen, T. and Skinner, R. Jr., "Responses to Alternatives Analysis Requirements," Transit Journal, Vol. 2, No. 4, November 1976, 53-71.
2. "Major Urban Mass Transportation Investment," Federal Register, Vol. 41, No. 185, September 1976.
3. Thomas, E. and Schofer, J., "Strategies for the Evaluation of Alternative Transportation Plans," NCHRP Report 96, HRB, Washington, D.C., 1970
4. Mass Transit, Vol. 3, No. 8, February 1976.
5. Manheim, M. et. al, "Transportation Decision-Making: A Guide to Social and Environmental Considerations," NCHRP Report 156, TRB, Washington, D.C., 1975.
6. "Increases in Public Transit Use Keyed to Revival of City Centers," Transportation Research News, No. 67, November, December 1976.

Session XV

Evaluation of Public Transportation
Alternatives

"Major Urban Transportation Investments" (1)

(1) Source: "Federal Register," Vol. 41, No. 185, September 22, 1976.

WEDNESDAY, SEPTEMBER 22, 1976



PART II:

**DEPARTMENT OF
TRANSPORTATION**

**Urban Mass Transportation
Administration**



**MAJOR URBAN MASS
TRANSPORTATION
INVESTMENTS**

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NOTICES

DEPARTMENT OF
TRANSPORTATIONUrban Mass Transportation Administration
MAJOR URBAN MASS TRANSPORTATION
INVESTMENTS

Statement of Policy

The purpose of this notice is to issue a Statement of Federal Policy with respect to decisions on major urban mass transportation investments assisted under the Urban Mass Transportation Act of 1964, as amended. The need for such a Statement has resulted from the growing complexity of the UMTA capital program and the increasing demands placed upon the available funds.

At the outset of the urban mass transportation assistance program in 1964, the \$75 million annual budget was directed toward the preservation of urban transit service in selected cities through the conversion of failing private transit companies to public ownership. A decade later UMTA's annual capital assistance budget exceeds \$1 billion, and is primarily devoted to modernizing existing transit properties and constructing new transit facilities. Not only has the magnitude and duration of Federal transit investments increased and changed significantly but the number of potential recipients has grown. The pressure of these competing demands requires the Department of Transportation to ensure that the available Federal resources are utilized in the most prudent and effective manner.

In the interest of making all urban areas aware of the procedures which are followed and the issues considered in Federal decisions to participate in the financing of locally initiated major mass transportation investments, the Department of Transportation is promulgating this Statement of Federal Policy. The policy represents a process-oriented approach designed to allow each urban area to take into account its unique characteristics in the planning, design and implementation of transportation improvements. As a condition of eligibility for Federal assistance, the policy requires that alternative investment strategies be considered in order to determine which investment best serves the locality's transportation needs, promotes its social, economic, environmental and urban development goals, and supports national aims and objectives. The policy stresses the need to consider combinations of transit modes and technologies appropriate to the service requirements of specific corridors, and requires major fixed guideway systems to be implemented incrementally, with priority given to the most immediate needs of the locality.

This Statement of Policy has been developed in concert with Federal, State and local transportation and planning officials, transit operators, public interest groups and other parties potentially affected by the Policy. Comments and opinions from these diverse groups have been sought by UMTA through individual solicitations, through interest

groups such as the American Public Transit Association (APTA), and through two major UMTA-sponsored consultative conferences (Airlie House Conference and Hunt Valley Conference).

The Policy Statement was first issued for public comment on August 1, 1975 (FR, Vol. 40, No. 149). Sixty-eight responses were received from local, State and transit agencies, metropolitan planning organizations and other interested parties. These comments led to a revision of the Statement and the addition of a description of UMTA procedures. By spelling out clearly the process by which it makes major capital grant decisions, UMTA hoped to increase its own accountability and add a measure of predictability to the discretionary grant award process.

The revised Statement of Policy was discussed at a working conference held under the auspices of the Transportation Research Board at Hunt Valley, Maryland on March 29 through April 1. In arriving at this final Statement of Policy, UMTA has taken careful account of the views and comments expressed at that conference and throughout the 20-month consultative process.

The following significant changes have been made from the initially proposed text of the Statement as issued in the FEDERAL REGISTER on August 1, 1975.

The section entitled "Extent of Federal Commitment" which appeared in the earlier version of the Policy Statement has been deleted. The proposition that the Federal Government might provide funding for alternatives which the local analysis had determined as not cost-effective is deemed to be inconsistent with the Federal obligation to ensure prudent and effective use of the taxpayers' money. The Department's policy of confining Federal financial support to cost-effective alternatives remains unchanged.

Review of the comments received indicated also the desirability of removing certain ambiguities and making certain clarifications in the Policy Statement. These changes are discussed below.

1. A number of respondents felt that no single overall measure of transportation cost-effectiveness could fully reflect all of the significant issues which must be considered in reaching responsible decisions. A single measure was not the intent of the policy. The statement now makes it clear that multiple measures of cost and of levels of effectiveness should be considered, and that effectiveness is measured by the degree to which the proposed investment meets the locality's transportation needs, promotes its social, economic, environmental and urban development goals, and supports national objectives.

2. Some comments interpreted the emphasis on a short planning horizon as a rejection of the concept of comprehensive metropolitan planning. The policy does not challenge the concept of long range planning, and UMTA recognizes the need for such planning as a means of giving an overall direction to metro-

politan development. However, UMTA believes that it is not prudent for either a locality or the Federal Government to make a massive commitment to a fixed course of action for mass transportation based solely on the necessarily speculative projections that must characterize plans which target 30 or 25 years in the future. Changing social priorities, demographic shifts, environmental concerns, accelerated inflation and other unanticipated developments can drastically alter even the most carefully conceived long range plans. It is desirable therefore to base immediate investment decisions on a shorter planning horizon. The sections on "Long Range Plan" and "Incremental Development" now bring out more clearly these considerations.

3. A number of respondents felt that a 10-year horizon for the short term analysis was too close in the future to permit investments, such as advanced acquisition of rights-of-way, that pay off only in the long run. These comments are well taken. Considering the long lead times that are required for most fixed guideway projects, a somewhat longer planning horizon is justified. The policy has now adopted a horizon of up to 15 years, counting from the time the analysis was carried out. Since major fixed guideway projects take up to 5-8 years to complete, this is tantamount to a 7-10 year horizon from the date of initial start-up operation.

4. Several comments expressed doubt about the feasibility of the incremental approach to transit system implementation because of the need to offer benefits more or less simultaneously to the entire region. UMTA agrees that there must be some geographic equity in transit development. But the incremental approach is not inconsistent with an equitable distribution of transit benefits. An "increment" of the plan may contain a package of projects designed to benefit an entire metropolitan area. For example, the initial "increment" of the plan may include express bus service in exclusive lanes, new fringe parking facilities, improved feeder services in suburban communities, as well as the first localized segment of a fixed guideway system.

5. The original conception of requiring Transportation System Management improvements in the operation of the existing transportation system as an alternative to the construction of new facilities was felt by many observers to be too confining. The policy now distinguishes between two concepts: the need to assess the potential of low-cost alternatives (e.g. express bus service in reserved lanes) as a discrete option to more capital intensive alternatives; and the need to employ various types of Transportation System Management actions to support and complement (but not substitute for) the proposed fixed guideway investment.

6. A more precise definition of a "major urban mass transportation investment" was urged by several respondents. This point has been clarified by bringing under the coverage of the policy all proj-

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ects involving new construction or extension of existing fixed guideway systems, except projects identified by UMTA as part of a demonstration program (such as the proposed "Downtown People Mover" demonstrations). Projects involving rehabilitation or modernization of existing facilities are not within the scope of the alternatives analysis requirement. Fixed facilities by nature of their permanence and irreversibility have potentially the greatest impact upon the urban area in terms of land use, financial burden, and urban growth. Decisions concerning construction of new fixed facilities, therefore, deserve particular care, regardless of their financial scope.

7. Questions were raised concerning the relationship of the Environmental Impact Assessment to the analysis of alternatives. The Policy now explicitly integrates the two processes and calls for the circulation of a final Environmental Impact Statement prior to a decision on the award of the preliminary engineering grant.

Issued in Washington, D.C. on September 9, 1976.

WILLIAM T. COLEMAN, JR.,
Secretary.

FEDERAL POLICY ON ASSISTANCE FOR MAJOR URBAN MASS TRANSPORTATION INVESTMENTS

Since the beginning of this decade, the Federal Government has provided an increasing share of the Nation's capital investment in urban mass transportation. In the years ahead, as more and more communities seek Federal financial aid to improve and expand their mass transportation systems, it is more essential than ever that Federal funds be effectively and efficiently utilized.

Since each metropolitan area has differing characteristics, Federal mass transportation assistance cannot be based on standardized prescriptions. Rather, Federal support should be flexible, relying heavily on local ability to assess present and anticipated transportation needs, identify and evaluate alternative opportunities for improvement, and initiate needed actions.

The Federal Government does, however, have a strong interest in ensuring that Federal funds available for mass transportation investments be used prudently and with maximum effectiveness. While there are no simple or standard procedures that will guarantee this outcome, a careful and systematic evaluation of the implications of alternative courses of action in advance of a Federal commitment should improve the quality of decisions. To this end and analysis of transportation alternatives and the filing of a final Environmental Impact Statement will be required as a condition of eligibility for Federal assistance for a major mass transportation investment. Federal support will be available only for those alternatives which the analysis has demonstrated to be cost-effective, where effectiveness is measured by the degree to which an alternative meets the locality's transportation needs, promotes its social,

economic, environmental and urban development goals, and supports national aims and objectives.

A major mass transportation investment for purposes of this Statement is any project which involves new construction or extension of a fixed guideway system (rapid rail, light rail, commuter rail, automated guideway transit) or a busway, except where such project is determined by the Administrator to be of importance as a demonstration of advanced technology. Rehabilitation and modernization projects are not included in the scope of this definition.

The analysis of alternatives shall be carried out as part of a comprehensive transportation planning process in accordance with the following principles:

A. LONG RANGE PLAN

Proposals for major mass transportation investments shall be consistent with an urban area's comprehensive long range plan which articulates the overall direction for metropolitan development and identifies major transportation corridors.

The long range plan should reflect an awareness that different levels and types of transportation service may be needed in different portions of the metropolitan area. Each major corridor should be considered individually to determine the level and type of service that will best meet its projected requirements.

The long range plan should further recognize the need for local community-level transit service as well as for express line-haul connections that foster region-wide accessibility.

As an example, a comprehensive transportation plan may call for the construction of a rail rapid transit line in a corridor of heavy demand, a "people mover" to facilitate local circulation in the central business district, a light rail network or busways to serve intermediate capacity corridors in the lower density portions of the metropolitan area, and fleets of fixed route buses and flexibly routed paratransit vehicles acting as feeders and distributors to the higher capacity line-haul systems and providing neighborhood circulation service in the local communities within the metropolitan region.

The long range plan should be reassessed and revised periodically as part of a continuing transportation planning process to reflect changes in local goals, priorities and long range forecasts; to respond to new land development and travel patterns; to adapt to new technologies as they are developed; and to adjust to the impact of previously implemented actions.

B. INCREMENTAL DEVELOPMENT

Where an area's comprehensive long range transportation plan calls for the creation of a fixed guideway system, the system should be proposed for implementation incrementally. Initial segments of the system should be proposed in corridors which can justify the need for fixed guideway service within 15 years of the date of the analysis. Each segment should be capable of justification on its own merits.

Corridors which cannot justify fixed guideway transit service within 15 years of the date of the analysis should be provided with levels and types of service appropriate to their needs, with the level of service being progressively upgraded as demand develops. Incremental developmental aims to ensure that high priority corridors receive initial attention; that appropriate balance is maintained between the transportation requirements of the entire region and those of local communities within the region, and between long range and short range needs for transportation improvements; that flexibility is preserved to respond to changing technology, land use patterns and growth objectives; and that the fiscal burden is spread over a long period of time.

C. EVALUATION OF ALTERNATIVES

In the interest of improving the quality of the local planning and investment decisions, any metropolitan area which intends to apply for Federal assistance for a major mass transportation investment must undertake an analysis of transportation alternatives with regard to any corridors in which fixed guideway facilities have been proposed for implementation. The analysis should consider a range of alternatives, including improvements involving better management and operation of the existing street and highway network e.g., through provision of reserved lanes for buses and other high occupancy vehicles.

This analysis should assess each alternative's capital and operating costs; ridership attraction; capital and operating efficiency and productivity; effects on modal choice, level of automobile use, environmental impacts and energy consumption; impact on land use and development patterns; extent of neighborhood disruption and displacement; job creation impact; and such other factors as are considered important by the local community.

The analysis should also compare the relative costs and effectiveness of each alternative, where effectiveness is measured by the degree to which the alternative meets the locality's transportation needs, promotes its social, economic, environmental and urban development goals, and supports national aims and objectives.

As part of the analysis of alternatives, a draft Environmental Impact Statement shall be prepared jointly by UMTA and the applicant in accordance with published guidelines.

D. TRANSPORTATION SYSTEM MANAGEMENT

Plans for a fixed guideway project should include transportation system management (TSM) actions to enhance the project's accessibility and convenience and to improve the quality of transportation service in other parts of the metropolitan area which will not be served by the fixed guideway project. Supportive TSM actions shall include the provision of adequate bus and paratransit feeder services and parking facilities at transit stations, and may include

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other measures aimed at increasing transit ridership and reducing unnecessary use of private automobiles within the transit corridor.

E. PUBLIC INVOLVEMENT

There should be full opportunity for the timely involvement of the public, local elected officials, and all levels of government in the alternatives analysis process. This involvement should be initiated early, so that all affected groups have an opportunity to influence the process in a timely and constructive fashion, particularly as to the alternatives to be considered, measures of effectiveness to be used, actions to be taken to minimize or avoid adverse effects and priority actions for implementation.

After completion of the draft Environmental Impact Statement a formal public hearing shall be held as required by the Urban Mass Transportation Act of 1964, covering both the analysis of alternatives and the draft Environmental Impact Statement.

PROCEDURES

This section states the procedures which UMTA will normally follow in reviewing the alternatives analysis, in implementing the Environmental Impact Statement requirement of the National Environmental Policy Act of 1969, and in making funding commitments to support major mass transportation investments.

1. The initial phase of the alternatives analysis process shall involve a preliminary analysis leading to the development of a citizen involvement mechanism, the choice of appropriate demand forecasting techniques and cost-effectiveness analysis methodology, the designation of a priority corridor(s), and the selection of a small set of promising transportation alternatives for analysis. UMTA must concur in these elements of analysis before the applicant may proceed with a detailed evaluation of the alternatives.

2. After obtaining UMTA's concurrence, the applicant shall proceed with the alternatives analysis and the preparation of a proposed draft Environmental Impact Statement (EIS). The

proposed draft EIS shall be combined in a single document with the results of the alternatives analysis and shall be prepared jointly by UMTA and the applicant in accordance with published UMTA guidelines. Each alternative selected for study shall be presented at the same level of detail.

The applicant shall designate, in a separate document to be submitted simultaneously, the preferred cost-effective alternative which he recommends for implementation, and state a rationale for his choice. The recommended alternative shall be described in terms of its corridor location, length of initial segment(s), technology, horizontal and vertical alignment, grade separation, station location and other relevant factors. This document shall clearly state that any recommendation is solely that of the applicant and that UMTA's judgment is reserved until the environmental process is complete.

Upon receipt of the combined alternatives analysis and proposed draft Environmental Impact Statement, UMTA will undertake a review of the document to ensure that the analysis has been carried out in conformance with UMTA policy and UMTA guidelines. This review will normally be completed within 90 days of the receipt of the draft alternatives analysis and proposed draft EIS.

4. After the consolidated alternatives analysis and proposed draft Environmental Impact Statement has been found in conformance with UMTA guidelines, UMTA will circulate it for comment. During the circulation period the applicant will hold a public hearing on the document and may, at applicant's option, include in such hearing consideration of any application for a grant for preliminary engineering on the applicant's preferred alternative.

5. At the end of the circulation period UMTA and the applicant will address the questions and comments received, correct any deficiencies in the analysis, and begin preparation of a final Environmental Impact Statement on a recommended alternative. The final EIS shall be prepared at the same level of detail as the draft EIS.

The final Environmental Impact Statement may also incorporate UMTA's decision with respect to a preliminary engineering grant, subject to the condition of satisfactory completion of the 30-day circulation period required for the final Environmental Impact Statement. This decision will be based upon a comparison of projects emerging from the alternatives analysis process.

UMTA may admit projects into preliminary engineering whose combined cost exceeds available Federal contract authority. This will be done in anticipation of any of several possibilities: the withdrawal of projects as a result of changing local priorities; a local decision to use non-Federal resources to finance more than 20 percent of total cost; or changing conditions such as the availability of detailed cost estimates which might lead to a later decision that a particular project cannot be Federally financed.

6. During the execution of preliminary engineering, the applicant will be expected to complete all the steps which must precede a full Federal commitment of capital grant funds to the project. These steps include providing evidence of firm commitment of the non-Federal capital share, providing evidence of State and/or local consensus regarding the financing of operating deficits, and planning for and gaining financial commitment to necessary supportive actions to promote effective utilization of the proposed fixed guideway system.

7. Upon completion of the preliminary engineering phase, the applicant may prepare a capital grant application for the construction (including final engineering and right of way acquisition) of the proposed project, and shall hold a public hearing thereon.

8. A definite funding commitment by UMTA for construction in a specific dollar amount will be made upon review of the capital grant application, the transcript of the public hearing and the detailed cost estimates emerging from preliminary engineering. The decision will be based upon a comparison of projects then pending.

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Questions -

1. Do you favor this Federal Policy with regard to major transportation investments? Why?
2. What drawbacks if any do you see in carrying out this policy?
3. Does the policy overlook important evaluation factors or criteria? What are they?
4. Should the policy apply to smaller urban areas?

SESSION XVI: THE DECISION MAKING PROCESS

Objectives of Session XVI

- . To point out the primary focal points of decision making and what factors are considered in the process
- . To stress the importance of the non-technical issues

Synopsis of Session XVI

This session provides a broad discussion of how decisions concerning public transportation get made, who makes them, and what are their motivating factors.

Outline for Session XVI

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Decision Making Process
3	Decisions
4	Value Capture
5	Summary

SESSION XVI
THE DECISION MAKING PROCESS

1. Introduction

How do major decisions concerning public transportation get made? Who decides what type of system will be implemented, where will service be provided, what will the fares be, who will finance the system? To what extent does the information on alternatives developed in the preceding chapter enter into the decision making process? It is clear that there is no single or universal answer to these questions. Decisions on major public transportation investments or policies are made by different means in different jurisdictions. However, there are some common denominators in the decision making process and these are dealt with in this session.

2. Decision Making Process

Decision makers like to have all the "facts" in front of them before they make a decision. However, in dealing with public transportation, there are few facts but many professional judgements based upon an assumed set of circumstances. Nevertheless, a vast array of information on alternative actions or policies is an essential to the decision making process. It may be used or it may be ignored. Certain data may be weighed more heavily than others. What has emerged in recent years is that the role of the professional transportation planner or engineer is to develop the characteristics, impacts, and effects of various alternatives and then to allow the decision makers to select a particular system or policy. Thus, the decision making process may be considered more a political one than a technical one.

a. Decision Makers

Decision makers can be grouped into four broad categories; namely, local transit authorities, local elected officials, and state and federal legislative or administrative officials.

