Federal Transit Administration

1997

National Transit Database

National Transit Summaries and Trends

CAUTION: Extensive efforts have been made to assure the quality of information contained in this report. It is impossible, however, to achieve complete accuracy and consistency of the reported data. In addition, the reported data do not include all relevant information generally necessary to explain apparent differences in performance (e.g., information related to work rules, topography, climate, and unusual events such as strikes and service start-ups). Users of this report, therefore, should be careful not to draw unwarranted conclusions based solely on the data contained herein.

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National Transit Summaries and Trends

For the 1997 National Transit Database Report Year

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Administrator
Federal Transit Administration

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Executive Summary

Overview

The *1997 National Transit Summaries and Trends (NTST)* provides an overview of the nation's mass transit industry. The *NTST* highlights the aggregate financial and operational characteristics and trends of mass transit for the five-year period from 1993 to 1997. The *NTST* provides key statistics and performance indicators for the transit industry.

The chapters include:

- National Transit Profile
- Capital Funding
- Operating Funding and Expenses
- Service Supplied and Consumed
- Safety and Security
- Reliability and Maintenance

This Executive Summary presents seven exhibits showing key data elements reported to the National Transit Database. Each exhibit is depicted graphically.

The exhibits included are:

Exhibit E-1—Capital Investment: Funding Sources 1993-1997

Exhibit E-2—Capital Investment: Uses of Capital Funds by Mode-1997

Exhibit E-3—Operating Funding Sources 1993-1997

Exhibit E-4—Fare Revenues and Subsidy per Passenger 1993-1997

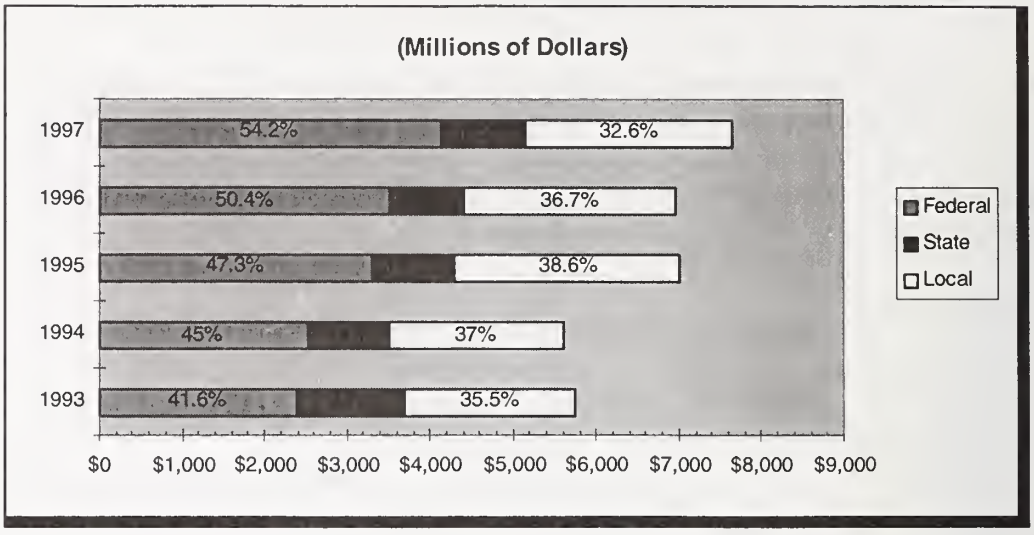
Exhibit E-5—Operating Expense by Mode 1993-1997

Exhibit E-6—Service Supplied: Vehicle Revenue Miles 1993-1997

Exhibit E-7—Service Consumed: Unlinked Passenger Trips 1993-1997

Exhibit E-1

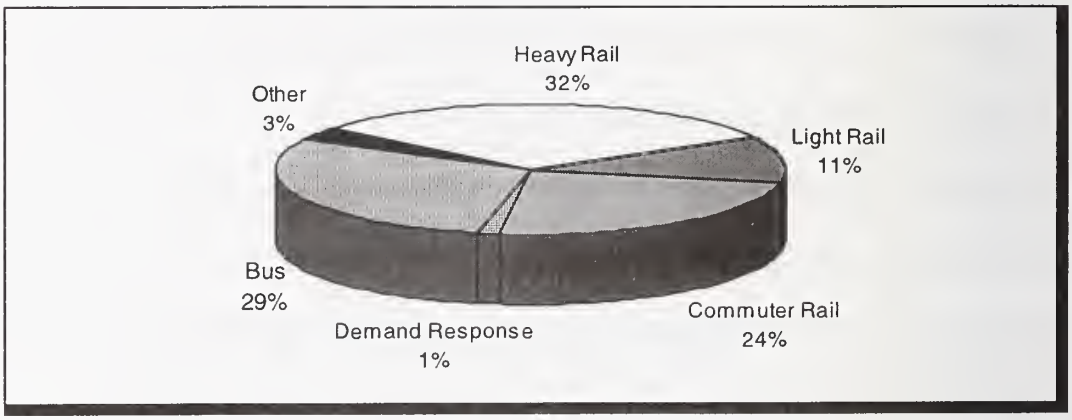
Capital Funding Sources 1993-1997



- Capital investment reached nearly $7.6 billion with an increase of 9.8 percent compared to 1996.
- The Federal share for capital funding accounted for 54.2 percent of the total invested in 1997, while local and state shares accounted for 32.6 and 13.2 percent respectively.
- Over 90 percent of capital funds was expended by agencies located in urbanized areas with over 1 million population.

Exhibit E-2

Capital Investment: Uses of Capital Funds by Mode 1997



- Heavy Rail mode accounted for the largest percentage of capital invested. Heavy Rail and other rail modes expended most of its capital funding in facilities and other transit infrastructure. Capital investments in rolling stock represented only 12.7 percent of the total capital investment in Heavy Rail.

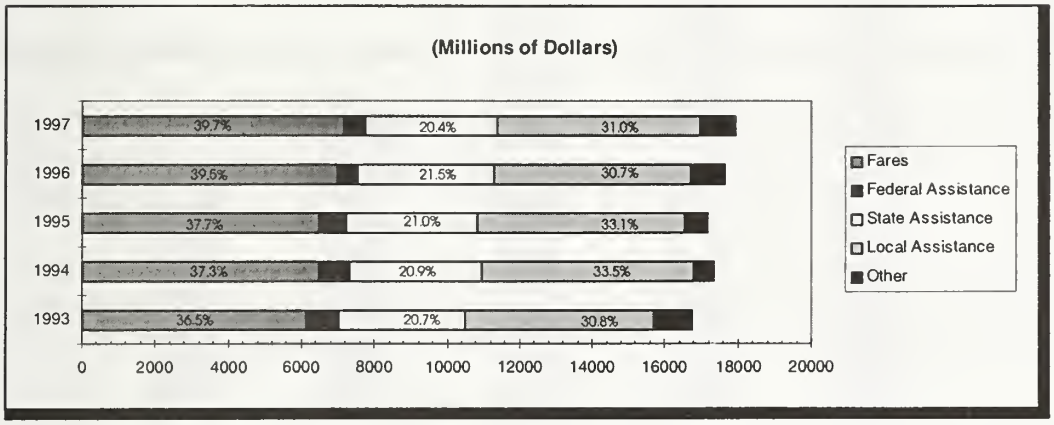
- Rail modes accounted for 66 percent of capital funds applied in 1997. These modes carried 38.3 percent of transit's total ridership and generated 28.3 percent of the revenue miles in 1997.

- Bus accounted for the second largest percentage of capital invested. Capital investments in bus were primarily in rolling stock at 51.4 percent.

- Bus carried 57.8 percent of transit's ridership and generated 56.3 percent of the revenue miles in 1997.

Operating Funding Sources
1993-1997

Exhibit E-3



- Total operating funding applied increased by 1.7 percent in 1997.

- Total fare revenues increased by 2.3 percent and represented 39.7 percent of all operating funds applied in 1997.

Exhibit E-4

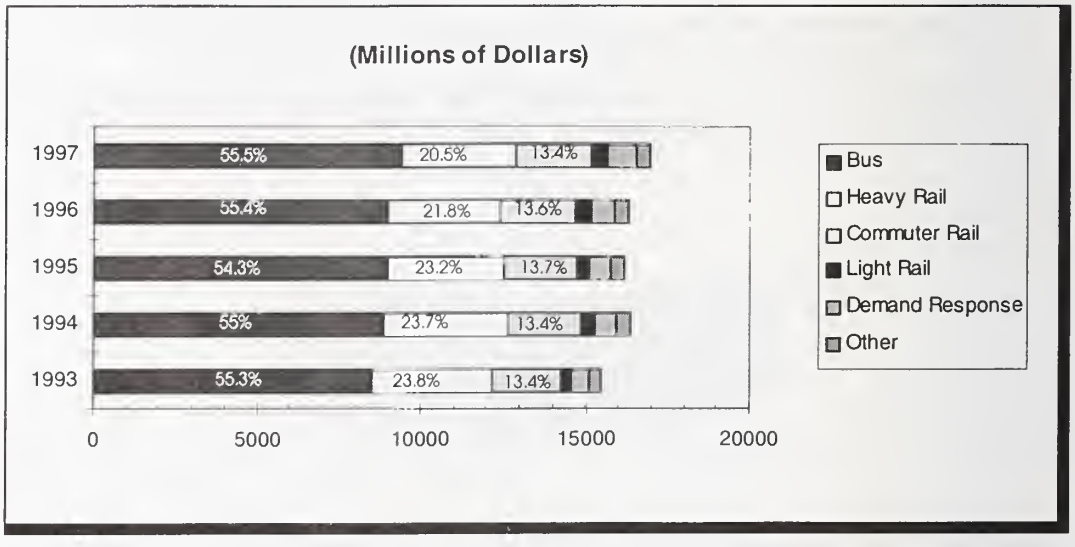
Fare Revenues and Subsidy per Passenger 1993–1997

- Total operating funding applied per passenger decreased in 1997 after showing an increasing trend over 1993-1996 time frame. Operating Funding per passenger went from $2.24 in 1993 to $2.33 in 1996 and decreased to $2.24 in 1997.

- The participation of fare revenues in the total funding applied per passenger has increased from 36.1 percent in 1993 to 39.7 percent in 1997.