1) Transit Authorities. The local transit authority has the responsibility for formulating the public transportation needs, evaluating alternatives, and recommending a system, and system financing. It is the Board of Directors of the authority which makes the decisions.

2) Local elected officials acting independently or in the form of a regional association, i.e. the MPO generally act as the citizen's representative in the decision making process.

In some instances, the decisions of local officials must be approved by the citizens by means of a public referendum, particularly when new financing is involved. Thus, the citizens in the San Francisco Bay area approved BART in 1962 (1), those in Washington, D.C. approved Metro in 1968, while Los Angeles residents have several times voted against a fixed rail system. Local approval of major transportation investments is a key step in the decision making process. Citizen

participation should be solicited at all times in the decision making process.

3) State Legislature. In some cases, state approval may be needed if new authority is necessary to tax in order to finance the system or if the state is to provide major financial inputs. Thus, in BART's case, the California legislature came to BART's rescue on several occasions when it seemed that the system would be halted for lack of funds.

4) Federal. Where federal discretionary funding is involved as is usually the case, then approval at the UMTA Administrator's level and perhaps at the Secretarial level will be needed to obtain long term funding commitments. This latter commitment has become increasingly important for fixed guideway systems where major federal investments are involved. As a general rule, the more money that is required from the federal government, the larger the federal role in the decision making process.

When Denver wanted to build a \$753 million, 22 mile light rail system, their application was turned down by UMTA. They were told that UMTA believed that an improved bus system was adequate for the area's transit needs. UMTA has committed \$100-\$200 million in improved bus services and Denver is reassessing its long term transit development options (2).

5) The Judicial System. The courts are playing an increasingly strong role in deciding major transportation questions. In general, this is in response to law suits questioning whether state and federal laws are being faithfully carried out especially those pertaining to environmental matters. Very often the judicial process results in lengthy delays, rather than in reversals of decisions, although in some cases, the delays do cause major system changes or modifications.

b. Motivating Factors

The various parties to the decision making process each have their own viewpoints and motives on which they base their decision. The local transit authority is generally interested in providing adequate public transportation services. However, there may be equally strong underlying motives. Like early freeway builders, many of the transit authorities are convinced that "monumental" fixed guideway systems are a must for their urban area regardless of cost. Such systems have much more "glamour" than less expensive but perhaps equally adequate express bus systems.

Fixed guideway systems provide more than glamour for an urban area. They signify large influxes of money into the local economy especially from the Federal government. This means high employment in the construction industry and major contracts for engineering and architectural firms. Fixed guideway systems add prestige to a city. The Paris, London, Moscow, Montreal, Mexico City and San Francisco subway systems are world famous. Few people on the other hand point with pride to an express bus system.

Citizens have many viewpoints and their actions are often governed emotionally by current issues. Thus, when freeways and the environment became an issue in the 1960's, there was a great deal of support for fixed guideway public transportation. Of course, at that time, the cost consequences were not fully understood or were not presented. In more recent years, economic and cost issues have become much more important and a discerning public is carefully examining the alternatives and placing heavy emphasis on pocket book issues. Likewise, local officials, faced with a multitude of competing needs are becoming very cognizant of transit decisions which affect their budgets.

At the state and federal level, primary emphasis is being placed on holding down costs in order to make more efficient use of the limited available funds. For example, it is doubtful if Washington, D.C. would be developing as extensive a rail system as it is if it were not the nation's capital and a showcase. However, the justification for major fixed investments is becoming more structured and the opportunity for political influence may be lessening.

c. Time Implications

The amount of time it takes to plan, design, and construct a public transportation system is playing a more important role in the decision making process. Both BART and Metro were over twenty years in the process before the first train began to run. Over this lengthy period of time, conditions change and both the citizens and the politicians have a tendency to change their minds. In many instances, the technology may have improved and what was appropriate in 1965 may no longer be so in 1977. Likewise, social, environmental, and economic values change and decisions change with them. Metro is in the midst of this dilemma at the present time. It has been told that UMTA will not finance more than 60 miles of the 98 mile system until an alternatives analysis has been conducted on a number of the lines. A partial response to this problem is that UMTA is promoting the incremental development of fixed guideway systems rather than the full system implementation. This limits the Federal government commitment and permits the system to be extended when the need justifies. It may also permit more effective use of new technology as it is developed.

Time is an important factor in assessing whether a particular decision was wise or not. Much has been written about BART and whether it can be considered a success or failure. Melvin Webber in his critical analysis basically concluded that BART did not live up to its backers' promises and comparable service could have been provided cheaper. However, in the last paragraph of his assessment, his ambivalence on the matter comes through. He states (3):

"But in the long run, say 50 years when the bonds will have been retired, when everyone will regard BART as just another built-in feature of the region,

rather like Golden Gate Park, perhaps no one will question whether BART should have been either built or abandoned. It will then be regarded as a handy thing to have, a valuable facilitator of trips that would not otherwise be made by the elderly and the young, a blessing that enriches the quality of Bay Area life. And who will gainsay then the wisdom of having built a white elephant today?"

d. Institutional Considerations

Institutional considerations enter the decision making process. The application of paratransit services may be negated if existing regulatory and legal constraints against their use cannot be overcome and if Section 13 (c) regulations are found to apply. The degree of local control over the system may determine how each jurisdiction decides. For example, a central city may favor a fixed guideway system with its extensive coverage while a suburban area with only limited service may favor the more ubiquitous express bus or light rail system. Not only would it have more service with the latter, but it can usually exercise more local control through determination of routes, stops, etc.

3. Decisions

What are the decisions that decision makers make? In general, they can be grouped into the following: system type, system size, system location, service level, fare policy, and financial considerations.

a. System Type

The particular system type will be selected through the evaluation of alternatives. It is important that all feasible alternatives be included in the alternatives analysis. Many of the earlier studies which justified rail transit systems conveniently dismissed express bus or light rail alternatives. However, with the exception of just a few of the more dense U.S. cities, express bus and light rail systems provide sufficient capacity to handle forecast demand.

An important decision in service type concerns the relationship of capital costs to operating costs. Systems that have high capital cost but low operating costs may be preferable to those with the opposite characteristics. This is especially true to the local area if the brunt of the capital costs are borne by state and federal funds and operating costs are a local responsibility. This somewhat explains the appeal that fully automated systems have with their promise (largely unfulfilled) to reduce labor costs per passenger.

b. System Size

The size of the system has a major impact on both capital and operating costs. Both BART and Metro have fairly extensive systems since they cover large geographical areas and the only way to get support from the suburbs was to extend lines far out into these lower density areas. In many cases, the outer portions of the line are least cost effective. Even though construction and land costs may be lower, the outer lines require large station areas for parking, major access improvements,

extensive feeder bus service, and storage and service maintenance facilities.

c. System Location

The particular location of transit lines and stations is a crucial decision in establishing a system. The high sounding reasons of promoting the orderly development plan for the urban area are often sacrificed for reasons of expediency, cost or public pressure. For example, many rapid transit lines have found it convenient to use existing or abandoned railroad rights-of-way even though the demand may be far removed. Pressure to move stations away from or closer to certain locations may also not be in the public interest of the system's efficiency. Politically, there may be a need to balance the amount of the system that is allocated to jurisdictions even though their needs may vary.

d. Service Level

The decision on service level is generally related to cost. The higher the service, the higher the cost. Although higher service means higher patronage, it usually means higher deficits when all trips must be subsidized. Thus, we see many people requesting lower service levels including elimination of mid-day and late evening service, reduction in weekend service, etc. as one means of cutting costs.

Some systems have also set high service level policies. They plan their systems to minimize the number of standees during the peak hour, to provide high frequency service, etc. Although such service level policies increase patronage, their cost implications must be considered.

e. Fare Policies and Financial Considerations

The establishment of fare policies and funding mechanisms go hand in hand. The question is where is the money coming from to operate the system? How much is generated by the fare box and how much from state and federal government and how much through purely local taxing schemes. Maximizing the federal and state contribution is a given. The key decision lies in what is raised locally or through the fare box. There is a growing feeling that transit fares should be low to encourage ridership. This philosophy has followed the public takeover and is evidenced by the decreasing percentage of operating revenue generated by the fare box. Local financing mechanisms have generally included property tax, sales tax, and toll revenues. Local priorities and political facts of life usually determine the establishment of fares and funding mechanisms. In Atlanta, it was the promise of a 15¢ fare that is credited with getting the voters to approve the MARTA rail system.

4. Value Capture

A new ingredient in the decision making process involves the concept of "value capture." The value capture concept has been used by UMTA recently to evaluate funding application for major new systems. Former UMTA Administrator Robert E. Patricelli recently described value capture as follows:

"There is nothing new about the value capture idea. It is well-known that the building of major roads and transit lines makes adjoining land more valuable. Trying to capture some of that value increase which transit creates in order to finance the cost of the transit system itself is what we are talking about. It is a technique widely practiced in the financing of the Toronto and Montreal systems and is used in Europe. Our own intercontinental railroads were built this way, using land grants along the right-of-way.

We are encouraging all communities we are dealing with to explore the idea in their own self-interest as a source of possible future capital or operating funding.

I have emphasized value capture approaches that do not involve new taxes. For example, transit systems can lease air rights over transit stations to generate income, as is done in Toronto. Or, under the so-called 'tax increment financing' approach, some portion of the added tax revenues generated at existing rates but on the higher assessable base could go to the transit system.

Further, some communities are finding the idea to be of interest. Denver has developed a proposal which would generate over \$400 million in value capture financing for its system by the year 2000. Mayor Bradley of Los Angeles and Young of Detroit have both supported the concept for their communities.

I believe that in my capacity of safeguarding the taxpayers' money, I must explore innovative approaches that promise to stretch federal and local dollars further."

The value capture principle appears to be one that will require local consideration in both the evaluation and decision making process. The principle has far reaching implications in terms of the long range financing of any selected system. APTA has endorsed the principle as a means for the transit operator to strengthen his financial base by benefiting from the escalating real estate values generated by public transportation investments. (4)

5. Summary

The decision-making process in public transportation is complex and scattered among a number of jurisdictions and bodies. The process is a continuing one which affects all aspects of the process including planning, design, implementation, and operation. The decision-making process takes place over a long period of time and few of the decisions that are made are not irreversible. The role of the transportation professional in the last few years has been to provide the technical information and background that allows the appointed or elected officials to make reasonable judgements.

References

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4. Passenger Transport, July 23, 1976.

Session XVI

The Decision Making Process

Experience in Chicago (1)

- (1) Excerpt from "Managing the Future Evolution of the Urban Transportation System," David W. Jones, Institute of Transportation Studies, University of California at Berkeley, November 1976.

The politics of Chicago are the politics of cleavage. They reflect conflict, compromise and consensus--between city and suburb; between upstate and downstate legislators; between Republicans, Machine Democrats, and Reform Democrats; between rival suburban counties, united only by their warriness of Cook County and the City of Chicago; between Illinois and northeastern Indiana; and between the rival bureaucracies which supply transit and highways, and compete for the funds necessary to maintain and rehabilitate an extensive but aging network of streets, highways and toll roads.

The institutions responsible for transportation planning programming and delivery in metropolitan Chicago reflect these lines of cleavage. Thus, transit services are provided by eight privately owned commuter railroads, the Chicago Transit Authority, 29 suburban bus operators, and a wide array of social service agencies and voluntary associations. Even highway operation is a fragmented responsibility with the Illinois Department of Transportation, the Illinois Toll Authority, and County Road Departments sharing responsibility for the maintenance and operation of state-marked routes. In Chicago proper, highway design and transit planning have traditionally been cooperative, largely because the Chairman of the CTA has traditionally been recruited from the DPW. As the Office of Technology Assessment has observed, "The City of Chicago, through its Department of Development and Planning and its Department of Public Works, has been the dominant force in transit planning (and, in fact, highway planning) and decisionmaking until the last three or four years."

The declining clout of the City in both highway and transit affairs reflects the emergence of the RTA and the State of Illinois as the dominant actors in the programming of funds.

RTA is a statutorily-created, voter-approved agency with planning, taxing, and purchase-of-service powers in the area of public transportation. RTA is governed by a board composed of four suburban members and four members representing Cook County and the City of Chicago--a one-man, one-vote representation of population shares in the six-county region. The eight board members elect a working Chairman who is responsible for agency administration and staffing.

RTA is authorized to enter into purchase of service contracts with commuter railroads, local bus companies, and taxi operators providing shared-ride services. It is responsible for apportioning a fraction of sales and motor vehicle tax revenues generated in the six-county area and has authority to impose an additional surtax on either parking or gasoline. It also is empowered to issue up to \$500 million in general obligation bonds and to establish transit fares.

An Office of Technology Assessment study has aptly described the dynamics of the RTA board:

The first and foremost issue involving RTA . . . was the selection of the chairman and its full-time executive leadership. Immediately after the city and the suburban jurisdictions named their respective sets of four board members, the city members proposed the selection of Milton Pikarsky as the chairman of RTA. Pikarsky at the time was chairman of CTA and previously had been Commissioner of the Department of Public Works. He had long been regarded as a strong, articulate, and effective leader of city positions in regional, State, and national transportation forums.

The strong advocacy of Pikarsky by the city RTA board members delayed RTA for many months while the suburban members either opposed his selection or insisted on a wide-ranging recruitment and interview program. In the end, Pikarsky was selected and RTA is in the process of organizing and initiating its program.

The city's long and aggressive campaign for Pikarsky's selection as RTA chairman indicates that it intends to exercise as strong a role as possible in the new agency's future policies and operations. It is evident, however, that the city's power over regional transit policy has been diminished significantly. The balanced composition of the RTA board plus specific legislative requirements designed to protect suburban jurisdictions ensure that transit policy and operations in the region will be shared by many jurisdictions. On the other hand, RTA's broad authority and funding resources may eventually make it a semi-independent force of considerable strength in the region.

Pikarsky brought to RTA an allegiance to the City of Chicago and a young coterie of CTA-trained transit planners. The allegiance of the planning staff and Pikarsky's efforts to tap suburban sales tax revenues to support commute rail services have resulted in a collision course with the board's four suburban directors. This conflict reached epic proportions in 1976, when majority approval of the agencies 1977 budget was withheld in an effort to force Pikarsky to resign. Faced with a cash-flow stoppage that left RTA without a paid staff for nearly a month and prevented contract payments to transit properties, the suburban directors yielded to Pikarsky for the time being.

Simmering on RTA's agenda are:

- Proposals for route, schedule and fare coordination.
- Negotiation of the appropriate cost accounting methodology to use in the purchase of services from commute railroads.
- A plan for staggered work hours and consequent adjustment of transit schedules.
- Plans for joint maintenance facilities.
- Political debts requiring the extension of suburban bus services despite a five-year unfunded operating deficit forecast at \$417 million.
- Negotiations over the revenue shares that would accrue to each transit operator if RTA were to impose a surtax on the sale of gasoline and contingency planning for additional taxing powers (given the shortfall between the gas tax ceiling and the projected operating deficit).
- The share of future transit capital development that the State will provide from motor fuel tax revenues, and the ability of the region to match federal capital grants (given the escalation of operating costs).
- The level of subsidy appropriate for paratransit services for the elderly and handicapped.

The State, unrepresented on the RTA board and without appointment review powers, is nevertheless a significant presence in RTA decision-making. RTA programming decisions must satisfy its own share-conscious board, but, with Legislative action required for new tax authority, they must also mesh with the bonding decisions of the State as a whole and satisfy the test of upstate-downstate consensus on a range of issues that extends beyond transportation to pollution control and education finance.

The State administration in Springfield is a direct and dominant player in highway development decisions. It was not always so. Project development and programming decisions were located at the highway district level before the advent of Governor Dan Walker's administration in Springfield. The District, borrowing heavily from the technical staff of the Chicago DPW, made project development decisions within formula apportionments determined at the State level. When programming authority was captured at the State level, the DPW lost substantial influence in project development decisions, with the State opposition to the Crosstown Expressway the most dramatic example of the resulting shift in power. The State, on the other hand, has limited technical resources in the Chicago area and has not been able to assemble a project-ready alternative to Crosstown in the absence of DPW cooperation.

The assumption of programming responsibilities by the State has increased the importance of the shadow programming activities of the Chicago Area Transportation Study. CATS performs MPO review and planning functions for the Chicago area but is formally an arm of the Illinois Department of Transportation. Highway programming decisions for the Chicago area have been negotiated in the CATS arena with increasingly active participation of suburban members of the CATS technical advisory committee. Suburban legislators have also increased their influence in the programming process due to their access to the administration in Springfield.

As a consequence of the change in the arena of programming decisions, the relationship between CTA, the DPW and IDOT District 1 which produced innovations in joint right-of-way development for mass transit, has been diminished in importance. A mature CATS-RTA-IDOT relationship has not yet emerged to fill this vacuum and uncertainty prevails with the election of a new Republican Governor and an expected turnover in IDOT executives.

The emergence of CATS as a forum for local-State cooperation is a product of competition between the Walker administration and the Daley machine. It is not yet a setting for mature technical evaluation of project options, but rather a setting for adjusting program priorities in light of Technical Advisory Committee recommendations of an informal, advocacy character. It is probable, however, that this arrangement will be valued by the incoming administration with its debt to the Republican collar counties surrounding Chicago. If this proves to be the case, CATS intent to develop formal evaluation methodologies to assist alternatives analysis and inform program management could begin to pay off.

Critical to CATS' role in multi-modal programming is the development of a cooperative relationship with the RTA. This has begun to emerge at the staff and technical planning level, but not at the policy board level where conflicts between the Walker and Daley organizations have played themselves out as conflicts between Pikarsky and the Chairman of the CATS Technical Advisory Committee, the State's Deputy Secretary of Transportation.

Thus, suburban representatives have gained access to the highway and transit programming process through CATS and RTA, but the multi-modal cooperation of the DPW-CTA era has yet to be replicated in these regional decision-making arenas. IDOT planning for the diversion of Crosstown Expressway funds to mass transit has begun to provide the impetus for a State role in Chicago area transit planning. But it is too early to tell whether this initiative will flower or wither under the new Republican administration in Springfield.

Questions

1. Is the institutional framework for transportation planning and operation in the Chicago area unique or typical? Cite examples to corroborate your response.
2. Comment on the importance of the makeup of the RTA Board.
3. What changes in the local power structure have taken place in recent years and how have these changes affected transit planning?

SESSION XVII: THE POLITICAL SPECTRUM

Objectives of Session XVII

- . To understand the relationship between the role of public transportation and the political forces which shape it
- . To be able to discern basic issues in public transportation that are affected by the political process

Synopsis of Session XVII

Basic issues concerning public transportation objectives, financing, allocation of services, etc. are examined within the political environment.

Outline for Session XVII

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Public Transportation - A Public Service
3	Jurisdictional Considerations
4	Funding Issues
5	Institutional Issues
6	The Transit Spokesmen
7	Summary

SESSION XVII: THE POLITICAL SPECTRUM

1. Introduction

During the last two decades, public transportation has increasingly become a political issue at the Federal, state and local level. Although politics and the transit industry were no strangers to each other even before the 1960's, their prior relationship was that of government to big business. However, when World War II ended, transit began its long decline. One by one, the private operators sold out and public authorities took over. These public operators were immediately faced with the problem of financing a money losing operation. As the need for subsidies grew, transit began to emerge as a political issue.