Exhibit E-5

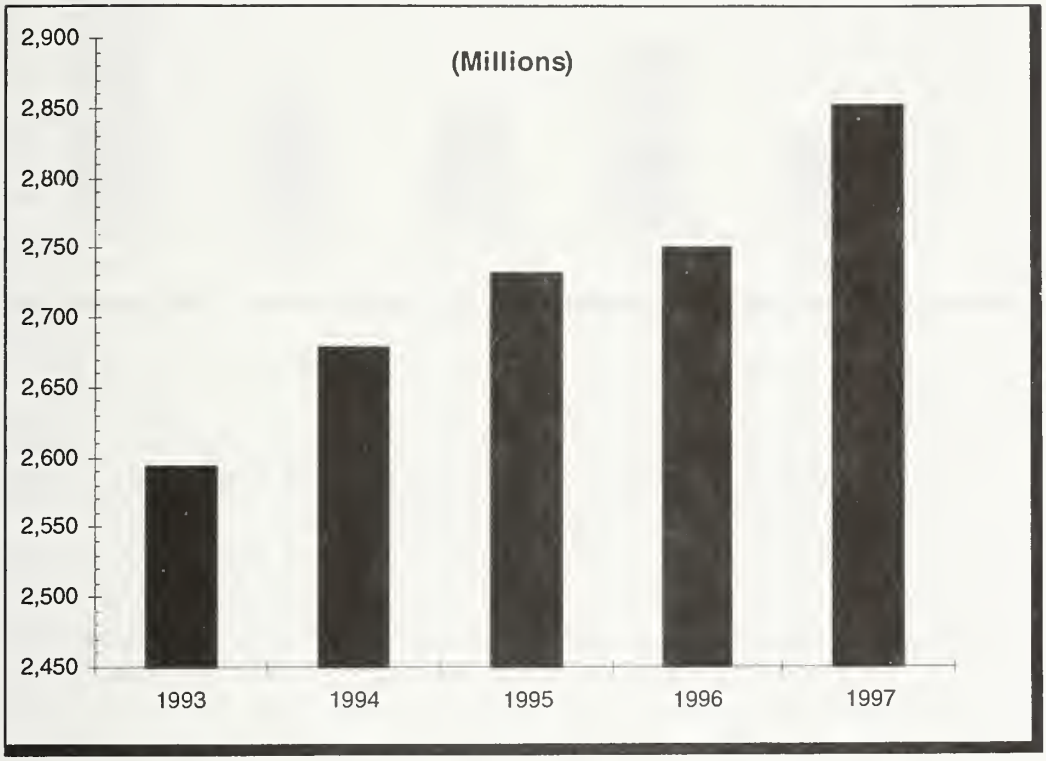
Operating Expense 1993–1997



- Operating expense has had an increasing trend from 1993 to 1997, and increased by 4 percent in 1997 compared to 1996.

- Bus accounts for over 55 percent of operating expenses and is operated by 442 transit agencies (over 82 percent). Heavy Rail accounts for over 20 percent of operating expenses and is operated by 14 transit agencies.

Service Supplied: Vehicle Revenue Miles 1993-1997 **Exhibit E-6**

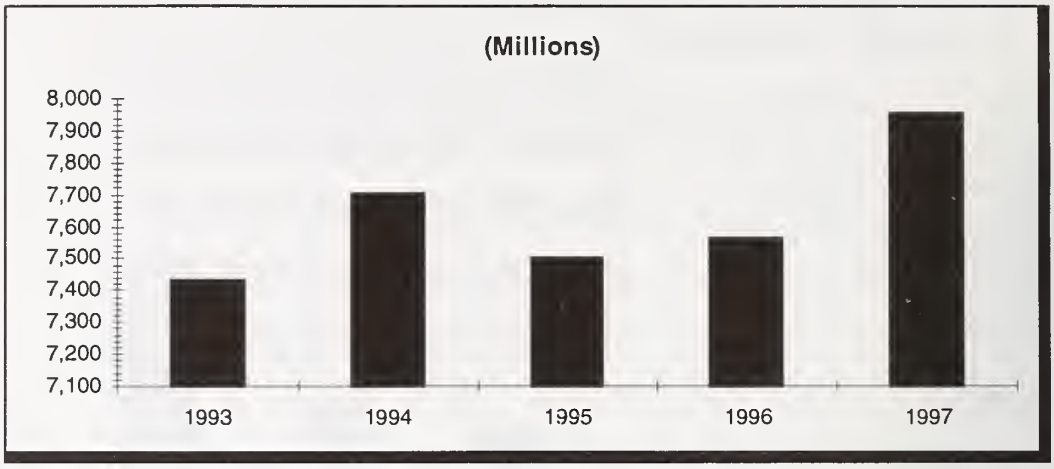


- Vehicle revenue miles increased during the 1993-1997 time frame. The pace of annual increases declined from 1993 to 1996. Vehicle revenue miles is 3.7 percent higher for 1997 when compared with 1996 and this is the highest annual increase for the 5 year period.

- The overall increase in vehicle revenue miles during the 1993-1997 time frame is 10 percent.

Exhibit E-7

Service Consumption: Unlinked Passenger Trips 1993-1997



- Unlinked passenger trips increased by 5.2 percent in 1997 compared to 1996.
- Heavy Rail, with a 12.6 percent increase, is the mode with the largest share in the overall increase of 5.2 percent in 1997.

Introduction

Purpose of This Publication

The *1997 National Transit Summaries and Trends (NTST)*, developed from the National Transit Database (NTD), highlights aggregated financial and operational characteristics and trends. The NTST is compiled to show key characteristics and performance indicators for the nation's mass transit industry. The NTST represents a portion of the National Transit Database Annual Report. This is the seventh annual edition of the NTST, which includes a five-year compilation of selected transit industry statistics. The NTST serves as a reference for transit professionals, researchers, and policy makers, as it describes the current condition of urban mass transportation in the United States.

Comments Welcome

Suggestions and comments regarding this document are encouraged and welcomed.

Report Organization and Overview

The *NTST* provides a national transit profile followed by chapters on capital funding; operating funding and expenses; service supplied and consumed; safety and security; and reliability and maintenance effectiveness.

Chapter 1: National Transit Profile

The National Transit Profile provides aggregate operating statistics and financial data for the transit industry. The data are presented at the aggregated modal level and a financial and operating summary of all modes combined. Only the most relevant modes in the NTD are included in the National Transit Profile: Bus, Heavy Rail, Commuter Rail, Light Rail, and Demand Response.

Chapter 2: Capital Funding

This chapter discusses sources of capital funding and its uses (rolling stock, facilities, and other uses) by mode and Urbanized Area (UZA) size. In addition, the implications of capital investments in new rolling stock acquired and average fleet age, as well as exhibits stratifying vehicle inventory data by fuel type and vehicle size are presented.

Chapter 3: Operating Funding and Expenses

Sources of operating funding and the cost of operating service are discussed in this chapter. A reporting change was introduced in 1994 that required agencies to report only the operating funds expended during the report year. Operating funds received during the report year that did not result in an expense in that year are not reported. Operating expenses are allocated by mode, function (vehicle operations, vehicle maintenance, non-vehicle maintenance, and general administration), and object class. Object classes are groupings of expenses on the basis of goods or services purchased and include salaries and wages, fringe benefits, services, material and supplies, purchased transportation, and other expense categories.

Chapter 4: Service Supplied and Consumed

This chapter provides an analysis of service efficiency and effectiveness and discusses both the amounts and kinds of transit services provided and utilized. Performance measures are used to evaluate the efficiency and effectiveness of transit service by relating miles, hours, and service consumption data to operating expenses.

Chapter 5: Safety and Security

This chapter discusses measures of data designed to offer insight into safety and security issues related to transit.

Chapter 6: Reliability and Maintenance Effectiveness

This chapter presents measures pertaining to reliability of service and effectiveness of vehicle maintenance, and includes data concerning maintenance expense and service interruptions. A discussion on usage trends of alternative fuels is also presented.

Chapter 7: Key Modal Characteristics and Uses of Capital Funds by Transit Agencies

This Chapter provides data on operations, performance, infrastructure, and uses of capital by transit agencies at the modal level.

Inflation

All revenue and cost information is represented in dollars as actually reported. Data have not been adjusted to reflect the impact of inflation. The consumer price index (urban) increased 19.1 percent between 1993 and 1997.

Rounding

Rounding may lead to minor variations in total values from one table to another for similar data, or may lead to instances where percentages may not total 100.

Number of Reporters

The NTD records reporters in several ways. One way is to record the actual number of individual reporters in each report year. For the 1997 Report Year, the number of individual reporters is 556. Of this number, 66 transit agencies received exemptions from detailed reporting and 14 agencies were deleted following an extensive review process. Thus, 476 individual reporters are included in the full database. Data from agencies granted exceptions are included only for the transit agency mode(s) and type(s) of service provided and the UZAs served. See **Exhibit I-1**.

Number of Agencies Reporting by Type of Service
1993-1997

Exhibit I-1

Type of Service	1993	1994	1995	1996	1997
Bus					
Directly Operated	352	357	352	357	364
Purchased Transportation	118	126	129	127	134
Total Number of Agencies*	**422**	**424**	**422**	**443**	**442**
Heavy Rail					
Directly Operated	14	14	14	14	14
Purchased Transportation	-	-	-	-	-
Total Number of Agencies*	**14**	**14**	**14**	**14**	**14**
Commuter Rail					
Directly Operated	9	9	7	6	7
Purchased Transportation	10	10	10	11	11
Total Number of Agencies*	**17**	**17**	**15**	**15**	**17**
Light Rail					
Directly Operated	17	19	19	20	20
Purchased Transportation	-	-	-	-	-
Total Number of Agencies*	**17**	**19**	**19**	**20**	**20**
Demand Response					
Directly Operated	185	201	209	213	224
Purchased Transportation	253	263	267	269	282
Total Number of Agencies*	**276**	**398**	**407**	**433**	**436**

(*) Some Agencies report directly operated and purchased transportation for the same mode.

Type of Service

Most of the data in the NTD are organized by mode and type of service. There are two types of service: directly operated service and purchased transportation. A typical transit agency in the NTD has both directly operated service and purchased transportation.

The service provided by a transit agency is considered directly operated when the transit agency is the entity responsible for generating the service to the public. Directly operated service can be provided by either a public or private entity.

A transportation service is considered purchased transportation in the NTD when a contractual relationship exists between at least two entities. The contractual relationship is to provide public transportation service. It includes payments or accruals to sellers, fare revenues retained by the seller, and other expenses incurred by the buyer (purchaser) for items such as contract administration, services and materials (advertising, customer information services, fuel maintenance, etc.). Generally, the entity buying the service is a public agency and the seller is a private organization.

Some purchased transportation data are reported from a directly operated perspective, especially when the number of vehicles operated in maximum service exceeds 100. In this case, the seller submits a full report for the purchased service. Therefore directly operated and purchased transportation are non-mutually exclusive categories of service. A discussion of purchased transportation in the NTD is presented in Chapter 4, **Exhibit 4-13**.

The number of agencies reporting directly operated and purchased transportation by mode from 1993 to 1997 is presented in **Exhibit I-1**.

Exhibit I-1 shows the number of agencies reporting individual modes by type of service for the 1993-1997 timeframe. The number of agencies reporting bus increased by 4.7 percent since 1993. The number of Demand Response reporters has increased steadily each year. There are 15.9 percent more Demand Response reporters in 1997 than in 1993. Light Rail experienced a growth in the number of agencies reporting this mode, with 3 new systems built between 1993 and 1997. Heavy Rail shows no growth or decline in the number of reporting agencies.

Exemption for Nine or Fewer Vehicles

Agencies operating nine or fewer vehicles in maximum service may be exempted from reporting to the NTD. Sixty six agencies were exempted in the 1997 Report Year compared with 60 agencies for the 1996 Report Year. Reporters who receive this exemption do not submit capital, operating funding, operating expense, and non-financial data and therefore are not included in the database for these items. The implications of the missing data for these agencies is not relevant in the aggregate given the small amount of service supplied and consumed by agencies operating nine or fewer vehicles in maximum service. It should be noted that the NTD includes some agencies operating fewer than nine vehicles in maximum service.

Calculation and Treatment of Joint Modal Expenses

Prior to 1992, joint modal expenses were allocated by function only and were included as part of the "other" object class. Since 1992, reporters fully allocated joint expenses for each mode by function and object class. Operating funding reported from 1995 on are the funds that resulted in expenses in these years. This is a reporting change introduced in 1994. Therefore, unless an agency had an operating deficit, the total funding applied should equal the sum of direct modal expenses and reconciling cash expenditures.

Performance Indicators

The *NTST* presents several performance measures as indicators of efficiency and effectiveness. These indicators include operating expense per vehicle revenue hour, operating expense per vehicle revenue mile, unlinked passenger trips per vehicle revenue hour, unlinked passenger trips per vehicle revenue mile, operating expense per unlinked passenger trip, and operating expense per passenger mile.

Relative Impacts of the Data

The data in the NTD are highly concentrated in large urbanized areas (UZAs) as seen in **Exhibit I-2**. This concentration is not surprising given the nature of public transit, especially mass transit, which provides public transportation services in densely populated areas. In terms of miles of service, over 78 percent of all data are reported by agencies in UZAs with over 1 million population. In addition, 87.1 percent of operating expenses and 90.5 percent of capital funds expended were reported by agencies in these large population centers. Agencies located in large UZAs (over 1 million population) have a smaller share of service supplied than mid-size and small UZAs due to differences in the population density of large and small UZAs. Another aspect of agencies located in large UZAs is that they are less dependent on operating subsidies than agencies in small UZAs. This becomes evident upon comparison of the percentage of total operating funds applied (87.5 percent) to the percentage of fares (92.5 percent) for agencies in large UZAs. Uses of Capital shows that while rolling stock is the major capital item for agencies in small UZAs, facilities and other transit infrastructure investments are made almost entirely in agencies located in large UZAs.

Exhibit I-2

Relative Impacts of the Data (Percentage) by UZA Size
1997

	Under 200,000	200,000 to 1 Million	Over 1 Million
Service Consumed			
Passenger Miles	2.5%	7.0%	90.5%
Unlinked Trips	3.0%	8.6%	88.4%
Service Supplied			
Vehicle Revenue Miles	6.7%	14.6%	78.7%
Vehicle Revenue Hours	7.1%	15.2%	77.7%
Vehicles Oper. Max. Service	8.8%	15.9%	75.3%
Operating Funds Total	**3.4%**	**9.1%**	**87.5%**
Passenger Fares	1.9%	5.7%	92.5%
Operating Expenses Total	3.6%	9.4%	87.1%
Capital Funds Total	2.6%	6.9%	90.5%
Uses of Capital Funds			
Rolling Stock	4.8%	11.4%	83.7%
Facilities and Other	1.6%	5.1%	93.3%

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National Transit Profile

Introduction

This chapter discusses the data included in **Exhibit 1-1**, the National Transit Profile, which provides an overview of the mass transit industry in the United States by displaying aggregated data for 1997. These data include:

- Sources of operating and capital funding
- A summary of operating expenses
- Uses of capital funds
- Service supplied and consumed

This information is also presented for each of the five major modes of service: Bus, Heavy Rail, Commuter Rail, Light Rail, and Demand Response. Additionally, performance indicators for each mode show measures of service, as well as and cost effectiveness and efficiency, in graphics.

Service Consumption

Service Consumption data includes passenger miles and unlinked passenger trips. Passenger miles and unlinked passenger trips are generally determined through sampling. Each transit agency reporting to the National Transit Database is required to report these data annually, and their sampling procedure must meet a minimum 10 percent tolerance and a 95 percent confidence level. Depending on the size and location of a transit agency, the sampling procedure should be carried out every year, every third year or every fifth year. Large agencies are required to sample annually. Agencies not required to sample every year determine passenger miles for non-mandatory sampling years using the sampling year's trip length factor. This trip length factor is defined as the ratio between passenger miles and unlinked passenger trips. These agencies may also report, for a non-mandatory sampling year, the figure for passenger miles determined in a mandatory sampling year.

Service Supplied

Service Supplied data includes vehicle revenue miles and hours, vehicles operated in maximum service and vehicles available for maximum service. Revenue miles and hours include the miles and hours that a vehicle travels when in revenue service. A vehicle is in revenue service when it is available to the public and there is a reasonable expectation of carrying passengers. Vehicles operated in maximum service and vehicles available for maximum service are the number of revenue vehicles operated/available to meet the annual maximum service requirement. In the National Transit Profile, vehicles available for maximum service are reported as total fleet.

Exhibit 1-1 National Transit Profile 1997

General Information (System Wide)

Service Consumption (millions)

Annual Passenger Miles	40,115.4
Annual Unlinked Trips	7,954.2
Average Weekday Unlinked Trips	26.5
Average Saturday Unlinked Trips	13.5
Average Sunday Unlinked Trips	8.5

Service Supplied

Annual Vehicle Revenue Miles (millions)	2,853.1
Annual Vehicle Revenue Hours (millions)	189.9
Total Fleet	98,363
Vehicles Operated in Maximum Service	76,092
Base Period Requirement	34,118

Vehicles Operated in Maximum Service

Directly Operated	Vehicles	Agencies
Bus	40,407	331
Heavy Rail	8,245	14
Other	2,709	37
Light Rail	803	20
Demand Response	3,999	200
Commuter Rail	3,806	7
Total	**59,969**	**609**

Purchased Transportation	Vehicles	Agencies
Bus	3,301	123
Heavy Rail	0	0
Other	2,454	19
Light Rail	0	0
Demand Response	9,690	252
Commuter Rail	678	10
Total	**16,123**	**404**

Financial Information (System Wide)

Sources of Operating Funds Expended (millions)

Passenger Fares	$7,126.7
Local Funds	5,806.0
State Funds	3,661.4
Federal Assistance	604.5
Other Funds	732.5
Total Operating Funds Expended	**$17,931.0**

Summary of Operating Expenses (millions)

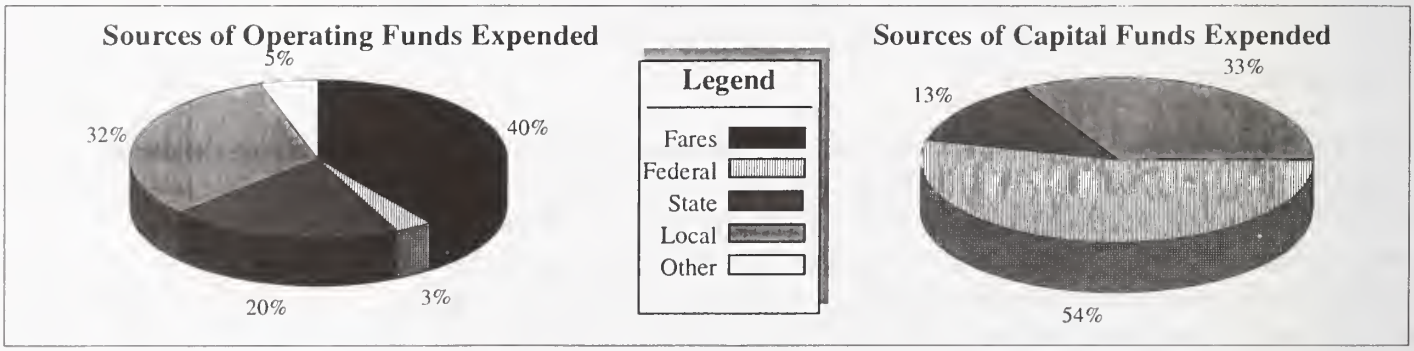
Salaries/Wages/Benefits	$12,510.4
Materials & Supplies	1,618.0
Purchased Transportation	1,294.6
Other Expenses	1,540.2
Total Operating Expenses	**$16,963.3**
Reconciling Cash Expenditures (millions)	$938.6

Sources of Capital Funds Expended (millions)

Local Funds	$2,492.0
State Funds	1,006.7
Federal Assistance	4,137.5
Total Capital Funds Expended	**$7,636.2**

Uses of Capital Funds (millions)

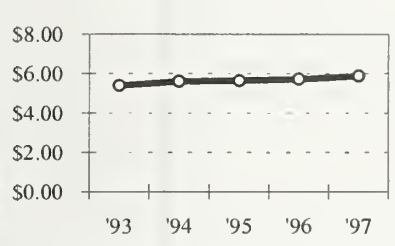
	Rolling Stock	Facilities and Other	Total
Bus	$1,145.0	$1,082.9	$2,227.9
Heavy Rail	298.3	2,047.8	2,346.1
Other	144.7	122.2	266.9
Light Rail	211.6	661.7	873.2
Demand Response	64.9	39.5	104.4
Commuter Rail	372.4	1,445.0	1,817.4
Total	**$2,237.0**	**$5,399.0**	**$7,636.0**

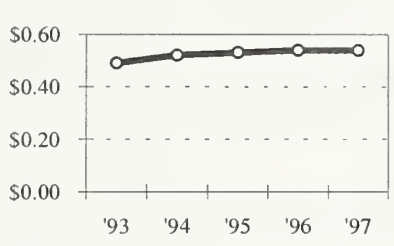


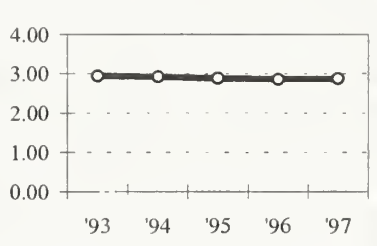
National Transit Profile 1997 (continued)