2. Public Transportation - A Public Service

For over a century, the public transit industry was considered one of the major industries in this country. It was the urban counterpart to the railroad industry and attracted some of the same infamous speculators. Fortunes were made in public transportation, not so much from the fare box, but from associated business ventures such as real estate, electric power, etc. Public service considerations were often secondary. When a Presidential Commission in 1919 suggested that the transit operators pay more attention to their customers desires, the advice was ignored by most of the industry.

This "customer be damned" attitude, usually translated into a "customer be tolerated" stance. It continued through the long years of the decline after World War II and in some instances seems to be alive in some publicly operated systems.

However, in most cases the takeover by public authorities has resulted in a change in philosophy by the transit operator. Most operators understand that public transit is a needed service in urban and rural areas. They are aware that many people are completely dependent upon public transportation to support their livelihood. Others who may own a car or have access to an auto may also prefer the advantages of public transportation. In many instances, public transportation offers the only realistic means of improving transportation in large, densely developed urban centers and in so doing improve the economic vitality of these areas.

a. National Concerns

From a national policy standpoint, proponents of public transportation cite a number of benefits. Fully utilized transit vehicles are more energy efficient than the low occupancy auto, resulting in significant fuel savings. A reduction in auto use is accompanied by a reduction in automobile emissions and less pollution. The changing emphasis to providing urban space for people and not motor vehicles is enhanced by greater transit use. In many minds an "improved quality of life" is associated with less automobile use. The trend to higher density central cities requires improved public transportation.

3. Jurisdictional Considerations

The primary political question related to public transportation is who pays and who benefits? This question is debated along jurisdictional lines with the primary opponents being the central city against the suburbs and rural versus urban interests.

a. City-Suburbs Priorities

The basic structure of local governments has changed little during the last several decades despite the vast change in the physical, social and economic makeup of urban areas. Although a single transportation authority usually provides transit service in an urban area, the area itself may encompass a dozen or more political entities, each of which has its own interest with regard to public transportation.

Where the transit system has passed from private to public ownership, it is normally governed by a state created authority or transit board. Membership of this board is determined by the legislation authorizing its creation but in general, membership is based on the jurisdictions represented in the service area. In many cases, elected local officials are members of the authority. In a recent interview, Milton Pikarsky, Chairman of the Chicago Regional Transit Authority, was asked to comment on the fact that the nation's mass transit systems are run largely by amateur boards selected on a political basis: "Would this trend continue?" Pikarsky replied:

"Now that we are receiving substantial public funding, I think it's quite appropriate that public transit be increasingly subject to political control. Transit boards will undoubtedly need to be educated. But I think the educational process will have to work both ways. Political boards will have to learn the technical reality of what public transportation can and can't do. At the same time, public transportation agency staff will have to become more sensitive to the political decision-making process."

The central city has the greatest need for public transportation. The highest number of transit dependents are located in the central cities. Central cities are also in the poorest financial shape. The suburbs on the other hand are less dependent on public transportation. Average auto ownership is high and their treasuries, as compared to the central city, are in relatively good shape. Most suburban areas are also trying to increase their tax base by adding "soft" industries which in turn reduces their reliance on the central city.

The problem becomes one of equitably distributing the mounting costs of operating an area-wide transit system among a number of jurisdictions. This in turn raises the questions of fare policies, levels of service, assignment of equipment, etc.

An example of the city-suburbs division was evidenced recently in the Washington, D.C. area. The chairman of the Metro Board, who also happened to be Chairman of the Washington, D.C. City Council, angrily charged that Virginia politicians may destroy the Metro program by "following an independent course on transit matters." The charge was specifically directed towards the Northern Virginia Transportation Commission (NVTC), a state created body which was established originally as a conduit for Virginia funds for Metro. It has evolved however, into a frequent critic of the regionwide transit agency. At issue was NVTC's reluctance to participate in the purchase of articulated buses. D.C. threatened to reciprocate by refusing further transfers of funds from abandoned interstate systems to Metro.

b. Urban-Rural Priorities

The growing federal and state involvement in assisting public transportation has been followed by increased demands to include the needs of rural areas as well. For many years, Federal policy, in a number of areas, but particularly transportation, tended to ignore the urban areas. Congress was dominated by rural oriented legislators who voted their constituents pocketbooks. However, as the shift to urban population areas was followed by legislative redistricting, especially after the 1960 census, the make-up of Congress began to change. Programs largely directed to urban areas were enacted. Rural interests in the early days were aimed at keeping the size of urban programs small. However, the momentum of the urban coalition has been strong and the rural strategy now appears to be to get as much of the action as possible.

The situation at the state level varies by state. Large industrial states, especially in the Northeast, have long had a strong urban orientation. Thus, New York State in 1967 passed a transportation bond issue which benefitted public transportation, particularly New York City by one billion dollars.

The smaller states and less urbanized states generally have only modest transit programs. Their orientation is towards their own needs particularly in the small cities and rural areas. Many of these states are taking an active part in the Section 147 program.

4. Funding Issues

At its simplest, the issue of public transportation revolves around priorities and the adequacy of available funds.

a. Scarce Resources for Public Transportation

The economic situation of the last few years has put a crimp into most urban government budgets. Against this background, transit has to compete with other vital urban needs including education, social services, health, police and fire protection, and public works.

Public transportation is also a newcomer to most local government budgets. Unfortunately, it is also one that has shown a voracious appetite when it comes to its share of the budget. As transit deficits have grown so have their corresponding portion of the local budgets. Much of the increased costs can be attributed to overall inflation of the last few years. Unfortunately, the end is not in sight.

b. Capital Costs

The initial UMTA funding mechanism was limited to capital grants on a discretionary basis. Since applications have always exceeded available funds, UMTA was forced to choose among competing jurisdictions. It is naive to think that some degree of political consideration did not go into the selection process.

UMTA's difficulties have been especially acute when it came to funding new fixed guideway systems. During the late 1960's and early 1970's, it appeared that most major urban areas wanted a fixed rail system. This desire was not discouraged by UMTA. However as experience with the cost of these new fixed guideway systems, particularly BART and METRO, was gained, UMTA began to have second thoughts. In some cases, the jurisdictions themselves have had second thoughts. The result has been a much more cautious policy by UMTA with greater encouragement to look to cheaper alternatives including light rail, express bus, or staging of systems.

c. Operating Subsidies

The problem of funding the vastly increasing operating subsidies of transit systems has become the focal point of political controversy. In 1970 the imbalance between operating revenue and operating expenses was slightly more than 184 million dollars. By 1975, this imbalance had risen by a factor of 10 and by 1980 operating deficits of 6-7 billion dollars are forecast nationwide.

Numerous factors account for this. The primary cause is the spiraling wage increases that have been awarded to transit employees. Payroll costs make up more than two-thirds of total operating costs and during the past decade the increase in real wages has far outstripped gains in transit productivity. In addition, salaries of public sector transit workers far exceed those employed by privately owned transit properties. Gambaccini (1) states that in New York City the transit workers wage level is now 40% above the average wage in the private sector. In addition transit workers salaries and wages, including social security and benefits increased 57.2 percent over the last 15 years after being adjusted for the cost of living.

Transit wages have increased much more rapidly since takeovers by public authorities. Transit unions appear to be in a better posture to achieve large increases from politically attuned government bodies than from profit motivated private industry. The recent entry of the Federal government into the operating subsidy picture coupled with Section 13c regulations has contributed to the rising wage demands.

In many cases, past union agreements are coming back to haunt current management. New York City allows its transit employees to retire after twenty years at liberal retirement allowances. Not only have retirement costs increased sharply but so have the costs of training replacements.

Another factor which has unknown but potentially significant consequences for operating costs are the new Federal policies on the elderly and handicapped.

These requirements will reduce system income as well as add equipment and employees to serve the needs of this group. To some extent, it may decrease overall service as in the case with kneeling buses which require additional time at each stop.

The Federal operating subsidies are based upon a formula that gives equal weight to population size and to population density. The formula fails to take into account the extent of current transit usage and in some cases shows substantial variations among cities in terms of allocations per revenue rider. For example, in fiscal years 1975 and 1976 Los Angeles received \$0.20 per revenue rider while New York City received \$0.03. (2) Smaller communities do even better on this basis but they provide substantially less transit service.

It is obvious that the allocation formula for Section 5 operating assistance is not to everyone's liking but a formula that is not population based would have little chance of getting through Congress.

In recent years there has been some vocal support for creating a transit trust fund similar to the highway trust fund. Others have called for a single fund which would change the highway trust fund to a general purpose surface transportation trust fund. One of the primary problems with a transit trust fund is what to use as a revenue base. A tax on the user is not practical or politically expedient. Diversion of part of the gas tax or an additional tax on gas has been suggested but has not received much support. Also there is a general antipathy to new trust funds which reduce Congress' political input.

Recently, however, Rep. James J. Howard (D-N.J.) proposed a mass transit trust fund that would be financed by a 2% corporate income tax. (3) Howard was suggesting this source as part of a wide-ranging total surface transportation policy for the next 30 years. The 2% tax proposed by Howard on corporate profits would offset and equal the reduction on this source proposed previously by former President Ford.

d. Formula vs. Discretionary Funding

UMTA funds are currently distributed on both a discretionary and formula basis. All Section 3 funds are discretionary while Section 5 funds are allocated under the previously described formula. Any discretionary program places powerful political clout in the hands of the administration in power to reward or ignore. It forces urban areas to compete with each other not always on the basis of need. A more equitable allocation of funds would appear to be desirable.

An indication of the political aspects of transit funding was Transportation Secretary Adams' displeasure to find that little of the discretionary funds from the 1974 NMTA Act remained unallocated. He was particularly unhappy about several large awards made by the preceding administration during the presidential election.

e. Conditions for Grants

In recent years UMTA has often attached new conditions to its grants as a way of trying to minimize costs while maximizing transit efficiency. For example, in approving Buffalo, New York's request for a light rail transit line, UMTA obtained a promise of no strikes from the participating labor unions. In Detroit a large Federal grant was given on the pledge that the city and private development would match the grant with the expenditures of funds to redevelop areas in the corridor. This would appear to be a trend of tying more strings to the grant process. It's workability remains in doubt.

5. Institutional Issues

As the transit industry changed from the private to the public sector, it has experienced the full range of "institutional problems." The problems have been legal, financial, political, jurisdictional, special interest groups, etc. A few of those which relate to the political side are discussed below.

a. Regulatory Barriers to Paratransit

Over the past few years paratransit services have emerged as important supplements to existing transit service or in some cases as solely viable systems of themselves. The paratransit options cover a broad range of services. Almost all involve small vehicles. Many of the services are privately operated. In a recently proposed policy, UMTA stated that outmoded local laws, regulations and ordinances often constitute a barrier to paratransit implementation. State and local governments were asked to review and revise such laws that constrain or inhibit paratransit services. UMTA itself stated that it would not apply Section 13(c) regulations to private transportation organizations that are providing paratransit services as an incidental adjunct to its main business. This proposed policy has yet to be adopted.

b. Elderly and Handicapped

The elderly and the handicapped have during the past decade shown that they are a powerful interest group. They have been particularly effective in seeing that their needs are included in major federal programs.

Since mobility is a common denominator to all activity, much of their efforts have been focused on public transportation. Their success may be reflected in Section 16 of the 1964 UMTA Act as amended. An example of the power they yield is the situation in the Washington, D.C. Metro system where they were able to get a court injunction requiring Metro to place elevators in each station at a system cost of 65 million dollars. They were also able to keep one completed station from opening for almost a year because the elevator was not installed.

The current UMTA requirements on serving the elderly and handicapped will undoubtedly add even further to the operating deficits. The full impact is still several years away.

c. Eligibility of Private Operators

Private transit operators are eligible for Federal aid providing a mechanism is available for public authorities to receive the funds and pass them on contractually to a private operator. However, a recent study by the GAO (4) found that many private operators weren't even aware of their eligibility and some operators hadn't even heard of UMTA. Sections 3e and 4a of the UMT Act encourages maximum feasible participation of private enterprise in carrying out the local urban transportation program.

d. Transit Industry

1) Full Service Institutions. Transit systems in recent years have provided a single type of service to all consumers in its service area. This has generally been confined to fixed route, fixed schedule service using full size buses. By so doing many individual market segments have been ignored. This is particularly true with the elderly, handicapped and those people who might be willing to pay a premium to door to door service. Robert Patricelli, former UMTA Administrator suggested that transit systems should become "full service institutions" by buying or directly operating a variety of services with a variety of vehicles. The transit authority then serves as a systems manager or broker as well as a direct provider. (See Session XI on Transit Broker Concept.)

2) Section 13(c). The Section 13(c) regulations have become a volatile issue in many aspects of public transportation. There is a disagreement at the Federal level between UMTA and the Department of Labor in their application. In some quarters UMTA is conceived to be the patron of the transit operator while the Department of Labor is more closely related to and sympathetic with the interests of organized labor. In recent years UMTA has attempted to ease the impact of Section 13(c) on the transit industry but often in the face of DOL opposition. Much of the concern in the industry is with the Section 13(c) effect on wage negotiations. Most operators see it as fueling the excessive wage demands of the last several years. UMTA's most recent concern is the application of Section 13(c) to the growing paratransit component of public transportation, much of which is non-union. A model 13(c) agreement has been drafted

by UMTA and APTA for use in major system contracts. This has been of assistance but Section 13(c) will be a focal point of argument for the foreseeable future.

6. The Transit Spokesmen

The resurgence in public transportation has been spearheaded by a number of individuals and agencies in both public and private life. These individuals and groups have often been referred to as the "transit lobby," an obvious comparison to the highway lobby.

a. Congress

The chief transit voice in Congress is Senator Harrison A. Williams, Jr. (D. N.J.), who has been the author of a number of major transportation bills. He pioneered transit legislation in the early 1960's, which provided federal dollars for transit improvements for the first time. Senator Williams' contributions to public transportation are cited in a recent editorial in *Passenger Transport* (5), which stated,

"If any one person has been the architect of the federal commitment to rebuild public transportation through financial aid, it has been Senator Harrison A. Williams."

Senator Williams has been ably supported in Congress, by many other Senators and Congressmen, particularly those from large urban areas.

b. Industry Organizations

The American Public Transit Association (APTA) is the chief industry spokesman for public transportation. APTA was formed in October, 1974 with the merger of the American Transit Association and the Institute for Rapid Transit. APTA membership includes more than 300 rail rapid and bus transit systems in the U.S., Canada and Mexico. APTA members carry more than 90% of all revenue passengers in this country. Since its formation APTA has become an increasingly influential organization speaking for the transit industry. APTA acts as a forum for its many members and as a major go-between in UMTA's dealing with the transit industry.

c. Special Interest Groups

The interest groups which favor expanded public transportation are diverse. Representatives of large urban areas are in the forefront. They see public transit as one way to revitalize the central city. In fixed guideway projects, they see federally supported public works programs aiding their local economy.

An element of the pro-transit group is made up of anti-highway organizations. This includes environmentalists, energy conservationists and those who consider the auto as a threat to the urban scene. Labor has always been strongly pro-transit in that there are over 100,000 unionized members in the transit industry.

d. Metropolitan Planning Organizations

Over the years metropolitan planning has resulted in the creation of multi-jurisdictional agencies or bodies. These bodies were largely designated to provide coordination among the numerous local units of government and to provide a framework for system wide and systematic planning. These bodies are known as Councils of Governments (COG's) in many regions.

In almost all cases COG's do not implement programs themselves. They do not have capital improvement program capability. Project implementation is the function of the individual jurisdictions within their region.

The COG's have had to walk a fine line to avoid usurping the authority of local governments. The distrust of regional government is strong and local perogatives are carefully guarded. Yet the need to find a mechanism to make more effective use of growing Federal programs in many functional areas has resulted in increased importance of COG's. This is especially true in transportation which is accepted as being a regional function rather than a local one.

The joint regulations issued by FHWA and UMTA in 1975 added further credibility to the regional approach when it designated the Metropolitan Planning Organization (MPO) as determined by the governor to be the forum for development of the TSM element as well as the long range transportation plan. It further made the implementation of any federally funded transportation facility subject to a specific approval process in which the MPO played the key role.

Since the TSM element involves short term improvements, the MPO has gained a substantial voice (if not a veto) in determining the transportation components of the capital improvement program of each local jurisdiction.

The role of the MPO varies from area to area. In most cases the staffs of the MPO's are ill equipped to develop operational plans which make up a large part of the TSM element. Most of the MPO's recognize this deficiency and have been content to act as a forum. Others, however, are taking a more aggressive approach and conflicts between the MPO's and local units of government have emerged.

If MPO's assert themselves by selecting projects in jurisdictions to be funded during the next five years, we can expect growing controversy. Especially if the MPO's decision appears to be arbitrary or politically motivated. Sid McCausland summarized the situation well when he said:

"The process that really counts in transportation is the one which determines who controls the cash. The history of this control over expenditures is long and rich in the lore of politics." (6)

In discussing the California situation, McCausland went on to say:

"It is just possible that the transportation planning process is going to wind up wielding considerable influence on the future of this State. Influence implies power and power implies politics."

The same could be said in any of the 50 states.

7. Summary

Public transportation is in the thick of politics at the Federal, state and local level. This can be attributed to the major changes that public transportation has undergone in the past several decades. The changeover from private to public ownership has been spearheaded by a growing governmental philosophy that public transportation is a necessary public service similar to other publically provided services. This philosophy is not shared by all particularly when it comes to determining how and who pays for growing operating deficits. Continued controversy may be expected at all levels of government.

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Session XVII

The Political Spectrum

"A Fair Share for Boston" (1)

(1) Source: Letter from former UMTA Administrator Patricelli to Mr. Frederick Salvucci and Mr. Robert Kiley, Boston, Mass.



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

THE ADMINISTRATOR

Mr. Frederick P. Salvucci
 Secretary
 Executive Office of Transportation
 and Construction
 One Ashburton Place
 Boston, Massachusetts 02108

January 18, 1977

Mr. Robert R. Kiley
 Chairman
 Massachusetts Bay Transportation
 Authority
 45 High Street
 Boston, Massachusetts 02110

Dear Messrs. Salvucci and Kiley:

I am writing to inform you of the status of the Urban Mass Transportation Administration's (UMTA) review of your applications to relocate the Orange Line in the Southwest Corridor and to extend the Red Line through Cambridge to Arlington.

We have been working closely with you for a number of years in the examination of transportation options in each of these corridors. Of particular significance was UMTA's support of the Boston Transportation Planning Review which was carried out in the early 1970's. This study culminated in a decision by the Commonwealth of Massachusetts to withdraw several Interstate highway segments in favor of a major program of public transportation improvement and expansion within eastern Massachusetts. As Secretary Coleman and I have indicated on several occasions, we believe that the initiative, foresight and leadership of public officials in Massachusetts in withdrawing highways and committing to a major transit improvement program is of national significance and truly deserves commendation.