Characteristics	Bus	Heavy Rail
Operating Expense (millions)	$9,421.9	$3,473.7
Capital Funding (millions)	$2,227.9	$2,346.1
Annual Passenger Miles (millions)	17,509.2	12,056.1
Annual Vehicle Revenue Miles (millions)	1,605.7	539.7
Annual Unlinked Trips (millions)	4,602.0	2,429.5
Average Weekday Unlinked Trips (millions)	15.3	8.1
Annual Vehicle Revenue Hours (millions)	124.6	26.1
Fixed Guideway Directional Route Miles	1,663.5	1,526.8
Total Fleet	54,946	10,228
Average Fleet Age in Years	8.1	21.1
Vehicles Operated in Maximum Service	43,708	8,245
Peak to Base Ratio	1.7	1.8
Percent Spares	26%	24%
Performance Measures		
Service Efficiency		
Operating Expense/Vehicle Revenue Mile	$5.87	$6.44
Operating Expense/Vehicle Revenue Hour	$75.64	$133.27
Cost Effectiveness		
Operating Expense/Passenger Mile	$0.54	$0.29
Operating Expense/Unlinked Passenger Trip	$2.05	$1.43
Service Effectiveness		
Unlinked Passenger Trips/Vehicle Revenue Mile	2.87	4.50
Unlinked Passenger Trips/Vehicle Revenue Hour	36.95	93.21

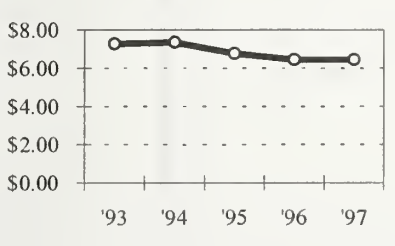
Bus

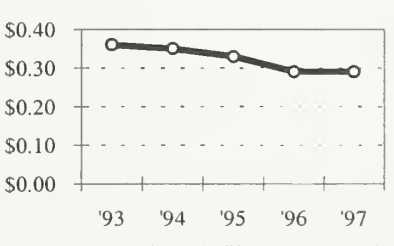


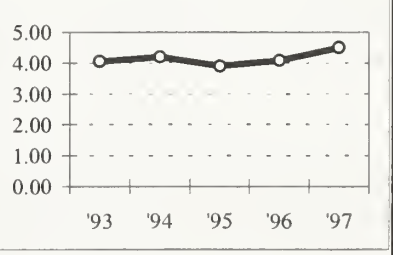




Heavy Rail







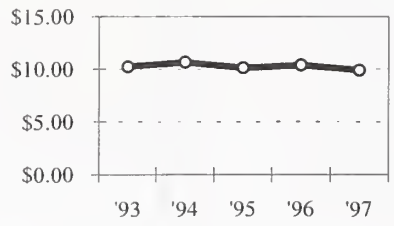
Source: 1997 National Transit Database

National Transit Profile 1997 (continued)

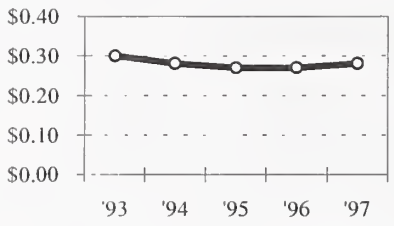
Characteristics	Commuter Rail	Light Rail
Operating Expense (millions)	$2,274.7	$471.4
Capital Funding (millions)	$1,817.4	$873.2
Annual Passenger Miles (millions)	8,037.5	1,023.7
Annual Vehicle Revenue Miles (millions)	229.6	39.8
Annual Unlinked Trips (millions)	357.2	259.4
Average Weekday Unlinked Trips (millions)	1.3	0.8
Annual Vehicle Revenue Hours (millions)	6.8	2.6
Fixed Guideway Directional Route Miles	6,392.9	658.5
Total Fleet	5,425	1,062
Average Fleet Age in Years	20.6	15.9
Vehicles Operated in Maximum Service	4,484	803
Peak to Base Ratio	2.0	1.6
Percent Spares	21%	32%
Performance Measures		
Service Efficiency		
Operating Expense/Vehicle Revenue Mile	$9.91	$11.84
Operating Expense/Vehicle Revenue Hour	$334.48	$183.69
Cost Effectiveness		
Operating Expense/Passenger Mile	$0.28	$0.46
Operating Expense/Unlinked Passenger Trip	$6.37	$1.82
Service Effectiveness		
Unlinked Passenger Trips/Vehicle Revenue Mile	1.56	6.52
Unlinked Passenger Trips/Vehicle Revenue Hour	52.52	101.08

Commuter Rail

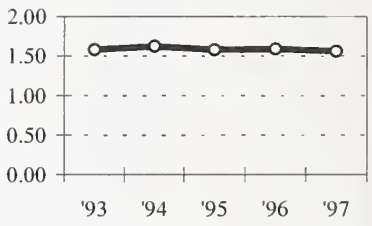
Operating Expense Per Vehicle Revenue Mile



Operating Expense Per Passenger Mile

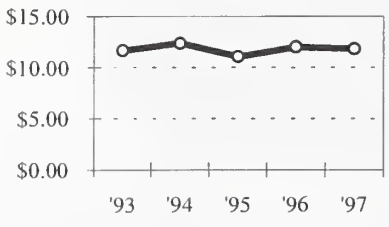


Passenger Trips Per Vehicle Revenue Mile

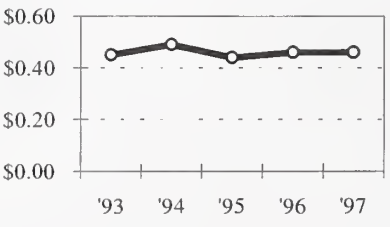


Light Rail

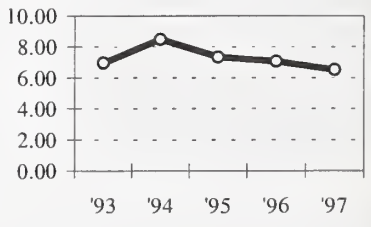
Operating Expense Per Vehicle Revenue Mile



Operating Expense Per Passenger Mile



Passenger Trips Per Vehicle Revenue Mile



Source: 1997 National Transit Database

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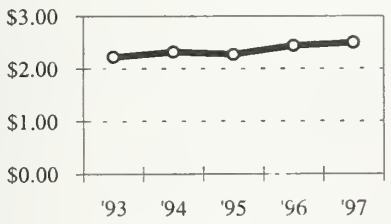
National Transit Profile 1997 (continued)

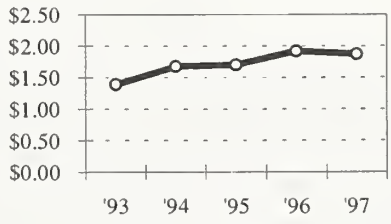
Characteristics	Demand Response
Operating Expense (millions)	$872.5
Capital Funding (millions)	$104.4
Annual Passenger Miles (millions)	466.2
Annual Vehicle Revenue Miles (millions)	349.8
Annual Unlinked Trips (millions)	60.0
Average Weekday Unlinked Trips (millions)	0.2
Annual Vehicle Revenue Hours (millions)	23.8
Fixed Guideway Directional Route Miles	N/A
Total Fleet	19,820
Average Fleet Age in Years	3.4
Vehicles Operated in Maximum Service	13,699
Peak to Base Ratio	N/A
Percent Spares	45%
Performance Measures	
Service Efficiency	
Operating Expense/Vehicle Revenue Mile	$2.49
Operating Expense/Vehicle Revenue Hour	$36.66
Cost Effectiveness	
Operating Expense/Passenger Mile	$1.87
Operating Expense/Unlinked Passenger Trip	$14.54
Service Effectiveness	
Unlinked Passenger Trips/Vehicle Revenue Mile	0.17
Unlinked Passenger Trips/Vehicle Revenue Hour	2.52

Demand Response

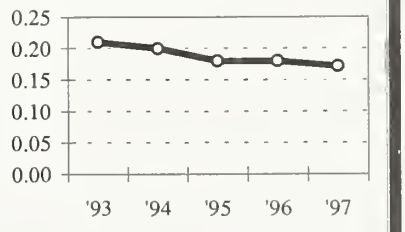
Operating Expense Per Vehicle Revenue Mile



Operating Expense Per Passenger Mile



Passenger Trips Per Vehicle Revenue Mile



Source: 1997 National Transit Database

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Financial Information

Financial Information includes data on the following:

- Operating funds applied
- Operating expenses
- Sources of capital funds expended
- Uses of capital funds

Operating funds applied include the funding sources for transit that resulted in expenditures and reported in aggregate not by mode. Operating expenses are reported by mode, function and object class. Function is the activity performed or cost center of a transit agency. There are four basic functions in the National Transit Database: vehicle operations, vehicle maintenance, non-vehicle maintenance and general administration. Object classes are groupings of expenses based upon goods or service purchased. For the National Transit Profile, object classes are grouped into 4 categories:

- Salaries/wages and benefits
- Materials and supplies
- Purchased transportation
- Other expenses.

Purchased transportation data is reported in two different ways: detailed reporting, which shows purchased transportation expenses broken down by object class and function. In this case, the purchased transportation data is included in salaries, benefits and all other object classes. In many cases, however, purchased transportation expenses are reported as a lump sum under the object class "purchased transportation." Therefore, these data represent the portion of purchased transportation data not detailed by function and object class. The expense reported under object class "purchased transportation" in the summary page of the National Transit Profile is not the total expense for purchased transportation in the NTD. Readers should refer to Chapter 4, **Exhibit 4-13** for a complete discussion on the service supplied and consumed, and operating expense for purchased transportation.

Capital Data

Capital Data is divided into sources of capital funds expended and uses of capital. Only the dollars resulting in capital expenditures for a given year are reported. There are three major categories for capital expenditures: rolling stock, facilities and other. Rolling stock includes revenue vehicles used to

provide transit service for passengers. Rolling stock expenditures include the acquisition of new and replacement revenue vehicles and major components and parts necessary for returning a revenue vehicle to an operable condition. This category also includes expenditures for rehabilitation, overhaul, or remanufacture of revenue vehicles.