Following a meeting in Senator Brooke's office several months ago, UMTA officials met with you to draw up a schedule for the prompt submission and review of applications for both the Orange Line project in the Southwest Corridor and the Red Line extension to Arlington. While there have been some delays in meeting the

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agreed-upon schedules, caused primarily by the need to modify proposals as a result of comments made at public hearings, we believe that good progress has been made in moving these projects ahead. Specifically, the draft EIS for the Southwest Corridor project will be in circulation soon.

You have asked for an indication of UMTA's position regarding the funding of each of these projects. As you know, no formal commitment to these or any other projects can be made until all statutory and environmental requirements are met. However, we can certainly appreciate your need to receive an indication of our position so that you can make necessary funding decisions at the State level regarding the commitment of matching funds for possible Federal grants. Accordingly, I am prepared to indicate UMTA's support for these two projects, subject to your meeting all statutory and environmental conditions and given the following opportunity with regard to project financing.

With respect to financing, the effect of the 1976 Amendments to the Federal-Aid Highway Act was to increase to approximately \$1 billion from less than \$600 million, the amount available for transit capital purposes in Boston's Interstate transfer account. Further, under these amendments, even the \$1 billion will continue to escalate at a rate consistent with increases in national Interstate construction costs until specific substitute transit grants are approved. Given this very large funding resource which is available solely to the Boston area, UMTA is able to consider your projects outside of the normal intercity competition for funds which must prevail in the allocation of our Section 3 discretionary capital grants. It is on this basis that I can now indicate UMTA's intention to progress these projects.

Of course, we are not in a position at this time to commit the Federal Government to a specific dollar level for either project, given the fact that engineering is still at a relatively preliminary stage. However, we understand that current estimates for the Southwest Corridor are in the magnitude of \$380 million in Federal funds while the current estimate for the Red Line project is in the magnitude of \$308 million. We are sure that you share our desire not to formally establish specific dollar ceilings in advance of more definitive engineering.

In addition to indicating our general support for these projects, we are reserving initial funding for them. UMTA has set aside \$100 million in Interstate transfer funds in its fiscal year 1977 budget for use exclusively in the Boston area. Further, subject to Congressional approval, UMTA's fiscal year 1978 budget proposes an additional level of Interstate transfer funding for Boston of \$200 million.

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Assuming satisfaction of remaining requirements and positive Congressional action, therefore, up to \$300 million will be available to you over the next 20 months to commence engineering and construction on the Orange Line and the Red Line projects. This is more money than we have ever committed in the first two years of any transit construction project, and should be more than adequate to meet your needs.

We understand your concern that the Boston area receive a fair and equitable share of UMTA Section 3 discretionary funds, and that funds from this source also be used to support the Orange and Red Line projects. Given current limitations on Federal discretionary funds for transit capital purposes, the demand from communities across the nation for these funds, and the other projects in the Boston area for which Section 3 funding is being sought, we believe that a dedication of Interstate transfer funds to support the Federal share of these two extensions is appropriate. Since Interstate transfer grants, like Section 3 grants, are funded from general Treasury funds and not the Highway Trust Fund, there is little practical difference as a matter of equity. However, should major amounts of additional discretionary capital grant funds become available to UMTA, it would certainly be reasonable to give consideration to a proposal for combined Interstate transfer-Section 3 discretionary grant support for these projects.

The Urban Mass Transportation Administration will continue to work closely with you to complete the EIS requirements and to advance engineering to a point that cost estimates are reasonably firm. Following completion of the EIS process and the statutory and administrative requirements of the Act, the Department will be in a position to make the formal funding commitment to these projects. The extent of Federal participation will be determined following the preparation of detailed cost figures as part of preliminary engineering. Further, UMTA's willingness to make specific dollar commitments to these projects will be conditioned on obtaining assurances from you with regard to certain matters which have been addressed in several recent major Departmental grants, including:

- (1) commitments to supportive public and private investments in the project areas which will help to ensure that the economic development benefits of the projects are being realized;
- (2) commitments from the grantee and from labor unions that significant apprenticeship, job training and employment opportunities will be created for minorities and for unemployed youth in transit construction;
- (3) commitments that full and equal opportunities will be provided to minority owned firms to participate in execution of the projects;

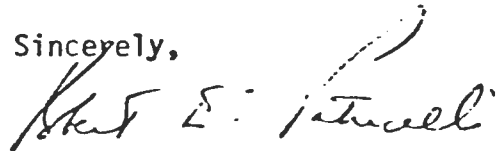
-4-

- (4) commitments from the Commonwealth of Massachusetts and the MBTA to retain a minority-owned consulting firm to advise and help carry out paragraphs (2) and (3), above; and
- (5) commitments from building contractors and labor unions to complete these projects without strikes or work stoppages.

We trust that this letter is helpful in clarifying the status of Federal review of these two significant projects. The \$300 million we are offering constitutes a commitment to the Boston area of about 8 percent of the total Federal capital funding for transit available throughout the nation in FY 1977 and FY 1978, and does not even include Section 3 grants which will be made to the region. This percent substantially exceeds your community's share of nation-wide urbanized area population or transit ridership and, together with \$640.6 million in UMTA capital grants already made to the region, should serve as ample proof of our commitment to assist in implementing your far-sighted program of public transportation improvements in the greater Boston area.

I hope this information is helpful to you.

Sincerely,



Robert E. Patricelli

Questions - XVII

1. Why do you think the meeting was held in Senator Brooke's office?
2. Do you believe that the Interstate Transfer account is an effective way to fund major transit projects?
3. Do you think Boston is getting its fair share of funds?
4. What factors do you believe should be considered in determining what is an urban area's fair share?

Session XVII

The Political Spectrum

"Government Accountability"

Source: Excerpt from "Along for the Ride - People, Politics, & Transportation: California-style," Assembly Committee on Transportation, California Legislature, Sacramento, California, October 1974, by Sid McCausland, Principal Consultant.

Accountability

We can establish standards of accountability for natural monopolies, but so far we haven't tried to make general government services accountable to anyone. There is the budget process and the squeeze-cut-and-trim directives, but they don't begin to equal the acid test of the market place.

City Councilmen, County Supervisors, State Legislators, and Federal Congressmen don't have the tools to judge the effectiveness of most government programs, and given the way interest groups react to challenge, it is not clear that they would want to act on the information if it was available. The only programs which get axed are those which have earned the enmity of powerful people.

There may be a way to make many government services more effective. It involves introducing accountability into the system. For all its shortcomings, government regulation of the natural monopolies has worked fairly well. One reason given for this is that the agency brokering the services for the consumer is not the same as the agency producing the service. When a consumer doesn't like the product of a particular business, there is usually another firm marketing the same product. This isn't true of most government services. With government you generally have to pay whether the service is good or bad.

Perhaps if elected officials perceived their roles as brokers, rather than administrators, they could spend more time concentrating on the quality of service.

Two additional factors are important on this point. It does not matter whether the service is provided by a private or a public entity. It is only important that the management be accountable to the consumer through the elected officials. It may be that this calls for even more structural separation than the current city-manager form of government provides.

The second factor is that, in spite of a growing trend by elected officials to assume double-role appointment to boards which actually manage a public service; elected officials should not be operating managers. They should be policy makers, brokers, public auditors; but not managers. Once the elected official becomes a manager the tendency to become enmeshed in the intricacies of the operation supercedes the necessity for viewing the operations within the overall community policy framework.

The Elected Official's Role

What we need to foster are techniques for opening the process up for innovation and change. Innovation and change which reinforce publicly perceived goals and objectives. Innovation and change which encourages problem solving and open decision making.

Since most elected officials are relatively cynical about their ability to significantly redirect the energies of a government program, they come to view themselves as adversaries of the bureaucracy. This too is a human reaction, but it is based as much on illusion as fact.

The elected officials are one of the keys to bringing government techniques forward into the decade of the 70's. Rather than viewing themselves as adversaries of the bureaucracy, they should view themselves as agents-of-the-people; as brokers who demand the best buy for their customers. The elected official should concentrate on insuring that problems have been defined at a level of sufficient comprehensiveness to encompass the prevailing social, economic, technological, and ecological concerns of the government. The officials should provide the stamp of approval of concensus program goals and evaluation criteria. And finally, the elected official should authorize the program manager to structure, restructure and institute a program aimed at meeting the requirements of the evaluation criteria. From that point on, the elected official should be the people's broker -- not involved in the direct management of the program -- apart from the program, always sensitive to the overriding question of whether or not the consumer is getting what is needed. The emphasis is not on the budget, but on the product. If the program is effective, the budget will be adequate for as long as needed. Once the program is found to be ineffective, regardless of how efficient it may be, the budget and the program should be terminated.

Unfortunately, this idyllic scenario doesn't reflect current government procedures. In today's world, the budget process is more important than program effectiveness. Elected officials are fascinated with the power which accrues to them as they allocate dollars to various items in the budget. Evaluations of program effectiveness are only used as clubs against those who are in disfavor. Dollars are distributed along historical lines, with special supplemental funds going to those currently in the limelight. The elected official is unable to extricate himself from this ancient process for a number of reasons, but one obvious reason is because government does not have to be effective to survive.

The elected officials cannot free themselves from this process by themselves. They need the help of the people.

Questions - XVII

1. McCausland argues for greater public accountability. Do you think that his suggestions for achieving this accountability are reasonable and achievable?
2. Do you believe that the budget process is more important than program effectiveness as stated by McCausland?

SESSION XVIII: THE FUTURE

Objectives of Session XVIII

- . To be able to identify basic issues in public transportation financing and administration over the next decade
- . To be able to describe generally the future outlook for public transportation in the United States
- . To be aware of the types and status of innovative equipment or concepts in public transportation

Synopsis of Session XVIII

The future outlook for critical aspects of public transportation will be discussed in this session. Future roles of local, state, and federal governments are described based on present trends in legislation and policy statements. Innovations in public transportation will be addressed.

Outline for Session XVIII

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Public Transit Needs
3	Public Transportation Financing
4	Administration of Public Transportation
5	Public Transportation Innovation
6	Summary

SESSION XVIII
THE FUTURE

1. Introduction

What happens to public transportation in the future will significantly influence urban development and our way of life. It is likely that 1977 will see the continuation of government policies and programs aimed at making public transportation a more viable and integral element of the urban transportation system. Legislation and regulation to this end will be forthcoming from the new Congress.

2. Public Transit Needs

a. Projected Trips

The 1974 National Transportation Report developed forecasts of future transit usage with 1971 as the base year. These forecasts are shown in Table XVIII-1. They indicate an overall doubling in public transportation usage from the low point of 1971 to 1989. The growth rates increase as city size decreases, which indicates the greater potential in those areas not now well served by transit. The category of "other systems" showed the largest increase, which would appear to reflect the potential for paratransit.

Table XVIII-1. Annual Passenger Trips on Public Transportation, by Mode and Population Class, 1971 and 1989

(Millions of passenger trips)

Mode and Year	Urbanized-area Population, thousands						Total All Areas
	2,000 and over	1,000 and under 2,000	500 and under 1,000	250 and under 500	100 and under 250	50 and under 100	
1971:							
Bus	2,739	630	488	220	153	52	4,282
Rail rapid	1,782	8	9	6	0	0	1,805
Commuter rail	271	(1)	(1)	(1)	(1)	0	271
Other systems	24	9	0	1	0	0	34
All Modes	4,816	647	497	227	153	52	6,392
1989:							
Bus	4,222	1,716	1,105	677	475	190	8,385
Rail rapid	3,103	513	281	53	3	0	3,953
Commuter rail	445	7	37	1	(1)	(1)	490
Other systems	32	295	202	191	125	4	849
All Modes	7,802	2,531	1,625	922	603	194	13,677

¹Less than 0.5

Source: Ref 1.

The 1989 forecasts are equal to the level of patronage experienced in 1954 and only 60% of the World War II peak when the U.S. population was 55% of its forecast 1989 total.

Any forecasts of public transportation patronage is subject to so many assumptions on physical and economic conditions, as well as government policies that a single number has little relevance. It can be concluded, however, that the bottom has been reached in transit patronage and that a growth of undetermined magnitude can be expected in the coming years. This growth will vary from area to area and even within an urban area depending on the level of service provided.

b. Future Needs

The future needs of public transportation have been examined in a number of studies. The capital costs of new facilities and equipment for urbanized areas were reported upon by the 1974 National Transportation Report and are summarized in Table XVIII-2. The table shows the costs by mode for various sized urbanized areas and for the periods 1972-1980 and 1972-1990. The information is based upon surveys conducted by the states in conjunction with the urbanized areas. For the 18 year period between 1972-1990, capital costs alone average nearly \$3.5 billion annually. This is substantially in excess of what is currently spent by the transit industry on capital improvements.

Table XVIII-3 presents the same data on a per capita basis. Note that per capita expenditures in areas over a million are ten times greater than those under a quarter million.

Table XVIII-2. Public Transit Capital Costs, By Mode, 1972-1980 and 1972-1990 (Millions of 1971 Constant Dollars)

Urbanized Area Population (Thousands)

Mode	2,000 and over	1,000 & under 2,000	500 under 1,000	250 & under 500	100 & under 250	50 & under 100	Total All Areas
<u>1972-1980</u>							
Bus	1,736	791	732	302	173	66	3,800
Rail	10,872	2,398	175	145	0	0	13,590
Commuter Rail	3,443	2	18	0	1	0	3,464
Other	550	808	170	107	4	*	1,639
Total	16,601	3,399	1,094	554	178	66	22,492
<u>1972-1990</u>							
Bus	3,083	1,778	1,898	806	414	190	8,169
Rail	31,449	6,781	2,417	784	146	0	41,577
Commuter Rail	5,337	35	41	14	8	2	5,437
Other	523	2,874	1,819	990	83	83	6,372
Total	40,392	11,469	6,176	2,594	650	275	61,556

* Less than \$500,000.

Source: Ref. 1

Table XVIII-3. Public Transit Capital Costs Per Capita By Mode, 1972-1980 and 1972-1990 (1971 Constant Dollars)

Mode	Urbanized Area Population (Thousands)						Average All Areas
	2,000 and over	1,000 & under 2,000	500 & under 1,000	250 & under 500	100 & under 250	50 & under 100	
<u>1972-1980</u>							
Bus	26.50	38.16	30.62	20.08	12.16	11.04	26.13
Rail	166.00	115.67	7.30	9.60	0.00	0.00	93.47
Commuter Rail	52.57	.09	.74	0.00	.05	0.00	23.82
Other	8.40	38.96	7.09	7.13	.29	.05	11.27
Total	253.46	192.87	47.45	36.81	12.50	11.10	154.69
<u>1972-1990</u>							
Bus	41.58	71.90	66.65	44.14	24.74	26.02	48.15
Rail	424.06	274.19	84.90	42.93	8.71	0.00	245.07
Commuter Rail	71.97	1.42	1.45	.74	.45	.32	32.05
Other	7.06	116.22	63.89	54.20	4.96	11.31	37.56
Total	544.66	463.73	216.89	142.01	38.85	37.65	362.83

Source: Ref. 1

Owen in the report "Transportation for Cities" (2) combined data from several sources including the 1974 National Transportation Report to show the increase in fleet size and route miles as related to capital expenditures between 1972 and 1990. These changes are shown in Table XVIII-4.

Table XVIII-4. Projected Change in Vehicle Fleet and Route Miles and Capital Expenditures for Transit, 1972-1990

Type of Transit	Number of vehicles in fleet		Route Miles		Capital Expenditures Between 1972 and 1990	
	1972	Increase 1972-90	1972	Increase 1972-90	Amount (billions of 1971 dollars)	Percentage of Total
Bus	50,100	24,000	49,200	26,500 ^a	8.2	13
Rail	10,600	7,500	3,200	1,580 ^b	41.0	67
Commuter Rail	n.a.	700		20	5.5	9
Other ^c	0 ^d	7,900	0	3,400	6.9	11
Total	60,700 ^d	40,200	52,400	31,500	61.7	100

Sources: American Transit Association, 1974-75 Transit Fact Book (Washington, D.C.: ATA, n.d.) p. 24; U.S. Department of Transportation, "A Study of Urban Mass Transportation Needs and Financing" (Government Printing Office, 1974; processed), pp. 111-16, 18, 19, 21; and Department of Transportation, "1974 National Transportation Report" (Government Printing Office, 1974; processed), pp. V-7, 8. Figures are rounded.

n.a. Not available.

a. Includes 1,400 miles of new busways or exclusive bus lanes.

b. Includes 1,200 miles in cities with no rail service at the present time (586 miles in Washington, Atlanta, Baltimore, Detroit and Los Angeles and the remainder in small cities).

c. Includes personal rapid transit, skybus, people movers, dial-a-ride, and similar systems.

d. Does not include commuter rail figures, which are not available.

All told, a 60% increase in fleet size is anticipated between 1972 and 1990. Increases for bus and rail systems are generally equivalent with the largest gains being shown in the "Other" category which includes the paratransit and AGT systems. In general, the increase in fleet size and route miles served is indicative of the potential increase in person-trip capacity. However, greater utilization of equipment, especially during non-peak periods can substantially increase the person carrying capacity on a daily basis.

c. Elderly and Handicapped

The transportation disadvantaged are demanding and will receive greater attention in the next decade. Federal requirements dictate that public transportation must serve their needs, cost implications aside. This category of user is growing at a greater rate than the population and will become an increasingly larger user of public transit services. It is likely that peak hour incentives will also be extended to the transportation disadvantaged.

d. Spatial Distribution of Jobs and Residences

Restructuring of urban areas has been cited as the most feasible means of solving the urban transportation problem(2). Creating higher density employment surrounded by high density residential areas will be more conducive to public transportation than the widely scattered development patterns currently in use. Nationwide changes in the land patterns of our major cities will take many decades, however. Government policies in the past few years have not changed to the extent that would halt continuing suburbanization. On the contrary, many of the suburban jurisdictions are aggressively pursuing non-residential development in competition with center cities as a means of easing residential tax burdens.

Much of the suburban development is being concentrated in corridors or areas that have traditionally been poorly served by public transportation. The challenge to the transit industry during the next decade will be to expand existing services and develop new services that make these new developments less dependent on the private automobile.

e. Reliance on the Automobile

During the next decade, we can expect that transportation policy makers will move towards provision of public transportation services that will allow urban dwellers a greater freedom of mode choice. This will not be for all trips or at all times during the day. Particular emphasis will be given to the journey to work and to radial service from suburb to center city. More direct service will be provided and greater use of fringe parking coupled with express bus service can be anticipated. Wider use of the variety of paratransit options will be experienced with further integration of these services into the total system.

Major emphasis will be placed on enhancing the image of public transportation in the minds of the general public. Likewise a greater public awareness that the use of public transportation is a viable option is needed.

3. Public Transportation Financing

a. Proposed Legislation

Federal participation in the financing of both capital and operating costs for public transportation has increased dramatically during the last decade. The National Mass Transportation Assistance Act of 1974 was particularly important in that it provided Federal operating assistance for the first time. The present legislation is by no means a plateau of Federal financial participation. Senator Williams (D.-N.J.) has introduced a bill entitled "The National Mass Transportation Assistance Act of 1977." (3)

Key features of the proposed 1977 bill are set out below.

Section 3, Capital Grants: Five-year (Fiscal Years 1978-1982) obligation levels are set at a total of \$11.4 billion reflecting an increasing annual rate of: 1978 - \$1.9 billion, 1979 - \$2 billion, 1980 - \$2.2 billion, 1981 - \$2.5 billion and 1982 - \$2.8 billion; sets aside, from the \$11.4 billion, an administrative apportionment of \$500 million annually for equipment purchases; permits the use of \$500 million in non-urbanized area funds for operating as well as for capital assistance; and adds a provision for the forgiveness of certain loans under Section 3(a).

Section 5. Formula Grants: Extends the formula grant program to 1982 by adding \$125 million in 1980 (making up for the transition quarter), \$1.1 billion in 1981 and \$1.25 billion in 1982; authorizes new funds of \$250 million annually for five years for supplemental discretionary grants for capital or operating projects to maintain essential commuter rail services, increase service innovations and assist high impact areas; and provides for the return of unobligated, formula-apportioned funds (if not used within two years of apportionment) to be made available to all areas under new discretionary Section 5 authority (estimated to amount to \$30 million at the end of FY 1977).

Section 16, Elderly and Handicapped:

Provides for the determination by the Secretary of Transportation on mobility provisions for the elderly and handicapped by accessible, regular fixed-route services or substitute special services; gives the Secretary authority to mandate the purchase of accessible equipment in order to assure mobility; requires local advisory committees and a national advisory council; and requires a report to Congress on public transportation needs of elderly and handicapped persons.

Reporting: Requires a report to Congress on funding requirements in 1980 and 1982.

The U. S. Conference of Mayors along with the National League of Cities and APTA have asked the new Administration for \$11 to \$12 billion more in urban transit aid by 1981. This would be in addition to the \$11.8 billion over six years provided by the National Mass Transportation Assistance Act of 1974. Senator Williams' bill seems to respond to this request.

b. Industry Proposals

APTA recently surveyed the needs of its members for the period 1977-1981. The transit properties were asked to estimate capital improvement costs based upon three scenarios which included no expansion, limited expansion, and all planned expansions. Under the limited expansion assumption, almost 21 billion dollars in capital improvement expenditures is needed of which the Federal share would be \$8 billion.

APTA has established its own Ten Point Action Plan for improving public transportation. These ten points include:

- . Realistic updating of the federal financing program.
- . Formulation by Congress of a National Transportation Policy.
- . Development of a comprehensive energy program which recognizes the short and long range importance of public transit.
- . Development and implementation of comprehensive recruiting, training, and managerial training programs.
- . Implementation of actions to resolve operator-supplier problems with regard to procurement of rail cars and buses.
- . Resolution of problems concerning the industry's ability to carry out vitally needed research and development.
- . Development of a National Model Program to expedite the movement of buses on city streets.
- . Development of an industry insurance program to provide consistency in and minimum premium payments for important coverage.
- . Development of a National Program to ensure personal security and to increase confidence in the use of public transit.
- . Renewed efforts in the broad field of equal opportunity and affirmative action, with particular emphasis on the recruiting, training, and advancement of minorities and women.

The ten point program is an indication of how the industry views its needs and what areas need attention in the upcoming years.

4. Administration of Public Transportation

Significant changes in the manner in which public transportation is administered may be anticipated during the next decade. The goal will be to better integrate public transportation into the urban transportation process. The administrative concepts of the mid-70's will no doubt be translated into the programs of the 80's.

a. Institutional Changes

1) Surface Transportation Administration. At the Federal level there appears to be a gathering momentum to merge the functions of FHWA and UMTA into a surface transportation agency. This reorganization has been discussed for a number of years but with some reluctance by both parties. However, as the missions of UMTA and FHWA draw closer to each other, the logic of fully integrating the operations becomes stronger.

2) Transit Ownership. The exodus of private owners from the transit industry can be expected to continue during the next decade especially for those systems that provide areawide service. In general, the economic and institutional barriers are too strong to permit profitable operations. That is not to say that privately operated transit properties will become a thing of the past but they will be a diminishing portion of the industry.

3) The MPO's Role. The future role of the MPO's remains an unanswered question. Recent federal regulations seem to have given them an upper hand in planning and implementing urban transportation policies and actions. However, it is unlikely that major local jurisdictions will sit idly by and allow a non-elective body to determine local priorities and programs. Aggressive MPO's may find their knuckles being rapped by jealous local agencies.

Frederick Salvucci, Massachusetts Secretary of Transportation succinctly stated the problem and offered a solution with regard to the Federal, state, and local government situation(4).

"On the matter of federal, state, and local relationships. State officials, such as those of us in AASHTO, and local officials, such as those in the League of Cities or the U.S. Conference of Mayors have at times tended to treat as an article of faith that each, respectively, should band together and demand that the federal transportation administrator deal directly with each, bypassing the other. This issue arises in spades in the case of the federal transit program, where the possibilities are legion. Mayors, transit operators (some local, some regional and some state), heads of state highway agencies, state secretaries of transportation, governors -- all or most of these are involved in varying degrees in transit capital or operating matters, depending on the pattern selected by a state legislature or under a state constitution for the governance of an urban area.

What, then, should federal transit legislation provide on this issue? Many of us, whether state or local officials, are aware of the dangers here as manifest in the U.S. DOT's episode with the "Metropolitan Planning Organization" regulation.

The basic federal legislative principle on the federal, state, and local relationship in the transit program might be simply to require the federal administrator to look to those officials held responsible under a state's organic law for the planning, financing, and implementation of transit capital improvements, and for the operation or financing of operations of the transit system. The point here is that it is very dangerous for federal law to permit, much less require, a federal administrator -- who is accountable for the investment of millions of federal dollars -- to deal with a state or local official not responsible under governing law for financing of the transit program. A functional approach such as that being described here ("who pays") may involve a multiplicity of non-federal officials for the federal administrator to have to deal with, but that is a problem inherent in our federalist system, and one that I am not disposed to attack here."

4) Transportation Broker. An institutional arrangement which may get greater use in the coming years is that of the Transportation Broker. The interest in this concept, pioneered in Knoxville, Tenn. is great. The system allows an umbrella agency to act as a broker, utilizing the services of public and private agencies in the most efficient manner to serve the varying needs of the urban area. The broker could act as the non-profit middleman in providing Federal and state funds to private operators. It would appear to be a feasible means of integrating a number of public and private transit services into a comprehensive areawide system with the least amount of institutional and regulatory changes.

5) Transit Association or Federation. Another institutional arrangement is where two or more public and/or private carriers serving the same area join to provide a single public transportation service without actually merging. The Metropolitan Transportation Commission in the San Francisco Bay area has adopted some measures in this regard including a common map of transit routes.

b. Regulatory Changes

Changes in Federal, state, and local regulations have generally lagged behind the recent events in public transportation. In many cases, the regulations which were instituted when transit was largely a private industry are no longer applicable. They often stifle the integration of the various transit systems and hinder the effective use of a particular system to serve a market segment. Much of the regulatory problem is identified with the newly emerging paratransit services. In particular, revision of regulation that limits the entry of taxis is required. Regulations which tend to restrict the full use of private transit services also

need to be reviewed. Changes in the application of the Section 13c regulations are one of the areas of regulatory change that may be anticipated in the next decade.

Vuchic, in a recent article, made the following statement (5):

"The goal of public regulation in urban transportation is not to maximize the profits of the operators, but to ensure adequate public service and protect public interests including users, community, and the entire urban environment."

c. Improved Financial Mechanisms

The grant process which UMTA has used in awarding capital funds has been criticized as cumbersome, time consuming and arbitrary. UMTA has recognized these deficiencies and has proposed new procedures for approving capital grants. The new process would move major UMTA decisions to an annual basis by using a single submission instead of the current process which is on a project by project decision. The thrust of the proposed new procedure as well as those that will ensue are to speed up the federal funding process and enable the local authorities to better plan their financial operations.

5. Public Transportation Innovation

What innovations can we anticipate during the next decade that would significantly affect public transportation? The answer is probably very little if the last decade was any guide. However, innovations in both institutional arrangements and technology will continue and some of the more important items are discussed below.

a. Auto Use

The auto will remain the dominant mode for urban travel for the foreseeable future. This fact of life has been noted in a number of recent studies. In a recent DOT report entitled "National Transportation Trends & Choices to the Year 2000", it was concluded that automobiles will continue to dominate American passenger travel and transportation problems for the balance of the 20th century (6). The report did warn, however, that major urban center cities face destruction if public transportation is not made dramatically more attractive.

Another recent report prepared by the Regional Plan Association of New York for UMTA made the following points (7):

- . 96% of all urban travel today is by automobile
- . Half of the nation's transit travel occurs in the New York City region which makes up less than one-tenth of the national population.
- . Even during transit's best days in World War II, transit ridership was only 14% of all urban travel.

The RPA report concludes that the most effective way of solving our urban transportation problem lies in changes in the nation's urban development pattern through increasing the size and compactness of downtowns and other clusters of employment and by increasing residential densities especially near downtowns. It goes on to acknowledge that increasing the density of urban areas in America "flies in the face of a long term trend."

Autos can be expected to become more energy efficient with lower pollutant emissions. Continued importance will be given to increasing auto occupancy through expanded carpooling campaigns. Under any set of reasonable assumptions, auto use will continue relatively unchanged during the next decade, although the cost of travel both in dollars and travel time may increase.

b. Auto Restricted Zones

UMTA has selected several cities where it hopes to demonstrate the benefits of auto restricted zones (ARZ). There are several European and Asian cities where ARZ's have been implemented on a fairly extensive basis. However, the experience in the U.S. has been quite limited both in numbers and in sizes. ARZ planners hope to reduce transit travel times and increase transit usage by making transit more attractive in comparison to auto travel. It can be expected that wider use of the auto restricted zone concept will be made in the next decade.

c. Bus Use

As noted in Table XVIII-4, a sizeable increase in the bus fleet can be anticipated in the coming years. The buses will be used in traditional means as well as in innovative services.

1) Exclusive Lanes. More extensive use of exclusive bus and other high occupancy vehicle lanes can be expected during the next decade. Facilities such as the Shirley Highway Express Lanes, the San Bernardino Busway, the Orange Streaker in Miami, have all proven that good bus service will get people out of their automobiles. More extensive use of preferential treatment for high occupancy vehicles can also be expected on arterial and city streets.

2) Paratransit. Paratransit services will expand during the coming decade. The myriad of uses that the various paratransit services can provide are only now beginning to be recognized. The advantages of paratransit are also being noted by many conventional transit systems as ways of expanding their service or more fully integrating services. Institutional problems may well plague wide scale use of paratransit but it appears that this problem is being addressed and considerable progress can be anticipated in the coming years.

3) Vehicle Types. A variety of vehicle types have been introduced over the last few years and should see wider use in the future. A greater emphasis on fitting the vehicle to the market is the basic factor behind this. Particular attention will be given to the smaller vehicles (12-25 passenger) in terms of developing more dependability and longer life. Greater use of articulated and double deck buses may also be expected on high volume lines.

Countering the trend to greater vehicle types will be the government stressing of greater vehicle standardization as one means of holding down costs.

d. Automated Guideway Transit

As indicated in Session VI, several AGT systems are in operation in selected environments. These include the Morgantown PRT, AIRTRANS at the Dallas-Fort Worth Airport, and the Shuttle in Tampa. The systems implemented thus far are special purpose and have limited applications. Their high costs and technological problems have put a damper on widespread use. However, research and development is being continued by UMTA and TSC and some limited additional uses can be expected during the next decade. In general, however, AGT systems will have made little impact on public transportation during the next decade.

1) Downtown People Movers. The most likely near-term application of AGT systems will be as downtown People Movers. Four cities have been selected by UMTA in which to test downtown people mover systems. The objective of the demonstration is to determine feasibility of moving large numbers of people in densely developed downtown areas including as a distribution system for existing or planned transit systems. Several operational people mover systems can be expected during the next decade with a major nationwide application depending upon the success of the demonstrations.

e. Waterborne Transit

In recent years, UMTA has funded several projects relating to ferry service in urban areas. The most extensive system is in the San Francisco Bay Area from Marin County to downtown San Francisco. Although ferries have limited applicability in most urban areas, we can expect to see further programs where appropriate conditions exist.

6. Summary

The resurgence of public transportation which began in the early 1970's will continue for the rest of this decade and into the next. Greater funding for both capital and operating assistance can be expected from all levels of government. Improved public transportation will be viewed as an essential element in upgrading and redeveloping our major central cities.

Increasing attention will be paid to overcoming institutional obstacles so as to allow better integration of all existing and planned public transportation services. No radical departure from existing technology is expected in the next decade. Innovative use of and improvement to currently available systems is most likely. The public takeover of transit systems will continue. New and more permanent funding mechanisms will be found to support public transportation services.

The automobile will continue to play the major role in urban transportation although public transportation, particularly during the peak period, will be the basis on which our large central core areas are revitalized.

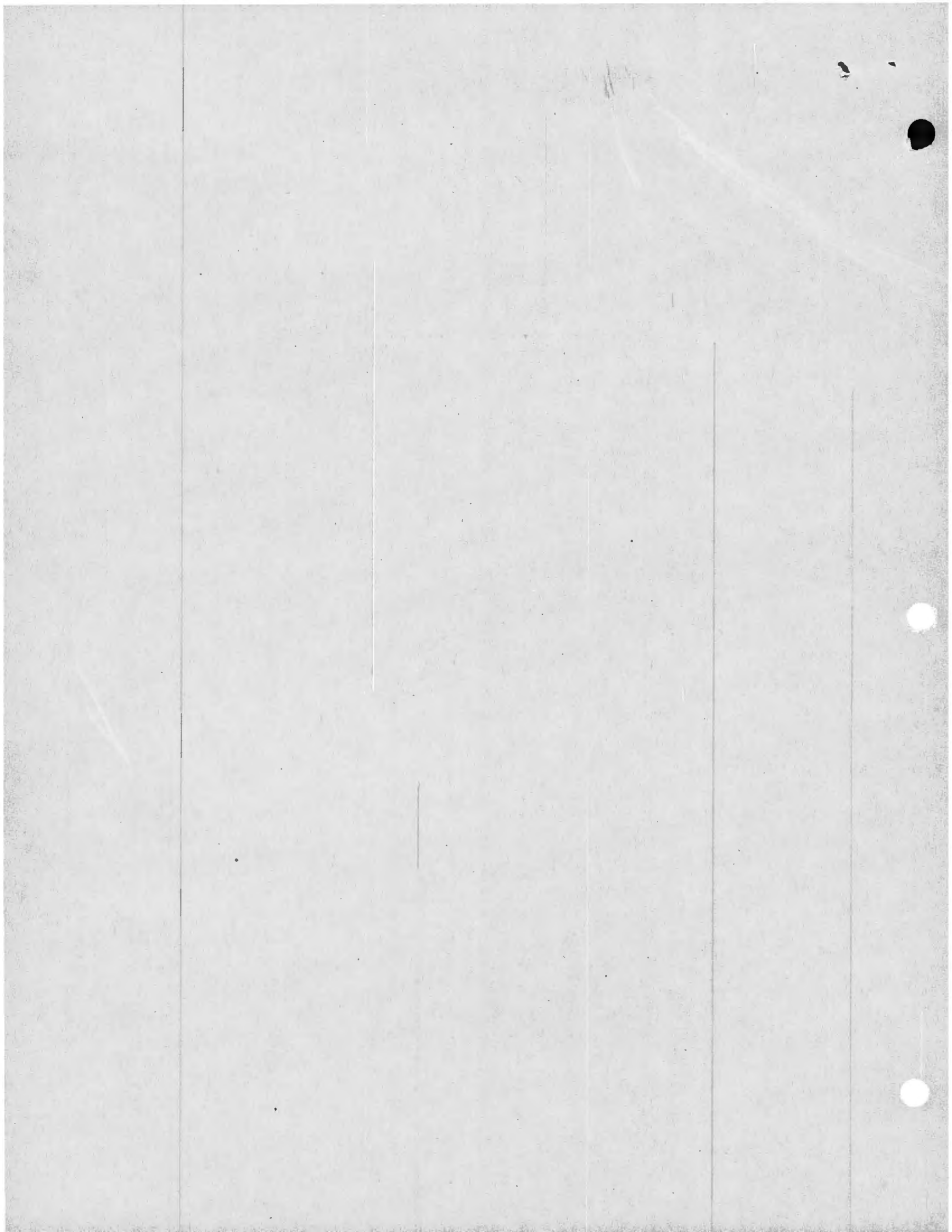
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Session XVIII

Energy Oil and Public Transit⁽¹⁾

- (1) Source: Remarks made by Milton Pikarsky, Chairman of the Regional Transportation Authority of Chicago, Ill., at the APTA Legislative Conference on March 8, 1978.



Discussion of Energy, Oil Imports and Public Transit

Presented by

Milton Pikarsky, Chairman
Regional Transportation Authority
Chicago, Illinois

at the

APTA 1978 Legislative Conference
March 8, 1978

Discussion of Energy, Oil Imports and Public Transit

Let me share with you a very different scenario. Since this nation is a representative democracy, we tend to react to crises of catastrophic events--a world war, the introduction of the contraceptive pill, the OPEC oil embargo. The OPEC oil embargo is one of the major events that is changing the form of public transportation.

Let me suggest to you one consequence of the embargo. All of the OPEC nations had a reserve currency of \$3 billion at the end of 1972. At the end of 1977, they had \$155 billion--the greatest transfer of wealth in the history of the world. And what does this mean? The impact of this transfer is affected by the way the OPEC nations have invested their money. They aren't investing it here in American productivity or in enterprise which create jobs, new wealth or increase the standard of living. In fact, we find that in 1975 and 1976, there has been a decrease in the incomes of American families by two to three percent each year. Although we haven't seen the 1977 figures--the indication is that we will probably see the same thing.

We are spending dollars buying foreign oil which were not spent before. In the 1950's, we produced 99% of the petroleum needed for domestic consumption. Today, it is less than 50 percent. This past year we exported goods and services of \$18 billion more than we imported if you exclude crude oil. Our outflow for imported oil was \$45 billion. This resulted in a net outflow of some \$27 billion.

And what does that mean? In a simplistic way, when our standard of living improves, each dollar of gross national product is provided 50 percent to labor and 50 percent to management as being a fair and equitable distribution. Labor was able to ask for more goods and services, management had the wherewithal to provide for more capacity, employ new employees, and the upwards cycle began and continues to begin. What is happening now is that instead of the dollar that is generated here for gross national product, 20 cents goes to the OPEC nations and 80 cents is divided perhaps into 50 cents to labor and 30 cents to management; labor being offered goods and services. But management does not have the wherewithal for the plant capacity, for the inventory, for maintaining the labor force, and the cycle downward begins. If labor gets the 30 cents and management gets the 50 cents--well--management may have the money for the new plant capacity, but labor isn't buying and we have the downwards cycle. We are in that period and it is going to continue.

It is the feeling of many people that I have spoken to in the economic field that this outflow of U. S. dollars is a crisis. We talk about an energy crisis, but for the time being, there is an ample

supply of energy available if we have the money to pay. We have seven percent of the world's population here, we consume about 35 percent of the world's energy and we can continue to do that if we have the money coming here and can spend it--but we don't have it. So there is a feeling that since the OPEC nations are mainly putting their money into certificates of deposits, in funds that are accruing interest which do not produce any wealth in this nation for the government, we will come to a rapid crisis late in 1979 or very early in 1980. In a democratic society it is difficult to determine what we should do to make a change. The recommendation is to reduce the amount of crude oil that we depend upon from foreign countries. We say, perhaps, that we can put some constraints on that.