Facilities and other capital expenditures include everything exclusive of rolling stock. This category includes the following items:

- Construction and rehabilitation of maintenance facilities
- Crime prevention and security equipment
- Line equipment and structures
- Signals and communications
- Power equipment and substations
- Transit malls and transfer facilities
- Intermodal terminals
- Shelters and passenger stations
- Depots and terminals
- High-occupancy vehicle facilities
- Transit ways and track
- Park-and-ride facilities
- Vehicle diagnostic equipment and real-time data acquisition systems
- Computer hardware and software
- Fare collection equipment

Modal Data

At modal level, **Exhibit 1-1** includes data items that are reported by mode and performance measures. Please note that these measures are national averages and the variance in data distribution may be large depending on the mode. For example, the variance in performance measures of Bus and Demand Response is higher than for rail modes. Bus and Demand Response operate in all types of

transit agencies under different conditions. Rail modes are operated almost exclusively in large metropolitan areas by large transit agencies. This fact results in smaller variance in the performance measures for rail modes.

The data shows that 7.95 billion unlinked trips occurred in 1997, resulting in over 40.1 billion passenger miles. This indicates that the average trip is approximately 5 miles. On an average weekday, 26.5 million unlinked trips occur. In terms of service supplied, 189.9 million revenue hours and 2,853.1 million revenue miles were produced, resulting in an average speed of nearly 15 miles per hour. For an average trip length of 5 miles, the average time riding a transit vehicle was nearly 20 minutes. This does not include the time required to access transit or the waiting time at stops and stations.

The total operating funding expended was nearly $17.9 billion, consisting of $16.96 billion in operating expenses and $.9 billion in reconciling cash expenditures.

The average cost per unlinked trip was $2.13 and the average fare per unlinked trip $0.90, which represents 42.2 percent of the total cost per passenger.

Capital investment consumed nearly $7.6 billion in 1997. Chapter 2 presents a discussion in capital funding and capital expenditures.

At the modal level, Bus and Heavy Rail are the modes with the highest levels of operating expense, and service supplied and consumed. All modes experienced increases in both service supplied and consumed. Heavy rail was the mode with the largest increase in service effectiveness as measured by unlinked passenger trips per vehicle revenue mile at 10 percent. Commuter Rail displayed steady behavior in terms of passenger trips per vehicle revenue mile. Demand Response had a clearly decreasing trend for the same ratio, resulting from the need of produce miles and hours of service at a rate greater than the rate of increase in ridership.

Chapters 3 and 4 present more analysis in operating data at the modal level.

Capital Funding

Introduction

Capital investment in transit increased by nearly 10 percent in 1997 compared to 1996, with $ 7.6 billion invested in capital projects. The Federal contribution was over 54 percent of the capital invested in 1997.

Chapter Organization

This chapter begins with a review of the sources of capital funding, then discusses the uses of capital funds by mode and by category of use. Data on transit infrastructure and other variables directly affected by capital investments is also presented.

Sources of Capital Funds

Federal capital assistance continues to be the single largest source of funds for capital investment in transit infrastructure. Of the nearly $7.6 billion used in 1997 for capital investment in transit infrastructure expansion and rehabilitation, Federal assistance accounted for 54.2 percent. Local funds represented 32.6 percent and State funding contributed 13.2 percent. The sources and amounts of capital funding for the 1993-1997 time frame are given in **Exhibit 2-1**. The contribution of Federal assistance increased from 41.6 percent in 1993 to 54.2 percent in 1997. The contribution of Local assistance had a decreasing trend between 1995 and 1997, ranging from 48.6 percent in 1995 to 32.6 percent in 1997. The trend for State assistance is the reverse of the Federal trend, decreasing from 23 percent in 1993 to 13 percent in 1997.

Exhibit 2-1

Sources of Capital Funds
(Millions)
1993-1997

	1993	1994	1995	1996	1997
Federal	$2,383.5	$2,518.1	$3,313.7	$3,506.3	$4,137.5
State	1,316.7	1,005.5	989.2	895.2	1,006.7
Local	2,033.4	2,074.8	2,705.5	2,553.4	2,492.0
Total	**$5,733.6**	**$5,598.4**	**$7,008.4**	**$6,954.9**	**$7,636.2**

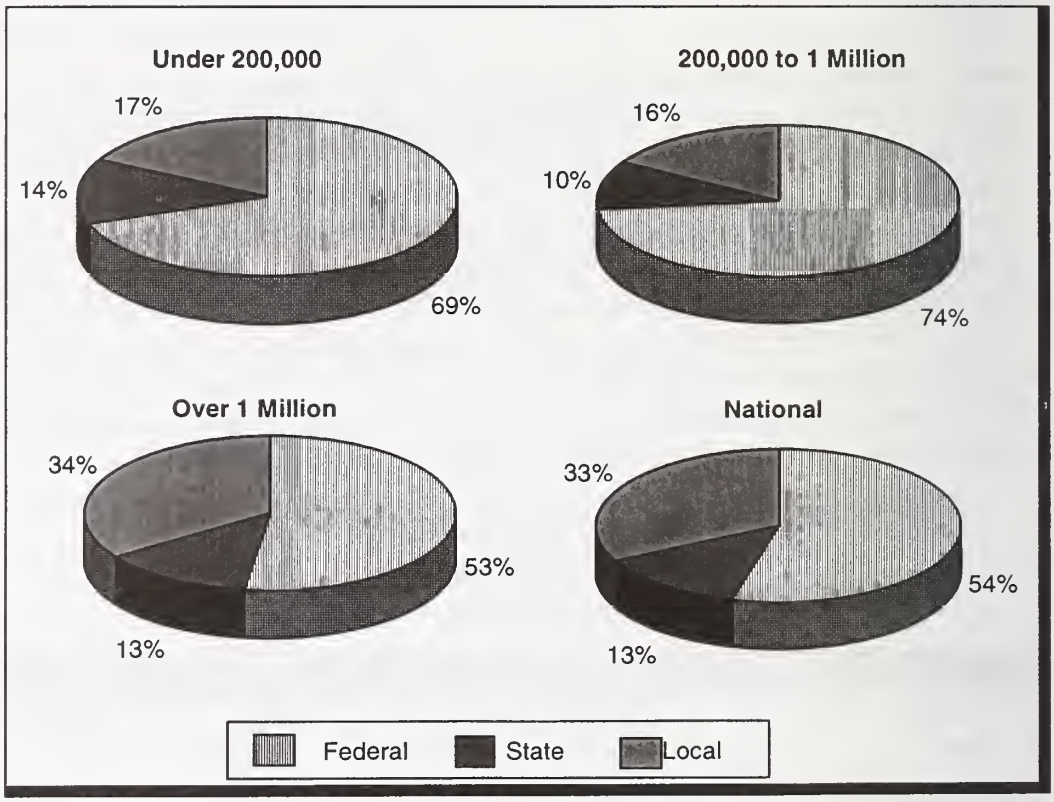
Distribution of Capital Funds by UZA Size and Source

Urbanized areas (UZAs) with a population of more than 1 million inhabitants account for nearly $6.9 billion, or 90.5 percent, of the capital investment made in transit infrastructure in 1997. This is due to the substantial number of fixed guideway systems in place, or being developed, in large metropolitan areas. These systems require large fleets of vehicles to accommodate passenger needs, in addition to maintaining significant capital assets, such as sophisticated signaling systems, and maintenance facilities.

As presented in **Exhibit 2-2**, large UZAs rely more heavily than mid-size or small UZAs on local funding sources to meet capital needs. This is because of the substantial investment needed to maintain their large transit infrastructures when compared to mid-size and small UZAs, which have far less transit infrastructure. **Exhibit 2-2** also shows that the share of federal assistance among agencies located in small urbanized areas is higher than for agencies located in large, densely populated areas.

Exhibit 2-2

Uses of Capital Funds by UZA Size and Source
1997



Uses of Capital Funds

Uses of capital funds are identified by mode and category of use in **Exhibit 2-3**. The categories of use are rolling stock, facilities and other capital expenditures.

Exhibit 2-3

Use of Capital Funds by Mode
(Millions)
1997

	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	Total
Rolling Stock	$1,145.0	$298.3	$372.4	$211.6	$65.0	$144.7	**$2,237.0**
Facilities	705.9	1,602.6	1,330.4	622.8	23.9	110.0	**$4,395.6**
Other Capital	377.1	445.2	114.6	38.9	15.6	12.1	**$1,003.5**
Total	**$2,228.0**	**$2,346.1**	**$1,817.4**	**$873.2**	**$104.4**	**$266.9**	$7,636.1

Rolling stock includes revenue vehicles used to providing transit service for passengers. Rolling stock expenditures include the acquisition of new and replacement of revenue vehicles, and major components and parts necessary for returning a revenue vehicle to operable condition. This category also includes expenditures for rehabilitation, overhaul, or remanufacture of revenue vehicles.

Facilities and other capital expenditures include everything not related to rolling stock. This category includes items such as:

- Construction and rehabilitation of maintenance facilities
- Crime prevention and security equipment
- Line equipment and structures
- Signals and communications
- Power equipment and substations
- Transit malls and transfer facilities
- Intermodal terminals
- Shelters and passenger stations
- Depots and terminals
- High-occupancy vehicle facilities
- Transit ways and track
- Park-and-ride facilities

- Vehicle diagnostic equipment and real-time data acquisition systems
- Computer hardware and software
- Fare collection equipment

In the aggregate, rolling stock represents 29.3 percent of capital expenditures while facilities and other represent 70.7 percent. Rail modes consume the majority of capital expenditures, with Heavy Rail, Commuter Rail, and Light Rail expending 66 percent of the capital investment in 1997.

Rail modes are mostly located in high density corridors in the largest metropolitan areas of the United States. The high levels of service supplied in these areas require large investments in items such as real-time data acquisition systems, complex maintenance facilities, passenger stations, intermodal terminals, and many other cost-intensive items. The nature of the rail systems explains the smaller role of the rolling stock share in the total capital expenditure of rail modes. Heavy Rail expended 12.7 percent of capital on rolling stock in 1997, while Commuter Rail and Light Rail expended 20.5 and 24.2 percent respectively.

Bus and Demand Response exhibit a different share in the distribution of capital expenditures among rolling stock, facilities, and other. Bus expended 51.4 percent of the capital invested on rolling stock, while Demand Response's share was 62.2 percent in 1997. Bus and Demand Response modes do not require the same level of investment in facilities and other as do rail modes; therefore, rolling stock is the main use of capital. Additionally, while rail modes are concentrated in large UZAs serving dense metropolitan areas, Bus systems operate in large, mid-size and small UZAs. The total capital expenditure for Bus is distributed among several transit agencies, small and large, across the nation. Mid-size and small UZAs account for 20.4 percent of the uses of capital funding for Bus. The share of rolling stock in these areas is even higher than the share for large urbanized areas. This fact contributes to the overall larger share of rolling stock for Bus. Demand Response displays an even higher percentage of capital expenditures for rolling stock, because capital items, such as intermodal terminals and shelters, are not normally required for this mode.