We know the love affair for the automobile politically precludes auto constraints so we drift until the crisis situation is upon us and we are right in over the brink and up to our necks.

Some changes are beginning to be observed. One of these changes is that the post World War II baby population that is now the 15-30 year age group is entering the housing market. They are deciding that they cannot afford the single family dwelling, to have a standard of living and a quality of life that provides the best attributes of a happy existence. Many are taking part in a big migration back to center cities and suburban sub-center cities where the housing patterns are more dense, where we have the townhouse, the condominium types, where we have common walls, less window space, reduced energy consumption, and greater densities. All of this will help encourage the use of public transportation. It is a feeling and a belief by many of us that we will see a resurgence of rail construction (whether we call it light rail or heavy rail), electrically operated and designed for connection between center cities and sub-center cities with feeder buses serving the periphery. Toronto and Ontario have done some extensive studies which have shown that an initial front end investment for expanding the Toronto line by about \$5 billion will help develop the economy of Ontario, would use electrical energy, and would tend to pay off over a period of 25-35 years all of the investment by a reduction in imported oil costs.

We find that, in this nation, since the political official who has to make the decision for the large up front capital investment has a life span of two to six years, he doesn't want to take the risk of providing the additional taxes or additional money to do that when he doesn't see a return for ten, fifteen or twenty years.

So we come to the current state, the present state, where we are in a situation of the standard of living going down; where there may be a large additional amount of unemployment and this is predicted to come late in 1979 or early 1980--we will have to change incrementally.

This isn't going to be an overnight radical change. The change comes over a period of some 20-30 years. We have these factors all in play now, interacting. We have an opportunity now to change a direction which will provide for a lifestyle and a standard of living that will be a successful, happy one. Coming to the point of a change late in 1979, you see the changes in Congress from those people who are aware of the interaction. These changes are working to the advantage of public transportation. When Jim Howard and Jim Wright are publically speaking of public transportation, it isn't because they have necessarily seen a new light of day compared to their prior highway advocacy. They see the issue of the economic well being of the nation, the interaction of the automobile, public transportation and the dollars that are flowing out of this country.

So, I suggest to you that one of our important goals should be to provide the embryo transit system, so that our society can move away from the excess of use of petroleum energy. We must put into the place the buses, rail systems, and other electrically-operated transit systems and increase the needed operating assistance. We must put the system in place now, even though today, in some cases, it is underutilized; even though today, many say that the national needs to plug more money for highway funds for repair bills and services and leave public transportation as it is. This is a perspective that we have to overcome. We can be articulate in what is needed. I believe that we have time on our side and there will be a major change in behalf of public transportation. As predicted by the economic's survey that was made by Frost and Sullivan, which said that while we only now carry about four percent of our total trips on public transportation, by the 1990's, we should see up to 29 percent and I think that is a realistic prediction!

Questions:

1. Do you agree with Mr. Pikarsky's implication that public transportation can solve our nation's energy problems? Explain.
2. What is the author's major recommendation, and do you agree? Why?
3. Do you agree with his prediction for a 29% share of trips by public transportation in 1990? Why? What are some necessary conditions for this to occur?

Session XVIII

The Future

Visions of the Future⁽¹⁾

(1) Source: Remarks by former FHWA Administrator Tiemann at Syracuse University, April 2, 1976.



DEPARTMENT OF
TRANSPORTATION



NEWS

FEDERAL HIGHWAY ADMINISTRATION

WASHINGTON, D.C. 20590

VISIONS OF THE FUTURE

* * *

REMARKS BY FEDERAL HIGHWAY ADMINISTRATOR NORBERT T. TIEMANN
AT 1976 SALZBERG PROGRAM, SYRACUSE UNIVERSITY, SYRACUSE,
NEW YORK, APRIL 2, 1976

* * *

I am delighted to be here today to take part in this panel and roundtable discussion. This is the first opportunity I have had to visit Syracuse, and I welcome it.

Our subject today, "Modal Visions," is an intriguing and provocative one, for history has demonstrated repeatedly that today's dreams often become tomorrow's reality.

As it happens, I recently was asked to write a magazine article on what the transportation picture in the United States will look like 25 years from now, in the year 2001. I think some of the things I said in that article would be pertinent here today.

Now, to predict what might happen a quarter century into the future is pretty risky, at best.

For example, who, in the World War II year of 1944, would have had the temerity to predict that the United States would land men on the moon 25 years later, in 1969? For most of us, certainly, that thought was as remote as the moon then was from the planet Earth.

On the other hand, change often does not come as rapidly as we sometimes foresee. In 1950, for instance, there were some who believed that by now we all would be enjoying automated highways. That has not yet come to pass.

Also, who in 1950 envisioned that this Nation was on the brink of embarking on the greatest roadbuilding program the world has ever known? Yet just 6 years later, Congress enacted the legislation that launched the 42,500-mile Interstate System. And in 1950, who would have had the prescience to foretell the incredible collapse of the American railroads?

Obviously, then, prophecy is an inexact science, to put it in the most favorable light.

However, with considerable trepidation, and with the hope that no one will hold me to them, I submit the following thoughts:

--The automobile, in some form, will continue to be the predominant form of transportation in this Nation. However, it will be much more energy-efficient and will come in great variety. Passenger vehicles will range from very high mpg mopeds to multi-passenger van-buses, and recreational vehicles with a high proportion of diesel and some Sterling cycle engines. Low powered electric and other two- or three-seat vehicles capable of practical maximum speed of 30 mph for use in neighborhoods and urban areas; carefully streamlined high speed intercity vehicles in two- and five-seat models, and very light utility vehicles serving the pickup and van role will be available.

--Motor fuels will include gasoline blended with 20 to 30 percent methanol, diesel fuel, nonpetroleum fuels from coal, gasahol (made from corn), cellulose products and wastes and electricity. Great progress will have been made in developing and producing synthetic fuels.

--Fuel, in terms of 1976 dollars, will cost about \$2 per gallon, including taxes, but expenditures per passenger-mile will have increased less than 100 percent, perhaps only 25 percent, for the conservation-conscious family.

--Trucks will be operating in designated lanes on selected intercity routes as trains of 3 to 12 semitrailer units behind a single tractor truck, with tandem axle loads of 40,000 pounds.

--Carpooling will be an established way of life. During rush hours in urban areas, more than 75 percent of the automobiles used for commuting will carry more than one person.

--Control technology will have been developed and be in use which will permit vehicles to travel at much closer

- 3 -

headways more safely.

--Exclusive bus lanes will be in use in all large urban areas.

--There will be much more emphasis on para-transit facilities. Buses will continue to play a major role in the urban mass transit picture, but unless there are major technological breakthroughs which greatly reduce the capital investment, few new subway systems will be in use. There will be increased use of "light" fixed rail facilities (an updated version of the old trolley cars), and monorail may play a very limited role in certain areas.

--All major cities will have several ARZ's--automobile restricted zones.

--Some new Interstate System-type freeways will have been constructed, but the focal point of the Federal-State highway program will be on expanding the capacity of existing Interstates and dramatically upgrading the existing Primary and Secondary roads (by then known by other names).

--Federal highway funds will be available for use by the States for rehabilitation of existing roads.

--The primary function of the railroads will be the long haul of freight, with piggybacking being used on a much larger scale. Passenger service will exist only in relatively short, high-density corridors (such as Washington-New York), but there it will thrive.

--There will be widespread use of various wastes as materials for highway pavements.

--The Federal interest in all forms of surface transportation will be expressed through a Surface Transportation Administration, which will include highways, rails, mass transit, and the waterways.

--Highway travel will be much safer; vehicles will have many more safety features and our engineering technology will have advanced to the point that the roads constructed in 2001 will make those we know now look out-of-date.

Well, that about covers it. I am sure that everyone here can make predictions of his own concerning our transportation system 25 years down the road. But let's all remember--at this point we're only guessing!

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Questions - XVII

1. What forecasts related to transit do you agree or disagree with? Why?
2. Do you agree with the comments on carpooling and on auto restricted zones? Why?
3. What other predictions would you make related to transit?

Session XVIII

The Future of
Public Transportation

"Federal Aid and Key Policy Issues" (1)

(1) Excerpt from Transportation for Cities, Wilfred Owen, The Brookings Institution, 1976.

For many years federal transportation policy ignored the problems of the cities. In fact, federal highway aid at one time could not be applied in place with a population of 2,500 or more. The major problem then was to build all-weather rural roads, and the agency in charge of road building at the federal level was the U.S. Department of Agriculture. But with the reorganization and revision of road policy that took place in the 1930s and 1940s, federal aid was transferred from the Agriculture Department and expanded to include an urban road program that would eventually create thousands of miles of urban expressways and an extensive system of federal aid for city streets.

Defects in the federal approach to urban transportation were, first, that it ignored public transit and, second, that it paid little if any attention to the interrelationship between transportation and the other aspects of urban development. By the early 1960s the first of these omissions was corrected by the initiation of a continuing transit aid program that has now become a multi-billion-dollar effort. This policy reversal has been accompanied by a substantial liberalization of federal aid for highways that is moving rapidly in the direction of a unified transportation program for urban areas. The second defect may be overcome by a transportation planning process that relates the financing of transportation facilities and services to comprehensive programs for the long-term development and redevelopment of urbanized areas.

An Overview of Federal Programs

A continuing program of federal aid for urban transportation began in 1944, when urban highways were made part of the established program of federal aid for state highways. But the highways eligible for aid were the extensions of rural highways through and around cities and were never considered an integral part of the urban transportation system. The objective was rather to facilitate intercity movement by the removal of urban obstacles.

Today the emphasis continues to be on intercity routes through and around urban areas as the Interstate Highway System has become the major focus of the federal highway program. A total of 8,800 miles of urban highways are included in the 42,500-mile interstate network, which is now 85 percent completed with a current price tag of more than \$70 billion. The federal share of the total cost has been 90 percent. In addition to the interstate mileage, work continues to be done on the 39,000 miles of urban extensions of state primary and secondary highways that are eligible for federal aid, and an additional urban system was recently authorized that includes other major streets not in the primary or secondary systems. This new network is expected to total as many as 190,000 miles.¹

Federal aid for urban public transit did not begin until after the passage of the Urban Mass Transportation Assistance Act of 1964, which established the first major program of capital grant assistance for mass transportation, following a transit demonstration program and a program of low-interest loans for transit facilities that began in 1961.² In 1970 Congress stated its intent to make \$10 billion available for transit investments over a 12-year period and authorized the expenditure of an initial \$3.1 billion. The total transit authorization was later doubled.³ The federal government paid two-thirds of the

1. Data on the interstate and urban highway systems are from Motor Vehicle Manufacturers Association of the U.S., *1973/74 Automobile Facts and Figures* (Detroit: MVMA, n.d.), p. 46; MVMA, *1975 Automobile Facts and Figures* (Detroit: MVMA, n.d.), p. 49; and Highway Users Federation, *Highways, Safety and Transit: An Analysis of the Federal-Aid Highway Act of 1973* (Washington, D.C.: HUF, 1973), p. 5.

2. See George W. Hilton, *Federal Transit Subsidies: The Urban Mass Transportation Assistance Program* (American Enterprise Institute for Public Policy Research, 1974), pp. 5-11, for a history of the early legislation.

3. These authorizations were the result of the Urban Mass Transportation Assistance Act of 1970 and the Federal-Aid Highway Act of 1973.

costs of transit equipment and other capital investments (but 90 percent for interstate highways) until 1973 when this proportion was increased to 80 percent.

The actual amount of aid for transit was relatively modest through 1970, amounting to about 4 percent of total federal outlays for urban transportation during the 1960s. For fiscal 1975, however, the program authorization had been increased to \$1.4 billion, ten times the 1970 level.⁴

From these increased funds, about \$3 billion of federal aid had been made available by mid-1974 under the Urban Mass Transportation Administration (UMTA) for 750 different capital grant projects. The program had helped 230 cities purchase 20,000 buses, and bus acquisitions accounted for one-third of the funds expended. A small group of six cities with rapid transit had been helped to construct 200 miles of new rail rapid transit lines and to buy new rail cars, and these grants accounted for 60 percent of all federal transit aid. Other funds were used to help public agencies purchase private transit companies, and 90 cities were included in this program.⁵

The nature of the UMTA program is illustrated by the 75 grants made during the month of June 1974, involving a total of \$267 million. The grants ranged from \$12,000 to Virginia Polytechnic Institute to develop a methodology for evaluating transit system compliance with civil rights requirements to \$50 million in supplemental grants to help pay for Atlanta's rapid transit. In general these allocations consisted of a large number of small grants for transit planning, often insignificant in amount; a small number of large grants for rail transport; and a considerable number of moderate-sized grants for bus purchases and for the takeover of private transit companies. But the major funding was for rail rapid transit, including new systems.⁶

These federal grants were in addition to state and local sources of transit financing: 17 states and over 80 cities have taken steps of their own to aid mass transportation systems. As early as 1967 New York provided \$1 billion for transit capital grants from a transportation bond issue, and both Pennsylvania and New Jersey provided transit operating subsidies. Massachusetts began paying 90 percent of the debt service on transit bonds for the Massachusetts Bay Transportation Authority from a state cigarette tax. Other states initiated various forms of tax exemptions, rebates, and reimbursements for fare discounts, while many local governments provided annual operating assistance to compensate for deficits.⁷ In 1972 state and local governments were contributing half again as much aid as the federal government.⁸

4. *The Budget of the United States Government—Appendix, Fiscal Year 1975*, p. 713.

5. "Mass Transit: Progress and Problems," Remarks by Secretary of Transportation Claude S. Brinegar at Meeting of Society of Automotive Engineers, Anaheim, Calif., August 14, 1974, *Department of Transportation News*, 05-S-74, p. 5. UMTA was established in 1968 to administer the federal urban mass transportation program.

6. U.S. Department of Transportation, "A Study of Urban Mass Transportation Needs and Financing" (Government Printing Office, 1974; processed), p. IV-16.

7. For information about state and local transit financing, see U.S. Department of Transportation, "Feasibility of Federal Assistance for Urban Mass Transportation Operating Costs" (DOT, 1971; processed), chap. 3.

8. Department of Transportation, "A Study of Urban Mass Transportation Needs," p. IV-16.

National legislation in recent years has altered the federal approach to urban transportation still further. Highway legislation in 1973 made possible for the first time the use of road money for urban mass transit. Transit aid in 1974 put transit financing on a long-term basis, with part of the money to be distributed among urbanized areas by formula. It also made federal money available for operating subsidies as well as capital investment.

The Federal-Aid Highway Act of 1973 authorized nearly \$18 billion for highways over the three-year period 1973-76. Most of the money (\$16.7 billion) has come from the Highway Trust Fund, the repository of federal motor vehicle and petroleum excise taxes that have been earmarked for highways. An estimated \$2.6 billion of this will be spent for urban highways.⁹ Matching provisions call for 70 percent federal financing of noninterstate highway programs—a change from the previous 50-50 matching provisions that became effective in 1974.

The move toward a unified urban transportation program was strengthened by two financial provisions in the 1973 highway legislation. Highway funds allocated to the urban system can now be used for transit projects instead of roads at the option of the local government. Additional provisions make it possible for cities to forgo the construction of further urban interstate highway links and instead to obtain an equivalent amount of general funds from the federal government to pay for alternative transit. There has been only limited use of these provisions, but examples include the use of funds previously reserved for highways for bus and rail projects under the New York City Transit Authority and the approval granted to the Massachusetts Bay Transportation Authority in Boston to withdraw \$600 million from interstate funds for transit.¹⁰

Other aspects of the highway program extend the scope of permissible expenditures far beyond the construction of new roads to programs for improved highway operations and safety, the acquisition of highway rights-of-way for transit, the construction of special lanes for buses, preferential treatment of transit through traffic controls, and the financing of parking space at transit stops. The creation of exclusive bus lanes and busways to expedite bus movement can also be financed through the highway program. But as yet there are only isolated cases of this use of road funds, and no community-wide efforts have been made to combine the two programs.

The National Mass Transportation Assistance Act of 1974 authorized the expenditure of \$11.854 billion for the period 1975 through 1980: \$11.3 billion for urban mass transportation and \$500 million for rural mass transit. The \$11.3 billion of urban money is divided two ways. The distribution of \$3.975 billion among cities of 50,000 population or more is to be used for either capital investments or to pay transit operating subsidies. Federal-local matching provisions are up to 80-20 for construction projects and up to 50-50 if grants are used for operating costs. The other \$7.325 billion made available by the transit program is allocated to capital projects subject to approval by the secretary of transportation. The act provides for federal matching of up to 80 percent of the cost of these capital projects.

The distribution of the nearly \$4 billion of either capital or operating assistance is based on a formula that gives equal weight to urban population size and to population density. These formula funds were made available at the rate of \$300 million in fiscal 1975, and the amount will increase each year thereafter to a level of \$900 million by 1980-

9. This figure is derived from past experience indicating that half the \$3 billion authorized for the Interstate Highway System by the Federal-Aid Highway Act of 1973 will be spent on urban sections. The balance includes \$300 million provided in the act for extensions of state highways within cities, \$800 million for the urban system, and \$50 million for special highways connecting the interstate system in urbanized areas.

10. *Department of Transportation News*, UMTA, 119-74, July 9, 1974; and information provided by the Department of Transportation.

Under the formula distribution, \$1 billion of the \$4 billion total goes to two urban areas—New York and Los Angeles. The New York-New Jersey area will receive \$707 million, or an average of \$118 million annually, while the second largest allotment, to Los Angeles, will total \$318 million, or \$53 million a year. Boston gets \$14 million annually, Baltimore \$10 million, and Houston \$8 million. (See table 2-1.) The difficulty of reflecting needs in a formula distribution based on population can be seen in the fact that Los Angeles, with only 153 million annual trips by transit, gets nearly half as much money as the New York area where there are 12 times as many transit riders and 45 percent of all households lack cars. San Diego, with 13 million transit riders a year, gets the same allotment as Milwaukee, with 63 million.¹¹ No formula could be found that proved wholly satisfactory.

In the case of both formula grants and capital assistance for specific projects, the new legislation requires the recipients of aid to submit a total urban transportation plan as a condition for participating in the program. These

Table 2-1. Projected Apportionment of Federal Transit Aid Funds, Selected Urbanized Areas, 1975-80^a

Millions of dollars

Urbanized area	Transit aid	
	Total, 1975-80	Annual average
New York-New Jersey	707	118
Los Angeles-Long Beach	318	53
Chicago	253	42
Philadelphia	153	25
Detroit	139	23
San Francisco-Oakland	102	17
Boston	87	14
Washington	91	15
Cleveland	56	9
St. Louis	62	10
Pittsburgh	53	9
Minneapolis-St. Paul	44	7
Houston	49	8
Baltimore	59	10
Dallas	33	5
Milwaukee	34	6
Seattle-Everett	35	6
Miami	43	7
San Diego	35	6
Atlanta	32	5

Source: *Federal Register*, vol. 40 (January 13, 1975), pt. 1, p. 2540.

a. Funds authorized under the National Mass Transportation Assistance Act of 1974.

plans must conform with overall urban development plans and include measures to improve the efficiency of transport operations and to conserve energy, improve air quality, and increase social and environmental amenity. Such measures may include the revision of transit fare policies, preferential treatment of transit through traffic regulations, the introduction of staggered work hours, the designation of all-bus lanes, and the encouragement of car pools. Beginning in March 1977 the annual program of an area's projects will not be approved unless supported by evidence that reasonable progress has been made in implementing previously programmed projects. UMTA will strengthen the process of determining appropriate capital investments by requiring cities to analyze the costs and benefits of alternative projects.¹²

11. Household car ownership and transit data are from American Institute of Planners and Motor Vehicle Manufacturers Association of the U.S., *Urban Transportation Factbook* (Detroit: MVMA, 1974), pp. I-25, I-29.

12. *Federal Register*, vol. 40 (August 1, 1975), pt. 3, pp. 32546-47; and *ibid.* (September 17, 1975), pt. 2, pp. 42976-84.

Basic Unresolved Issues

The "1974 National Transportation Report," a cooperative study by state and local governments that deals with transit and highway needs between 1972 and 1990, indicates the magnitude of projected capital expenditures for urban transportation.¹³ In 241 urbanized areas during this period the proposed outlays total one-quarter of a trillion dollars. Whatever the exact amount, these expenditures will have a powerful influence on the future of the cities, and the future of the cities is not being thought about very much as urban areas vie for a share in the 80 percent federal inducement to invest in new capital projects for public transit.

Two-thirds of the \$62 billion of capital outlays now planned for transit is for rail systems, a proportion that suggests the importance to the cities of the decisions now being made for transportation. Bus systems, which are expected to account for 68 percent of the nationwide increase in transit ridership, would involve only 13 percent of the capital cost.¹⁴ And although the \$62 billion spent for transit may double the number of transit passengers by 1990, according to Department of Transportation estimates this increase would mean that the level of transit patronage would be no higher than it was in 1950.¹⁵ The resulting annual net operating deficits are expected to increase from close to \$1 billion in 1972 to \$2.5 billion by 1990, but this seems to be an unrealistically conservative estimate.¹⁶

The figures are disconcerting, and they pose some urgent questions.

—Is it desirable to use 67 percent of available capital for rail systems that will accommodate only a very small percentage of riders? What should be the federal position on rail rapid transit versus buses? Should the federal government be tempting the cities to adopt highly capital-intensive solutions in the face of so many other needs?

—Since the proportion of urban trips by transit is not expected to change, even after the expenditure of \$62 billion in new capital, what are the alternatives? Could more effective results be achieved through efforts to increase the operating efficiency of the urban transport system as a whole? Could buses and taxis, combined with tax and pricing policies, regulations, and other low-cost solutions bring about a greater shift from automobile to public transportation?

—If the efforts of public agencies to expand public transit are to have the very limited results now anticipated, there is urgent need to assure the continuation of essential automobile services. But how is this to be reconciled with the outlook for energy supplies and prices?

—In view of the long-term outlook for energy, is federal policy focusing sufficiently on the research and development necessary to accelerate the discovery of alternative transport technologies? And how can urban growth policies and community design be made consistent with efforts to solve the transportation problem?

13. U.S. Department of Transportation, "1974 National Transportation Report" (Government Printing Office, 1974; processed). Cost data in this section are in 1971 constant dollars.

14. *Ibid.*, p. V-8.

15. Department of Transportation, "A Study of Urban Mass Transportation Needs," p. 1-4; and American Public Transit Association, '74-'75 *Transit Fact Book* (Washington, D.C.: APTA, 1975), p. 14.

16. Department of Transportation, *ibid.*, pp. III-30. Actually, transit deficits for as early as 1981 have been estimated at \$4 billion. See "Remarks by Robert E. Patricelli, Administrator, Urban Mass Transportation Administration, before the Fifth Annual Legislative Conference on Transportation, New York, N.Y., October 21, 1975," *Department of Transportation News* (DOT, n.d.), p. 3.

Transportation investment alone has not helped very much to resolve the problems of urban congestion anywhere in the world. There is strong evidence that the characteristics of the cities themselves are the reason for the persistence of transport problems and that only an attack on urban design, environmental deterioration, and the plight of the urban population itself can help make cities and their transportation more manageable. There is a danger that an overcommitment to transport investment—and particularly to rail rapid transit—may leave the cities less capable than ever of solving their basic problems.

Questions

1. How would you respond to the question posed by Owen at the end of the paper?

SESSION XIX: INFORMATION SOURCES

Objective of Session XIX

- . To be able to identify information sources of public transportation relating to planning, design, construction, operation, and maintenance. Sources will include government and industry organizations.

Synopsis of Session XIX

A brief review of the sources for various types of information relating to public transportation will be made in Session XIX. Continuous references to information sources will be made during the course.

Outline for Session XIX

<u>Part</u>	<u>Subject</u>
1	Introduction
2	Government Organizations
3	Transit Industry Organizations
4	Equipment Manufacturers
5	Handbooks and Data Sources
6	Magazines, Periodicals, Newsletters

SESSION XIX
INFORMATION SOURCES

1. Introduction

There are a variety of information sources for public transportation relating to planning, design, construction, operation, and maintenance. Information sources include all levels of government but particularly Federal and State Departments of Transportation and local transit authorities, universities, industry representatives, area trade associations, equipment manufacturers, and the individual transit operators. Information is available in various forms including annual statistics, daily, weekly, or bi-weekly Newsletters or announcements and periodic research reports. Some of the more useful information sources are described below.

2. Government Organizations

On the federal level, the U.S. Department of Transportation through its modal Administrations (FHWA, UMTA) publishes various literature:

- . DOT (UMTA) News
- . UMTA External Operating Manual
- . FHWA Federal Aid Highway Program Manual
- . Summary of National Transportation Statistics
- . Intermodal Transportation Planning Directory
- . Various research and status reports, (e.g., 1974 National Transportation Report)

Other federal sources of transportation-related information include the Federal Register (referenced in several sessions) and the Bureau of the Census of the Department of Commerce. The Federal Register contains proposed and final regulations reflecting Congressional mandates, such as those dealing with good faith progress for the elderly and handicapped. The Bureau of the Census published various books containing population statistics.

UMTA and FHWA accomplish most of their day-to-day contact with state and local agencies through their field or regional offices. Figures XIX-1 and XIX-2 show their locations. Tables XIX-1 and XIX-2 present contact information as of July 1976. More U.S. Department of Transportation information is available in the Telephone Directory, U.S. DOT.

UMTA's and FHWA's Office of Public Affairs serve public information needs.

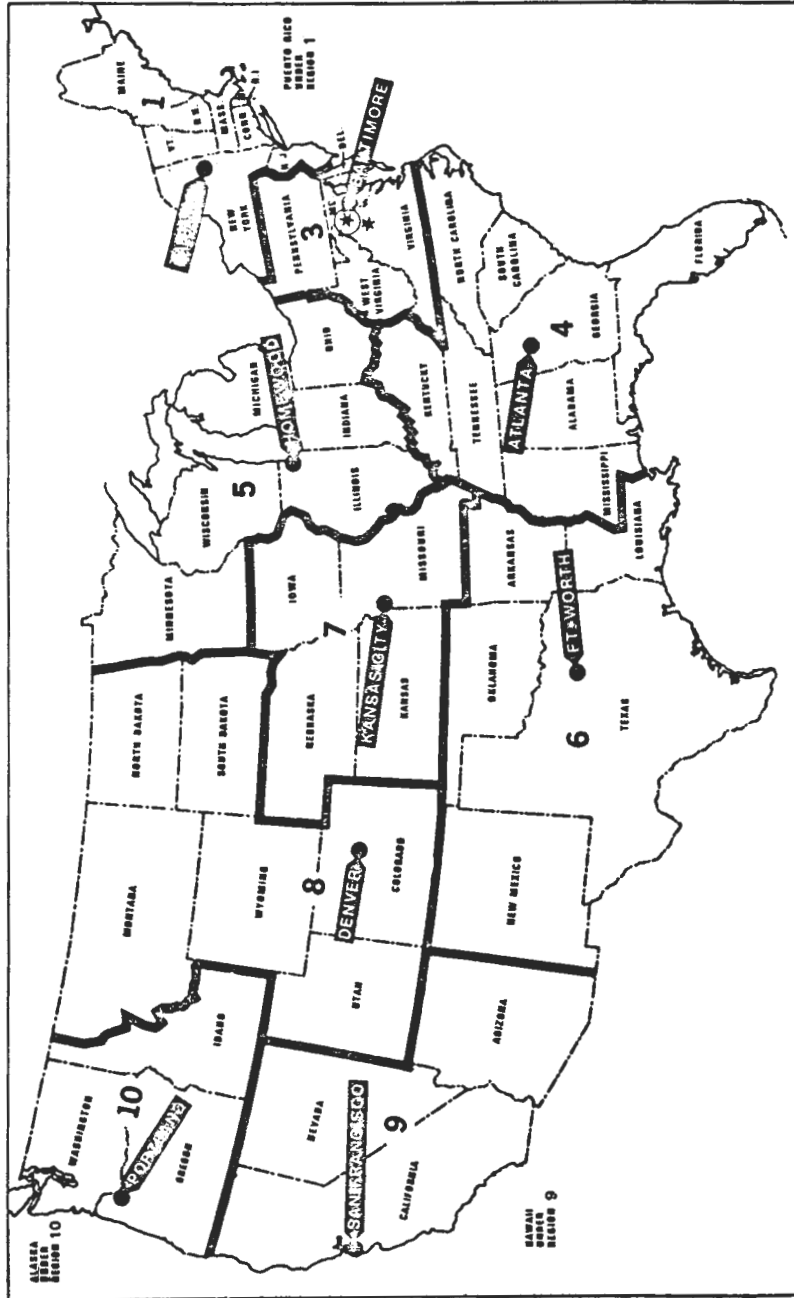
UMTA
400 7th Street S.W.
Washington, D. C. 20590
(202) 426-4043

FHWA
400 7th Street, S.W.
Washington, D. C. 20590
(202) 426-0677

Table XIX-1. FHWA Regional Offices

Region 1 8:00-4:30 EST	Robert E. Kirby, Regional Administrator, FHWA, Leo W. O'Brien, Federal Bldg., Room 729, Clinton Ave. and North Pearl St., Albany, N.Y. 12207, Tel. FTS: 8-562-6476 (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont, Puerto Rico, and Virgin Islands)
Region 3 8:00-4:30 EST	W. H. White, Regional Administrator, FHWA, Room 1633, George H. Fallon Federal Office Building, 31 Hopkins Plaza, Baltimore, Maryland 21201, Tel. FTS: 8-922-2361 (Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia)
Region 4 7:45-4:15 EST	James D. Lacy, Regional Administrator, FHWA, Suite 200, 1720 Peachtree Road; N.W., Atlanta, Georgia 30309, Tel. FTS: 8-285-5078 (Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Kentucky, and Tennessee)
Region 5 7:30-4:00 EST	Donald E. Trull, Regional Administrator, FHWA, 18209 Dixie Highway, Homewood, Illinois 60430, Tel. FTS: 8-380-6300 (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin)
Region 6 8:00-4:30 CST	James W. White, Regional Administrator, FHWA, 819 Taylor Street, Fort Worth, Texas 76102, Tel. FTS: 8-334-3232 (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas)
Region 7 7:45-4:15 CST	John B. Kemp, Regional Administrator, FHWA, P.O. Box 19715, Kansas City, Missouri 64141, Street Address: 6301 Rockhill Road, Kansas City, Missouri 64131, Tel FTS: 8-926-7563 (Iowa, Kansas, Missouri, and Nebraska)
Region 8 7:45-4:15 MST	Daniel Watt, Regional Administrator, FHWA, P.O. Box 25246, Building 40, Denver Federal Center, Denver, Colorado 80225, Tel. FTS: 8-234-4051 (Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming)
Region 9 7:45-4:15 PST	Frank E. Hawley, Regional Administrator, FHWA, 2 Embarcadero Center, Suite 530, San Francisco, California 94111, Tel. FTS: 8-556-3951 (Arizona, California, *Hawaii, and Nevada)
Region 10 8:00-4:45 PST	Louis E. Lybecker, Regional Administrator, FHWA, Room 412, Mohawk Building, 222 S.W. Morrison Street, Portland, Oregon 97204, Tel. FTS: 8-423-2065 (Alaska, Idaho, Oregon, and Washington)

Figure XIX-1. FHWA Regional Offices

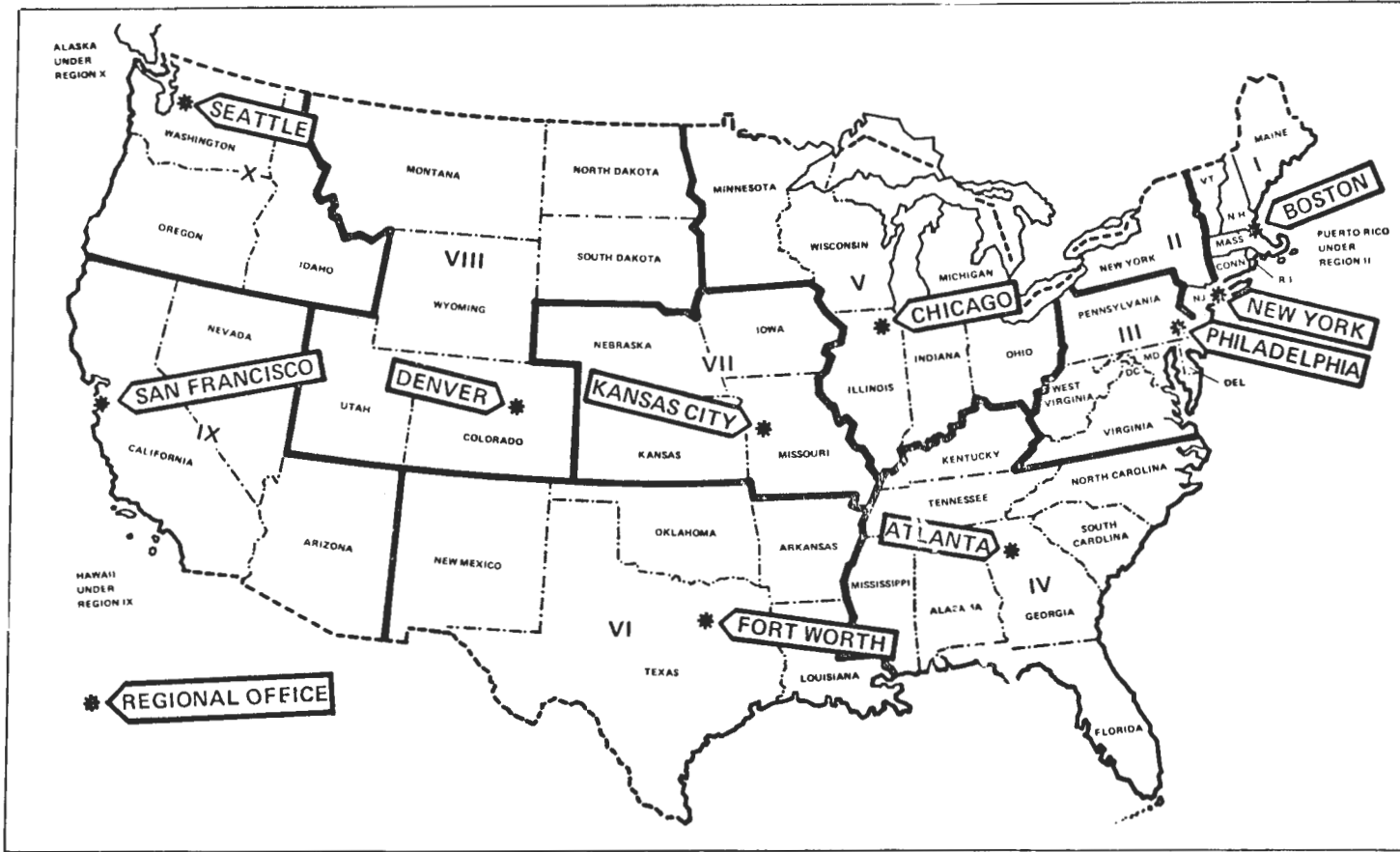


★ Washington, D.C. Headquarters

● Regional Headquarters

* Region 15 (Arlington, Va.), Eastern Federal Highway Projects Office

NOTE: FHWA Region 1 Conforms to Standard Regions 1 and 2



Figures XIX-2. UMTA Regions and Field Offices

Table XIX-2. UMTA Field Offices

Region I	Regional Director, Transportation Systems Center, Kendall Square, 55 Broadway, Cambridge, MA, .02142 Tel: (617) 494-2055; FTS 837-2055
Region II	Regional Director, Suite 507, 26 Federal Plaza, New York, NY, 10007, Tel: (212) 264-8162; FTS 264-8162.
Region III	Regional Director, Suite 1010, 434 Walnut Street, Philadelphia, PA, 19106; Tel: (215) 597-8098; FTS 597-8098.
Region IV	Regional Director, Suite 400, 1720 Peachtree Road, N.W., Atlanta, GA, 30309; Tel: (404) 526-3948; FTS 285-3948
Region V	Regional Director, Suite 1740, 300 S. Wacker Drive, Chicago, IL, 60606, Tel: (312) 353-0100; FTS 353-0100.
Region VI	Regional Director, Suite 9A32, 819 Taylor Street, Fort Worth, TX, 76102, Tel: (817) 334-3787; FTS 334-3787.
Region VII	Regional Director, Room 303, 6301 Hill Rock Rd., Kansas City, MO, 64131, Tel: (816) 926-5053; FTS 926-5053.
Region VIII	Regional Director, Suite 1822, Prudential Plaza, 1050 17th Street, Denver, CO, 80202, Tel: (303)-837-3242; FTS 327-3242.
Region IX	Regional Director, Suite 620, Two Embarcadero Center, San Francisco, CA, 94111, Tel: (415)-556-2884; FTS 556-2884.
Region X	Regional Director, Suite 3106, Federal Building, 915 Second Avenue, Seattle, WA, 98174, Tel: (206) 442-4210; FTS 399-4210.
TTC	Transportation Test Center, Reagin F. Parker, UMTA Programs Director, Pueblo, CO, 81001, Tel: (303) 545-5660; FTS 323-9341.

3. Transit Industry Organizations

a. American Public Transit Association (APTA)

APTA is the major transit member organization. Formed in 1974, APTA is a merger of American Transit Association (ATA) and the Institute for Rapid Transit. ATA itself was formed in 1882 to unify the transit industry. APTA's members consist of American and foreign public and private transit operating properties, government agencies, state transportation departments, consultants, contractors, manufacturers, and suppliers. APTA maintains close liaison with Congress and UMTA. APTA publishes various literature.

- . Transit Fact Book (annually)
- . Directory (annually)
- . Transit Journal (quarterly)
- . Passenger Transport (weekly newsletter)

APTA maintains a staff in Washington, D.C. (202)331-1100.

b. Transit Advertising Association (TAA)

TAA, located in Washington, D.C. is an advertising trade association with U. S. and Canadian members.

c. Association of American Railroads (AAR)

Also located in Washington, D. C., AAR is a central and research agency of the railroad industry. It published numerous research, financial, and statistical literature.

- . Yearbook of Railroad Facts
- . Railroad Review and Outlook

d. American Association of State Highway and Transportation Officials (AASHTO)

AASHTO, formerly AASHO, is an organization of agency personnel whose aim is to foster development, operation and maintenance of an integrated transportation system.