Current Infrastructure: Fixed Guideway Characteristics

Exhibit 2-4 reflects the amount of fixed guideway segment miles by mode and shows the continuing investment in the development and operation of fixed guideway systems. For Bus, both exclusive and controlled access rights-of-way are included. The continuing investment in fixed guideway systems is most prominent for Bus, which has increased fixed guideway segment miles by 36.7 percent since 1993. The Bus fixed guideway segment miles reported are for the

actual segments being operated. Many Bus fixed guideway segments are used by more than one transit agency. Each transit agency is required to report its operation on each segment. However, **Exhibit 2-4** only includes the actual segments measured in miles.

Exhibit 2-4

Fixed Guideway Miles by Mode
(Actual Segments)
1993-1997

Mode	1993	1994	1995	1996	1997
Bus*	925.6	958.7	1,029.5	1,121.6	1,265.7
Heavy Rail	1,451.7	1,455.2	1,458.0	1,477.6	1,526.8
Commuter Rail	5,875.1	6,033.4	6,161.7	6,363.7	6,392.9
Light Rail	537.4	561.9	567.6	637.5	658.5
Demand Response	-	-	-	-	-
Other - Ferryboat	475.6	486.5	489.5	477.0	496.3
- Trolleybus	405.2	416.9	411.6	415.8	419.8
- All other	21.7	26.5	18.3	26.7	25.8
Total	**9,692.3**	**9,939.1**	**10,136.2**	**10,519.9**	**10,785.8**

** Exclusive plus Controlled Access Rights-of-Way.*

For rail, increases were reported for Heavy Rail, Commuter Rail, and Light Rail. Heavy Rail had an increase of 5.2 percent for the 1993-1997 time frame. The increase in Light Rail is more noticeable as it increased by 22.5 percent, which is due in part to five new starts during this period. In 1994, new systems in Denver and St. Louis added new fixed guideway directional route miles for Light Rail, and in 1996 a new Light Rail system in Dallas began revenue service. Commuter Rail had an increase of 8.8 percent during the 1993-1997 time frame. Demand Response is not a fixed guideway mode and therefore does not have any fixed guideway miles.

ADA Accessible Vehicles

The percentage of vehicles that are ADA accessible by mode is shown in **Exhibit 2-5**. This exhibit is presented only for 1994, 1995, 1996, and 1997 since reporting ADA compliant vehicles only became a requirement in 1993. As the exhibit shows, Heavy Rail is the mode with the largest percentage of ADA accessible vehicles, 78.1 percent. Bus follows with 67.8 percent.

Exhibit 2-5

Percentage of ADA Accessible Vehicles by Mode
1994-1997

Modes	Percent Available			
	1994	1995	1996	1997
Bus	52.8	60.2	65.3	67.8
Heavy Rail	78.9	79.3	78.0	78.1
Commuter Rail	17.5	20.1	25.1	28.8
Light Rail	36.7	41.8	48.9	48.1
Demand Response	50.9	54.3	62.2	61.9

Spare Ratio

Exhibit 2-6 reflects the relative stability of spare ratios for each mode since 1993 with the exception of Light Rail and Demand Response. The spare ratio for Light Rail and Demand Response increased by 11.1 and 28.1 percent respectively when compared with 1993. These increases are related in part to the gap between the number of new vehicles acquired to meet projected ridership and the current real demand for Light Rail and Demand Response service. Demand Response is also the mode with the highest spare ratio at 45 percent followed by Light Rail with 32 percent.

Exhibit 2-6

Spare Ratio by Mode
1993-1997

Mode	1993	1994	1995	1996	1997
Bus	23.0%	22.9%	23.3%	24.6%	26.0%
Heavy Rail	25.6	24.2	27.5	26.0	24.0
Commuter Rail	18.2	17.9	17.0	19.2	21.0
Light Rail	28.8	34.1	37.8	39.6	32.0
Demand Response	35.1	36.0	42.5	38.8	45.0

Average Fleet Age

The average fleet age by mode for the 1993-1997 time frame is provided in **Exhibit 2-7**. The average fleet age increased in 1997 for Heavy Rail and Commuter Rail. The average fleet age for Bus and Demand Response decreased slightly.

Average Fleet Age by Mode
1993-1997

Exhibit 2-7

Mode	1993	1994	1995	1996	1997
Bus	8.3	8.5	8.4	8.4	8.1
Heavy Rail	17.8	18.6	19.3	20.1	21.1
Commuter Rail	18.8	19.2	19.6	20.5	20.6
Light Rail	14.3	14.3	16.2	16.0	15.9
Demand Response	3.7	3.7	3.6	3.6	3.4

Non-Fixed Guideway Vehicles

Non-fixed guideway vehicles by vehicle type and mode are presented in **Exhibit 2-8**. Over 83 percent of vehicles operated in Bus service are high capacity coaches seating more than 35 passengers. In contrast, 45 percent of Demand Response vehicles are vans, while over 29 percent are automobiles.

Non-Fixed Guideway Vehicles
by Vehicle Type and Mode
1997

Exhibit 2-8

Vehicle Type	Bus	Demand Response
Class A Bus (>35 Seats)	45,453	49
Class B Bus (25-35 Seats)	5,016	117
Class C Bus (<25 Seats)	2,373	4,555
Articulated Bus	1,482	2
School Bus	2	138
Van	311	8,528
Automobile	7	5,709
Trolleybus	240	0
Total	**54,644**	**19,098**

Non-fixed guideway vehicles by vehicle type and by propulsion are shown in **Exhibit 2-9**. The exhibit shows that, while other forms of propulsion are growing in acceptance, diesel fuel-powered vehicles and gasoline-powered vehicles continue to account for 71.4 percent and 22.6 percent, respectively, for all non-fixed guideway vehicles. Other means of propulsion, including electricity, liquefied natural gas, compressed natural gas, and liquefied petroleum gas, account for the remaining 6 percent. A discussion on trends in the use of alternative fuels can be found in Chapter 6, **Exhibit 6-4**.

Exhibit 2-9

Non-Fixed Guideway Vehicles by Vehicle Type and Propulsion
1997

Vehicle Type	Diesel Fuel	Gasoline	Other Fuels	Total
Buses				
Class A Bus (>35 Seats)	43,101	21	2,380	**45,502**
Class B Bus (25-35 Seats)	4,723	63	350	**5,136**
Class C Bus (<25 Seats)	4,418	1,815	701	**6,934**
Articulated Bus	1,430	0	54	**1,484**
School Bus	114	26	0	**140**
Automobiles	17	5,615	76	**5,708**
Vans	2,381	10,231	1,180	**13,792**
Total	**56,184**	**17,771**	**4,741**	**78,696**

New Vehicles Acquired

A summary of new vehicles acquired by mode and by type of service is presented in **Exhibit 2-10**. The data included in this exhibit covers the period between 1992 and 1996 and not the period from 1993 to 1997 as with other exhibits in the *1997 NTST*. The reason is that since a transit agency's report year is based on its fiscal year, data for 1997 is limited to that portion of the manufacturer year included within the transit agency's fiscal year. For example, a transit agency with a fiscal year ending on June 30 will report only the new vehicles accepted and placed into service at the end of June 30. As a result, a vehicle manufactured in a given year, but accepted after the transit agency's fiscal year ends, will not be reported until the subsequent report year for that transit agency. One half of all transit agencies conclude their fiscal year on June 30. Consequently, current year data would understate the number of new vehicles for 1997.

Exhibit 2-10

New Vehicles Acquired by Mode and Type of Service
1992-1996

Modes/Type of Service	1992	1993	1994	1995	1996
Bus	3,026	2,747	3,116	3,472	4,245
Heavy Rail	215	226	86	67	13
Commuter Rail	94	66	85	36	48
Light Rail	34	38	-	48	47
Demand Response	1,134	1,746	2,534	2,655	2,282
Other	674	255	378	539	374
Total	**5,177**	**5,078**	**6,199**	**6,817**	**7,009**

The total number of vehicles acquired in 1996 increased by 2.8 percent over 1995. New vehicles for Bus increased by 22.3 percent in 1996 when compared with 1995. Rail modes had a decrease in the number of new vehicles in 1995. Bus accounted for 60.6 percent of all new vehicles acquired in 1996, while Demand Response accounted for 32.6 percent. Rail modes accounted for 1.5 percent of new vehicles for that year.

Another perspective on fleet age is provided in **Exhibit 2-11**. Comparisons with **Exhibit 2-10** should be avoided because **Exhibit 2-11** provides data by fleet type, while **Exhibit 2-10** provides information by mode. Each of the vehicle types experience a different useful life which is greatly influenced by use, weather, road conditions, maintenance practices, and local policies regarding rehabilitation and overhaul. Thus, the decline in average age is reflected in the number of standard buses, small buses, and vans that are 5 years of age or less, while the longer useful lives of Heavy Rail, Commuter Rail, and Light Rail vehicles are reflected by the large number of vehicles that are more than 15 years old.

Vehicles by Age and Vehicle Type
1997

Exhibit 2-11

Vehicle Type	Age in Years							Total
	5 Years or Less	6-11 Years	12-15 Years	16-20 Years	21-25 Years	Over 25 Years	No Year Reported	
Buses								
Class A Bus (>35 Seats)	14,390	17,622	9,169	3,478	525	318	0	**45,502**
Class B Bus (25-35 Seats)	2,797	1,717	336	262	21	3	0	**5,136**
Class C Bus (<25 Seats)	5,057	1,625	164	6	1	0	81	**6,934**
Articulated Bus	209	205	889	181	0	0	0	**1,484**
School Bus	69	48	16	1	0	0	6	**140**
Trolleybus	68	291	2	196	326	0	0	**883**
Heavy Rail	569	1,460	2,129	735	1,609	3,671	0	**10,173**
Commuter Rail	634	812	549	615	1,136	1,991	0	**5,737**
Light Rail	231	300	144	327	20	110	0	**1,132**
Ferryboat	6	19	6	19	10	22	0	**82**
Automobile	1,325	344	20	16	2	0	4,009	**5,716**
Van	9,721	1,758	66	3	0	0	2,248	**13,796**
Other Vehicle Types	82	31	19	1	1	52	118	**304**
Total	**35,158**	**26,232**	**13,509**	**5,840**	**3,651**	**6,167**	**6,462**	**97,019**

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Operating Funding and Expenses

Introduction

This chapter discusses patterns and trends in funding and expenditures for transit operations. Sources and levels of such funding are outlined, along with general trends for operating funding and expenses. Operating expenses are presented and discussed by mode and object class. The National Transit Database uses accrual accounting as the basis for financial reporting. Under this method, revenues are recorded when earned, regardless of whether receipt of the revenue takes place in the same reporting period. Similarly, expenditures are recorded as soon as they result in liabilities for benefits received, regardless of whether payment of the expenditure is made in the same reporting period.