- . A Policy on Design of Urban Highways and Arterial Streets (Red Book)
- . A Policy in Geometric Design of Rural Highways (Blue Book)

e. Transportation Research Board (TRB)

The Transportation Research Board is an agency of the National Research Council, which serves the National Academy of Sciences and the National Academy of Engineering. The Board's purpose is to stimulate research concerning the nature and performance of transportation systems, to disseminate information that the research produces, and to encourage the application of appropriate research findings.

- . TRB Records
- . Special Reports

f. National Cooperative Highway Research Program

Funded by AASHTO, NCHRP is administered by the membership of TRB. Various transportation related research projects are contracted to research agencies (consultants, universities, etc.) and documented in NCHRP reports. In recent years, more emphasis has been placed on transit research.

4. Equipment

There are numerous sources in this category. One reference manual is the LEA Compendium, published by the N.D. Lea Transportation Research Corporation. It is annually updated to include recent developments in transit technology. Published in various topic series, equipment specifications are provided in specific issues. Other sources are manufacturers' brochures and literature describing their equipment.

5. Handbooks and Data Sources

Two major sources are:

- . Fletcher, William S., and Sid Davis, Urban Transportation Information Handbook, Atlanta University, School of Business Administration, Atlanta, Ga., October 1975.

This reference focuses on information sources such as agencies, publications, periodicals, etc.

- . American Public Transit Association (APTA), Transit Fact Book, '75-'76 Edition, APTA, Wash., D.C. March 1976.

Published annually, the 1977 edition is due out in March 1977.

6. Magazines, Periodicals, Newsletters

The following is a list of major transit-related publications in this category.

- . Mass Transit
583 National Press Building
Washington, D.C. 20045
(202) 638-0330
- . Passenger Transport
APTA
1100 17th Street, N.W.
Washington, D.C. 20036
(202) 331-1100
- . Urban Transport News
1126 National Press Building
Washington, D.C. 20045
(202) 628-7986
- . Transit Journal
APTA
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GLOSSARY

A Public Transit Glossary

(This material was extracted from four sources: the San Francisco Municipal Transit Authority (MUNI), the American Public Transit Association (APTA) Fact Book '75-'76 edition, and the Urban Mass Transportation Travel Surveys of 1972 and was edited for general use by JHK & Associates.)

THE GLOSSARY

Access Time: The time required to walk or drive from the origin of a trip to a transit stop, plus a waiting time based on the frequency of transit service; the walking or driving time from the transit stop to the destination. Includes miscellaneous delays encountered within transit terminals.

Administrative and General Expense (including Insurance and Safety Expense): Total expense of all labor, materials, facilities, equipment, and fees associated with general office functions, legal services, safety, and insurance.

Adult Cash Fare: Basic full fare paid by one person for one transit ride excluding transfer charges and zone charges (if any).

Alight: The act of leaving a transit vehicle.

Analysis Area: Any segment or part of the total study area which is defined for purposes of special analysis.

Annual Payroll: Wages and salaries including overtime and allowances paid to transit system employees.

Arterial: A highway primarily for through traffic, usually on a continuous route.

Average Annual Earnings per Employee: "Annual Compensation" divided by "Average Number of Employees."

Average Fare: "Passenger revenue" divided by "revenue passengers."

Block Men: Operators regularly assigned to cover runs left open when the main operator is on his two days off per week.

Board: The act of entering a transit vehicle.

Built-in Overtime: Many commuter-type runs which serve primarily morning and evening passengers involve more than eight hours of work in a ten or eleven hour period, the point after which overtime pay takes effect. Some runs have a half-hour to an hour and a half of built-in overtime to avoid having to hire two men (one for the morning, another for the afternoon) to cover each run.

Bus: (See Motor Bus)

Bus Lane: A street lane intended primarily for buses, either all day or during peak hours, but which other traffic may use under certain circumstances: i.e.; to make right turns. If other traffic is physically prevented from using this lane, it is referred to as an exclusive bus lane, e.g.: in an arterial contra-flow lane on a freeway median strip.

Cable Car: Transit vehicle railway operating in mixed street traffic with unpowered, individually-controlled transit vehicles propelled by moving cables located below the street surface and powered by engines or motors at a central location not on board the vehicle.

Capacity: The maximum number of passengers that can be transported over a given section of a transit route in one direction during a given time period (usually one hour) under prevailing traffic conditions.

Capital Costs: Nonrecurring costs required to construct transit systems, including costs of right-of-way, facilities, rolling stock, power distribution, and associated financing charges, administrative and design costs.

Captive Transit Rider: A person who does not have a private vehicle available or who cannot drive and who must use public transportation in order to travel.

Census Tract: Divisions into which large cities and adjacent areas are divided for the purpose of providing comparable small-area population and housing census tabulations.

Central Business District: Usually the downtown retail trade area of a city, or generally an area of very high land valuation, traffic flow, and concentration of retail business offices, theaters, hotels and service businesses.

Central Control: The radio base communications center which coordinates line supervision, passing instructions on to individual inspectors and operators.

Club or Subscription Bus: A transit service operating to specified schedules on fixed routes (although such routes can be modified), but not available to the general public.

Collector - Distributor Street: A street which collects and distributes traffic between higher type arterial highways and less important streets or directly to traffic destinations, with intersections at grade, and with the functions of traffic movement and access to abutting properties equally important.

Commuter Railroads: Railroad systems which operate a form of rapid transit service over their facilities in metropolitan areas.

Cordon Line: An imaginary line enclosing a study area.

Corridor: A route or group of routes having similar travel characteristics.

Data Collection Area: The area within which travel data are collected.

Demand Responsive Transit: (often called "dial-a-ride") is a form of para-transit operating within specified areas but not on specific routes or to specific schedules. Taxis are a form of demand responsive transit.

Depreciation and Amortization: Total decline in value of transit system assets incurred through use of tangible property (depreciation) and intangible property (amortization).

Desire Line: A straight line connecting the origin and destination of a trip. A desire line map is made up of many such desire lines, the width or density of which represents the volume of trips moving between the origin and destination.

Destination: Terminal end of a trip or the point at which a trip terminates.

Dispatchers: Personnel who are responsible for seeing that every scheduled run leaves on time. They must match the work force with the work load on a minute by minute basis, and are the supervisory level in most direct, frequent contact with the operators.

Divisions: Relatively independent, geographically separate units to which operators and vehicles are assigned for both operation and maintenance.

Double Headway: An operator is "carrying a double headway" when his leader has missed his run. The time gap between vehicles is doubled, providing more time for passengers to accumulate at bus stops. This inconveniences both passengers and operators, since with an overcrowded vehicle, he must make more frequent and longer stops. The operator usually cannot maintain his schedule; later runs catch up with him, a frequent cause of bunching.

Down: Two definitions: a vehicle is "down" when it is out of service, in the shop for repairs. "Running down" means a vehicle is running late, behind schedule.

Express Service: A type of operation providing higher speed with fewer stops than generally exist on local transit lines, in order to traverse fairly long distances as rapidly as possible. May be on exclusive right-of-way (rapid transit) or in other traffic (buses on freeways, city arterials).

Employer Payroll Taxes: Transit system portion(s) only of federal, state, and local payroll tax obligations.

Extraboard: Operators who have no regularly assigned run but who are used to cover runs left open due to vacations, sick leave, industrial accidents, jury duty or other irregular absences. They are paid even in the event there are no runs open for them to cover - but that almost never happens.

Federal Operating Assistance: Financial assistance for transit operations (not capital expenditures) which originated at the federal government level and are allocated to urbanized areas on a formula basis.

Feeder Service: Local transit service to pick up or deliver passengers in connection with a transfer at a rapid transit station or express or arterial bus stop or terminal.

Forecasting: The process of determining the future values of land use, socio-economic, and trip making variables within the study area.

Fringe Benefit Costs: Transit system expenditures for employee compensation in addition to wages, salaries, and employer payroll taxes.

Generator: A point from which trips are produced (such as a dwelling unit, a store, a factory, an office, etc.).

Gross Income (Deficit): "Net Operating Revenue (Loss)" plus the sum of "Net Auxiliary Operating Revenue" and "Non-Operating Income."

Head Sign: A large destination or route sign located above the windshield on every transit bus. The route number is also displayed on the side sign next to the front door and on the small sign in the rear window.

Headway: The scheduled time gap between transit vehicles on any particular line. Headway varies with the time of day, becoming shorter at peak hours and longest at night.

Heavy Rail: Heavy-weight transit vehicle using third-rail power source and operating on exclusive right-of-way as subway or elevated railway with high-level platform stations.

Income (Deficit) Including Operating Assistance: "Ordinary Income (Deficit)" plus "Total Operating Assistance."

Income Taxes: Amount of income taxes attributed to transit operations, including income tax reductions (negative adjustments) allowed on income tax obligations resulting from non-transit operations of a privately-owned company operating a transit system in addition to other businesses.

Inspectors: The men who supervise the transit operations on the line. They attempt to evaluate performance, enforce work rules, and untangle problems. There are mobile inspectors assigned to radio-equipped cars and fixed inspectors assigned to posts at designated intersections.

Jitney: Jitney service generally operates on fixed routes for all passengers desiring the service, but does not conform to a fixed schedule. In some foreign cities, jitneys deviate from their principal routes.

Latent Travel Demand: The potential number of trips that could be made by people who cannot now travel conveniently, or at all.

Layover Time: (See Recovery Time)

Leader: The transit vehicle ahead of the next scheduled run on the same line.

Light Rail: Streetcar-type transit vehicle railway constructed on city streets, semi-private right-of-way, or exclusive private right-of-way; formerly known as "streetcar" ("trolley car") and "subway surface" depending upon local usage or preference.

Line, Route: The course followed by scheduled transit vehicles as part of the transit system.

Line Checks: The procedure for determining how close to scheduled performance any line is performing.

Load Factor: The proportion of persons using a given transit vehicle, relative to the total capacity of the vehicle to carry passengers.

Local Operating Assistance: Financial assistance for transit operations (not capital expenditures) which originated at the local government level.

Local Service: A type of operation involving frequent stops and consequent low speeds, the purpose of which is to deliver and pick up transit passengers as close to their destinations or origins as possible. May be on exclusive right-of-way (rapid transit with stations spaced at 1/2 mile intervals or less) or in other traffic (local transit lines).

Local Street: A street or road primarily for access to residence, business, or other abutting properties.

Maintenance and Garage Expense: Total expense of all labor, materials, equipment, and facilities used to repair and to service transit passenger vehicles, service vehicles, and passenger vehicle rights-of-way.

Mass Transit (Mass Transportation): The general term used to identify buses, subways, fixed rail vehicles, and any other type of vehicle available to the public which moves relatively large numbers of people at one time.

Maximum Load Point: A point at which the largest number of transit passengers are on board a transit vehicle on a particular transit run.

Miss-Out: A situation in which an operator without notification fails to report for work.

Missed Run: See Open Run.

Modal Split: The process of separating total person trips into various modes of travel.

Model: An analytical tool used by transportation planners to assist in making forecasts of land use, economic, socio-economic, and travel characteristics.

Motor Bus: Rubber tired, self-propelled transit vehicle with fuel supply carried on board the vehicle.

Net Auxiliary Operating Revenue: Net revenue from affiliated facilities and organizations rendering services other than provision of transit service.

Net Operating Rents: Net amount of (a) all expense paid by a transit system for rents associated with transit operations and (b) all revenue received by a transit system from property associated with transit operations rented to other parties.

Net Operating Revenue (Loss): "Total Operating Revenue" minus "Total Operating Expense."

Network: The configuration of transit routes and stops which constitute the total system.

Non-Operating Income: Net income from transit system facilities or operations not associated with providing transportation or transit service.

Open Run: A run for which there is no operator available, and which therefore stays in the yard.

Operating Costs: Recurring costs incurred in operating transit systems, including wages and salaries, maintenance of facilities and equipment, fuel, supplies, employee benefits, insurance, taxes, and other administrative costs. Amortization of facilities and equipment, which is a recurring cost, is occasionally included, but more often stated separately.

Operating Revenue: The gross income from operation of the transit system, including fares, charter income, concessions, advertising, etc. Does not include interest from securities, non-recurring income from sale of capital assets, etc.

Operating Taxes and Licenses: Total cost of all taxes and licenses - other than income taxes - associated with transit system operations including employer payroll taxes.

Ordinary Income (Deficit): "Gross Income (Deficit)" minus the sum of "Total Income Deductions" and "Income Taxes."

Origin: The beginning of a trip or the zone in which a trip begins.

PCC: Presidential Conference Cars built by the St. Louis Car Company, 1935, rail vehicles, "trolleys".

Passenger Revenue: Fares, including transfer charges and zone charges, paid by transit passengers travelling aboard transit vehicles operating in regular service; also known as "farebox revenue."

Para-Transit: Forms of urban passenger transportation which are available to the public, are distinct from conventional transit, and can operate over the highway and street system. Shared-ride taxis, carpools, rental cars, and subscription bus clubs are often included under the definition.

Peak Hour: That hour period during which the maximum amount of travel occurs. Generally, there is a morning peak and an afternoon peak.

Pre-Test: The process of testing the procedures to be used in conducting a travel survey.

Property: The general term given to a transit system.

Public Transportation: The term public transportation can be considered to cover all aspects of publicly available transit services including both Mass Transit and Para-Transit.

Pull-In Time: The time a run is due back at the yard after completing the day's trip.

Pull-Out Time: The time the operator must leave the yard to reach his outer terminal to begin the run. Generally, ten minutes after check-in time.

Rapid Transit: Transit vehicles operating over completely grade-separated private right-of-way. The term rail rapid transit, also known as "rapid rail transit," applies to both operation of light rail vehicles over exclusive private right-of-way and operation of heavy rail vehicles; the term bus rapid transit applies to operation of motor buses over exclusive bus roads ("rapid busways").

Recovery Time: Extra time scheduled at the outer terminals to allow for rest stops and to help make up time lost from running down.

Revenue Passengers/Revenue Passenger Rides: Single-vehicle transit rides by initial board (first-ride) transit patrons only; excludes all transfer rides and all non-revenue rides.

Robbing the Lines: When transit service on a particular line or series of lines is unusually poor, central control may instruct inspectors to cover this service by dispatching drivers from other routes.

Route: A fixed path traversed by a transit vehicle in accordance with a predetermined schedule.

Run: One transit vehicle trip in one direction from the beginning of a route to the end of it. When a transit vehicle makes a round trip on one route, it has completed two runs.

Run-Sign: The small box displaying several digits - the vehicle's run number - located in the lower right corner of the windshield.

Running Time: The scheduled elapsed time between certain points along each route. Scheduled running time varies with the time of day to take traffic congestion into account.

School Trippers: Special runs - either regular or charter - to serve the needs of school children. The term is sometimes given to regular lines heavily patronized by students on their way to or from school.

Screenline: An imaginary line splitting a study area into two parts, for analysis purposes.

Sharp: An operator "running sharp" is running ahead of his schedule, a cardinal sin. Better to be late than a little early, for two reasons: the operator could be causing a patron to miss the bus and thus miss one or more transfer connections. Second, running sharp increases the headway between the early vehicle and his follower, burdening the passengers with a longer wait and the other operator with a heavier workload.

Short-Haul Transit: Service over short distances (less than about one mile) intended to move passengers within congested areas such as central business districts, amusement parks, airports, etc., and to facilitate access to and from transit, parking, and other terminals.

Single-Vehicle Transit Ride: One person travelling aboard one transit vehicle.

Socio-Economic Data: Data describing the social and economic characteristics of travelers.

Standby Time: The time between morning and evening peak hours when an operator is not driving his regular run, but is available for other work if necessary.

Standard Metropolitan Statistical Area: An SMSA is a county or groups of counties containing at least one city (or twin cities) of 50,000 or more population, plus any adjacent counties which are metropolitan in character and economically and socially integrated with the central county or counties. (In New England, towns and cities, rather than counties, are the units used in defining SMSA's.)

State Operating Assistance: Financial assistance for transit operations (not capital expenditures) which originated at the state government level.

Study Area: The area delimited for the purpose of data collection by a transportation study. This area usually contains the central city and surroundings which will become urbanized in 20 to 30 years and is the area for which forecasts of travel are made, in most instances.

Terminal: The terminating point of transportation routes of one or more modes with transfer facilities and, often, amenities for passenger convenience. (This term is also used for intercity passenger transportation and for freight transportation where freight storage space may be provided in lieu of passenger amenities.)

Total Income Deductions: Interest and discount expenses, including interest on long-term obligations, and obligations associated with losses or defaults by parties contracting with the transit system.

Total Labor Costs: Sum of "Annual Compensation," "Employer Payroll Taxes," and "Fringe Benefit Costs."

Total Operating Assistance: Sum of "Local Operating Assistance," "State Operating Assistance," and "Federal Operating Assistance."

Total Operating Expense: The sum of all transit system operating expenses: "Transportation Expense (including Station and Fuel Expense)," "Maintenance and Garage."

Total Operating Revenue: Total revenue derived from provision of transit service including reimbursements by third parties for reduced fare rides and for guaranteed costs not covered by "farebox revenue."

Total Passengers/Total Passenger Rides: Combined total of all single-vehicle transit rides by (1) initial board (first-ride) revenue passengers, (2) transfer passengers on second and successive rides, and (3) non-revenue passengers entitled to transportation without charge.

Total Vehicle Miles Operated: Sum of all passenger vehicle miles operated in line (regular) service, special (charter) service, and non-revenue service. When vehicles are operated in trains, each vehicle is counted separately, e.g. an eight-vehicle train operating for one mile equals eight vehicle-miles.

Traffic Assignment: The process of determining route or routes of travel and assigning trips to those routes.

Traffic, Solicitation, and Advertising Expense: Total expense of all labor, materials, facilities, equipment, and fees associated with soliciting and promoting patronage including timetables and other publications distributed to the public.

Train: Two or more transit vehicles physically connected and operated as a unit.

Transfer: The portion of a trip between two connecting transit routes, both of which are used for completion of the trip.

Transportation Expense (Including Station and Fuel Expense): Total expense of all labor, materials, equipment, facilities, and fees required for operating transit passenger vehicles and passenger stations.

Travel Survey: The collection of data describing social, economic, and travel characteristics of given groups of persons who make trips by various modes of transportation.

Trip: One traverse of the line's route. Trips are either inbound or outbound. Each run involves from two to two dozen trips.

Trip Distribution: The process by which the movement of trips between analysis zones is estimated.

Trip Generation: A general term describing the analysis and application of the relationships that exist between the trip makers, the urban area, and trip making.

Trolley Coach: Rubber-tired transit vehicles propelled by electric motors drawing current, normally through overhead wires, from a central power source not on board the vehicle. Generally operates in mixed traffic.

Turnbacks: If a bus is running far behind schedule, an inspector may instruct the operator to skip a part of the trip in order to get back on time.

Urbanized Area: An urbanized area containing a city (or twin cities) of 50,000 or more population, plus the surrounding closely settled incorporated and unincorporated area which meet certain criteria of population size or density.

Wye: A stub-end track located at infrequent intervals along streetcar lines for holding disabled vehicles and to enable turnbacks.

Yard: Open storage lots for trolley coaches and motor buses.

Zone (Analysis Zone): A subdivision of the study area which is used for data collection and analysis purposes.