Chapter Organization

The chapter begins with a review of the various funding sources, including Federal, state, local and passenger fare revenues. Operating expenses are then presented by mode and object class.

Operating Funds Applied

Operating funds include Federal, state, and local financial assistance used to subsidize the cost of operating transit service, as well as all categories of passenger fare revenues. Operating funds applied are unavailable by mode in the NTD. One of the reasons for this limitation is related to the integrated fare policy found in large transit systems operating more than one mode. Federal funds include general grants of operating assistance funds under 49 United States Code 5307 and other grants that have an operating assistance component. State funds include direct operating grants and assistance to transit agencies (e.g. reduced fares for the elderly and physically challenged). Local assistance, besides municipal appropriations, incorporates funds available from dedicated taxes (property, sales, income, or other); tolls and fees; revenues accrued through purchased transportation agreements; and other non-fare-based revenue sources such as concessions and advertising.

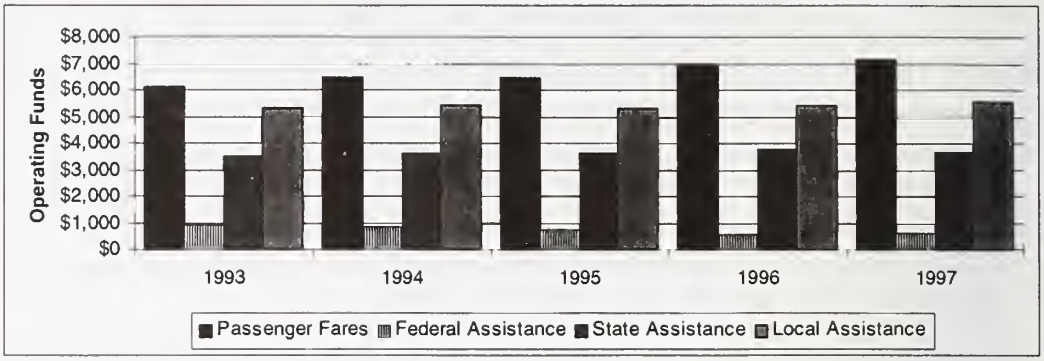
A reporting change was introduced in 1994 for operating funds applied. For 1994, only the funds expended in that reporting year were reported. Previously, all funds collected were reported regardless of whether they were expended in the reporting year. Therefore, variations in the funding amounts by source, from 1993 to 1994, may be affected by this reporting change.

Sources of Operating Funding

As shown in **Exhibit 3-1**, passenger fares and local funds compose the bulk of operations funding. In 1997, fares contributed 39.7 percent of the funds applied for transit operations while local assistance contributed 31 percent. State operating assistance accounted for 20.4 percent while Federal funds supplied 3.4 percent.

Exhibit 3-1

Sources of Operating Funds
(Millions)
1993-1997



Operating funds applied increased 1.7 percent in 1997 compared with 1996. In the aggregate, there was a decrease in State assistance at 3.4 percent. Federal assistance and Local assistance increased by 9.2 percent and 3 percent respectively.

For the 1993-1997 time frame, passenger fares as a percentage of operating funds applied had an increasing trend, ranging from 36.5 percent in 1993 to 39.7 percent in 1997. The contribution of local assistance remained stable, ranging from 30.8 percent in 1993 to 31 percent in 1997. Federal assistance accounted for 5.4 percent of the total operating funds in 1993 and decreased to 3.4 percent in 1997. State assistance decreased from 20.7 percent in 1993 to 20.4 percent in 1997.

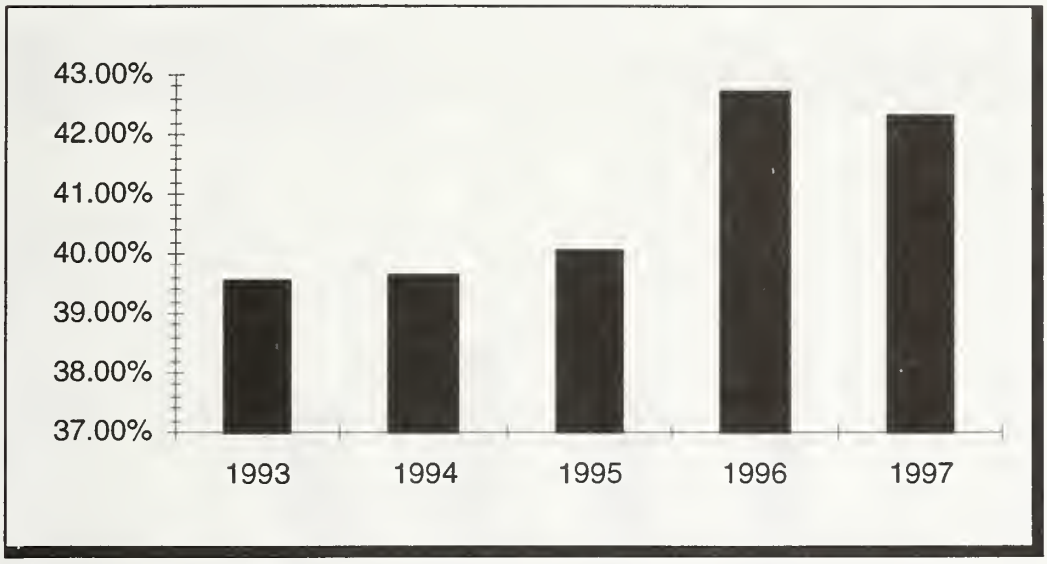
The Federal participation in operating subsidies to agencies had a decreasing trend, as Federal resources shifted toward investments in capital. The Federal share in capital investments surpassed 50 percent in 1997. See Chapter 2 for a discussion in capital investment and expenditures.

Passenger Fare Revenue to Operating Expense (Recovery Ratio)

The recovery ratio for the 1993-1997 time frame is presented in **Exhibit 3-2**. The recovery ratio in the last five years had an increasing trend between 1993 and 1996, ranging from 39.5 percent in 1993 to 42.7 percent in 1996. The ratio decreased slightly, down to 42.3 percent, in 1997.

Ratio of Passenger Fare Revenue to Operating Expense
1993-1997

Exhibit 3-2

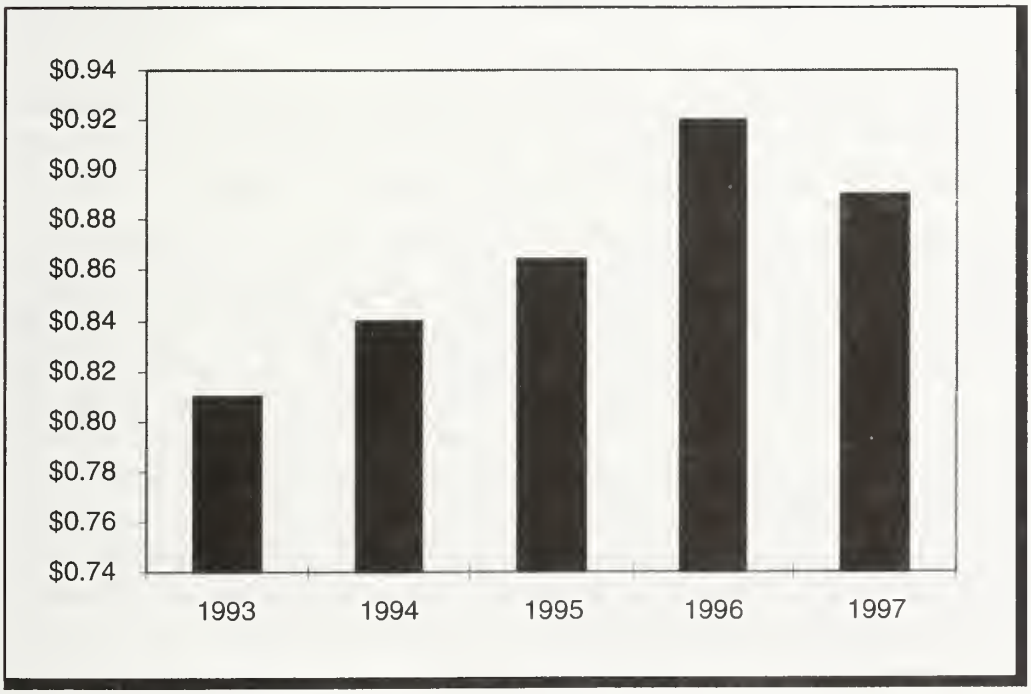


Average Fare Revenue per Unlinked Passenger Trip

Average fare revenue per unlinked passenger trip is shown in **Exhibit 3-3**. The exhibit shows an increasing trend between 1993 and 1996, ranging from $0.81 per passenger in 1993 to $0.92 per passenger in 1996. The ratio decreased slightly, down to $0.89 per passenger, in 1997.

Passenger Fare Revenue per Unlinked Passenger Trip
1993-1997

Exhibit 3-3

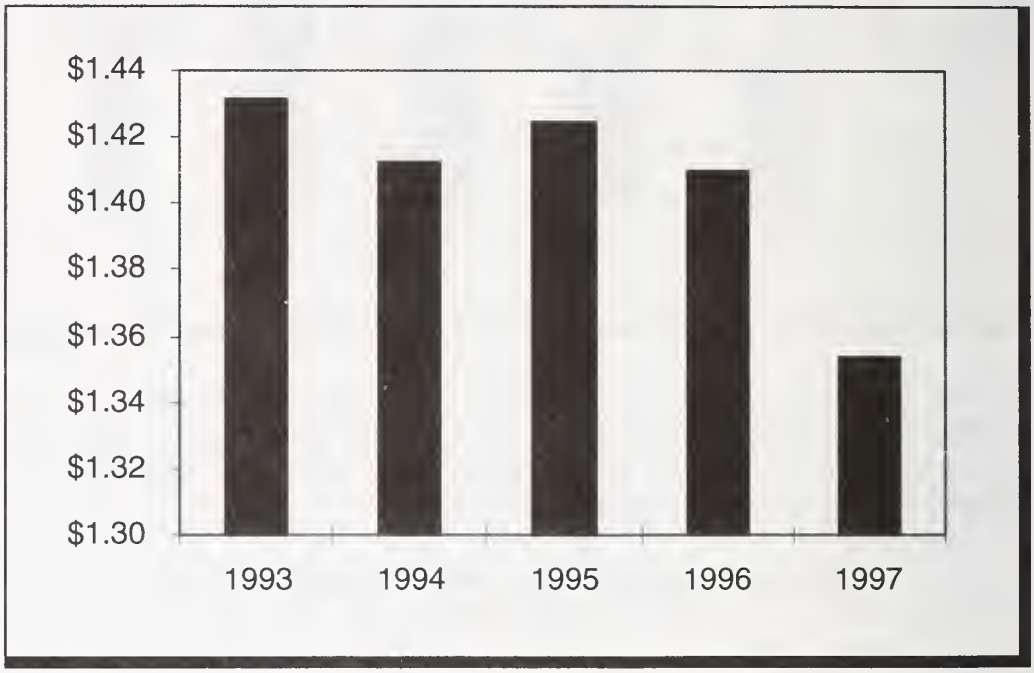


Average Subsidy per Unlinked Passenger Trip

Average subsidy per passenger is shown in **Exhibit 3-4**. The subsidy per unlinked passenger trip went from $1.43 per passenger in 1993 to $1.35 in 1997, representing a 5.6 percent decrease for the period. Subsidy per passenger decreased between 1996 and 1997, yet still accounts for 60.3 percent of the total funding applied per passenger.

Exhibit 3-4

Operating Subsidy per Passenger
1997



Sources of Operating Funds Applied by UZA Size

Distribution of transit operating funds applied by size of urbanized area is shown in **Exhibit 3-5**. The total operating funding in large, mid-size, and small urbanized areas increased slightly in 1997. Small and mid-size urbanized areas are more dependent on subsidies than large urbanized areas.

While the trend in transit operating funds applied indicates a decreased role for Federal funding and an increased role from other sources, a variation exists among the different sizes of urbanized areas. For small urbanized areas, Federal assistance decreased from 19.7 percent in 1993 to 13.5 percent in 1997. For mid-size urbanized areas, the decline in the share of Federal assistance was smaller, from 11.9 percent in 1993 to 6.5 percent in 1997. For large urbanized areas, Federal assistance reduced from 4.3 percent in 1993 to 2.7 percent in 1997. State and Local assistance increased for all areas. State and Local assistance grew by 36.4 and 19.1 percent respectively for small urbanized areas between 1993 and 1997. The largest increase in Local assistance was for mid-size urbanized areas, at 24.1 percent.

Sources of Operating Funds by UZA Size
(Millions)
1993-1997

Exhibit 3-5

UZA Size	Year	Passenger Fares	Federal Assistance	State Assistance	Local Assistance	Other	Total
Over 1 Million	1993	5,685.3	641.9	3,086.7	4,408.5	993.8	$14,816.2
	1994	6,017.6	591.9	3,218.3	4,945.1	516.9	$15,289.8
	1995	6,027.5	511.0	3,184.6	4,796.7	586.6	$15,106.3
	1996	6,482.6	354.8	3,356.1	4,577.3	833.1	$15,604.0
	1997	6,588.7	418.0	3,175.6	4,636.8	881.1	$15,700.2
200,000 to 1 Million	1993	320.0	168.7	273.8	588.7	70.0	$1,421.2
	1994	328.3	164.5	276.5	694.3	40.0	$1,503.6
	1995	333.5	155.6	281.2	698.6	44.1	$1,512.8
	1996	358.2	110.5	288.4	640.3	49.8	$1,477.3
	1997	404.4	105.2	329.5	730.5	59.8	$1,629.4
Under 200,000	1993	111.7	102.5	114.6	168.3	23.4	$520.5
	1994	120.5	105.1	131.9	176.0	17.7	$551.2
	1995	117.9	101.3	132.9	182.3	20.5	$554.9
	1996	123.9	88.3	144.1	187.8	28.1	$572.3
	1997	133.7	81.3	156.3	200.4	30.1	$601.8
Total	**1993**	**$6,117.1**	**$913.0**	**$3,475.1**	**$5,165.5**	**$1,087.2**	$16,757.9
	1994	**$6,466.4**	**$861.5**	**$3,626.7**	**$5,815.4**	**$574.7**	$17,344.7
	1995	**$6,478.9**	**$767.8**	**$3,598.6**	**$5,677.7**	**$651.2**	$17,174.3
	1996	**$6,964.8**	**$553.6**	**$3,788.6**	**$5,405.5**	**$911.0**	$17,623.5
	1997	**$7,126.7**	**$604.5**	**$3,661.4**	**$5,567.6**	**$971.2**	$17,931.4

For large urbanized areas, a decline in the share of Federal assistance occurred for the 1993-1997 time frame, while the contribution of state funds decreased from 20.8 percent in 1993 to 20.2 percent in 1997. Local assistance share remained stable between 1993 and 1997. For large urbanized areas the trend is to replace lost Federal and state subsidies with fare revenues and other directly generated funds.

The trends in contribution of passenger fares to total operating funds applied depend on the urbanized area's size. For small urbanized areas, the share of passenger fares increased 19.7 percent from 1993 to 1997. In 1993, passenger fares represented 21.5 percent of the total operating funds applied, and this figure increased to 22.2 percent in 1997. For mid-size urbanized areas, there was also an increase in the share of passenger fares for the 1993-1997 time frame, increasing from 22.5 percent of the operating funds in 1993, to 24.8 percent in 1997. For large urbanized areas, the contribution of passenger fares increased from 38.4 percent in 1993 to 42 percent in 1997.

Operating Expense

The total operating expenses for 1997 increased by 4 percent compared with 1996, resulting in over $16.9 billion in expenditures. Total operating funding for 1997 was over $17.9 billion and greater than the total operating expenses. This surplus was due to reconciling items that were reported in a variety of ways as a result of local ordinances and conditions to reconcile NTD expenses with public

financial reports. Reconciling items include interest expenses, leases and rentals, purchase and related parties lease agreements, and other items. Depreciation is also reported as a reconciling item; however, since it is not a cash expenditure, it is excluded from the computation of the total reconciling cash expenditures. Total reconciling cash expenditures were over $938 million in 1997.

Total operating expenses increased 9.6 percent from 1993 to 1997 as shown in **Exhibit 3-6**. The consumer price index increased 19.1 percent for this period.

Exhibit 3-6

Operating Expense by Mode and Reconciling Cash Expenditures
(Millions)
1993-1997

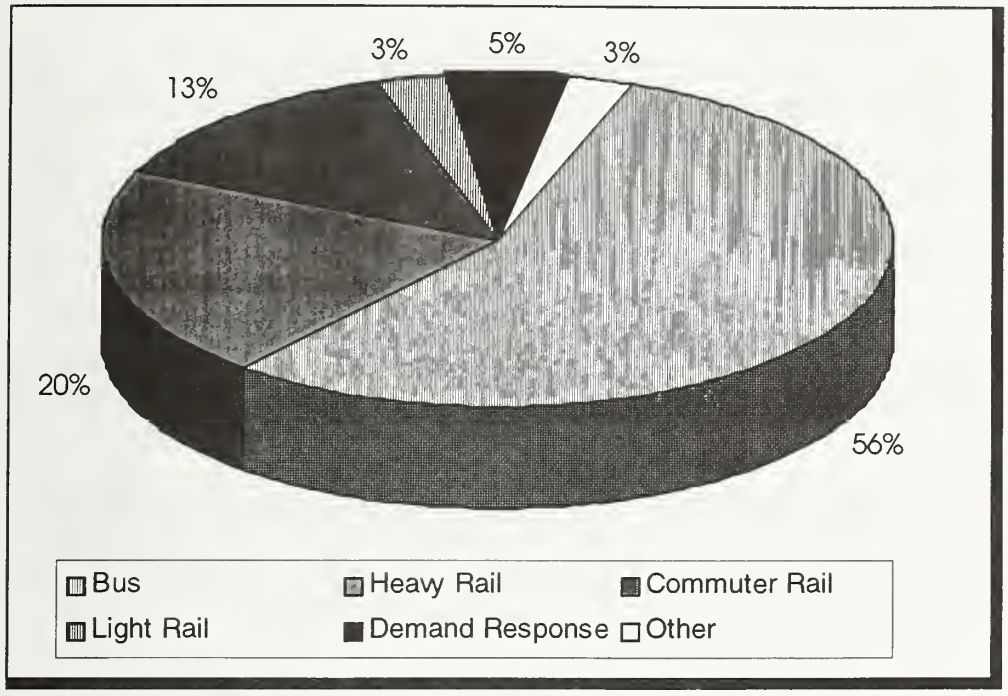
Mode	1993	1994	1995	1996	1997
Bus	8,513.6	8,859.5	8,972.2	8,995.3	9,421.9
Heavy Rail	3,668.6	3,786.0	3,522.9	3,401.9	3,473.7
Commuter Rail	2,079.9	2,227.8	2,206.7	2,294.0	2,274.7
Light Rail	314.1	411.6	375.2	440.3	471.4
Demand Response	540.1	633.9	689.5	750.1	872.5
Other	356.4	401.0	415.0	420.3	449.1
Operating Expenses	**15,472.7**	**16,319.8**	**16,181.6**	**16,301.9**	**16,963.3**
Reconciling Cash Expenditures	**$914.3**	**$961.0**	**$1,047.1**	**$808.3**	**$938.6**

Upon examination of total operating expenses by mode, Demand Response and Light Rail experienced the highest increases for the 1993-1997 time frame, increasing by over 61 and 50 percent respectively. These increases reflect expansion of the service supplied by these modes and implementation of new Light Rail systems. Commuter Rail experienced an increase of 9.4 percent in operating expenses. Heavy Rail is the only mode with a decrease for the 1993-1997 time frame. The increase for Bus was 10.7 percent and reflects the moderate increase in service supplied for this mode over the last five years.

The contribution of each mode to total operating expense in 1997 is shown in **Exhibit 3-7**. This exhibit reflects the dominance of Bus service, which accounted for 56 percent of 1997 total operating expenses. Heavy Rail consumed 20 percent and Commuter Rail 13.4 percent. Demand Response and Light Rail, while increasing in the amount of service supplied and in operating expense, represent 5.1 percent and 2.6 percent, respectively for 1997.

Distribution of Total Operating Expense by Mode
1997

Exhibit 3-7



Object Classes and Functions

Operating expenses are reported by object class and function in the NTD. Object classes are groupings of expenses based upon goods or services purchased. The following are the items included as object classes in the NTD:

- Labor
- Fringe Benefits
- Services
- Materials and Supplies
- Utilities
- Casualty and Liability Costs
- Taxes
- Purchased Transportation
- Miscellaneous Expenses
- Expense Transfers

A function represents the activities associated with accomplishing a certain task. The following are the four functional categories used for reporting:

- Vehicle Operations
- Vehicle Maintenance
- Non-vehicle Maintenance
- General Administration

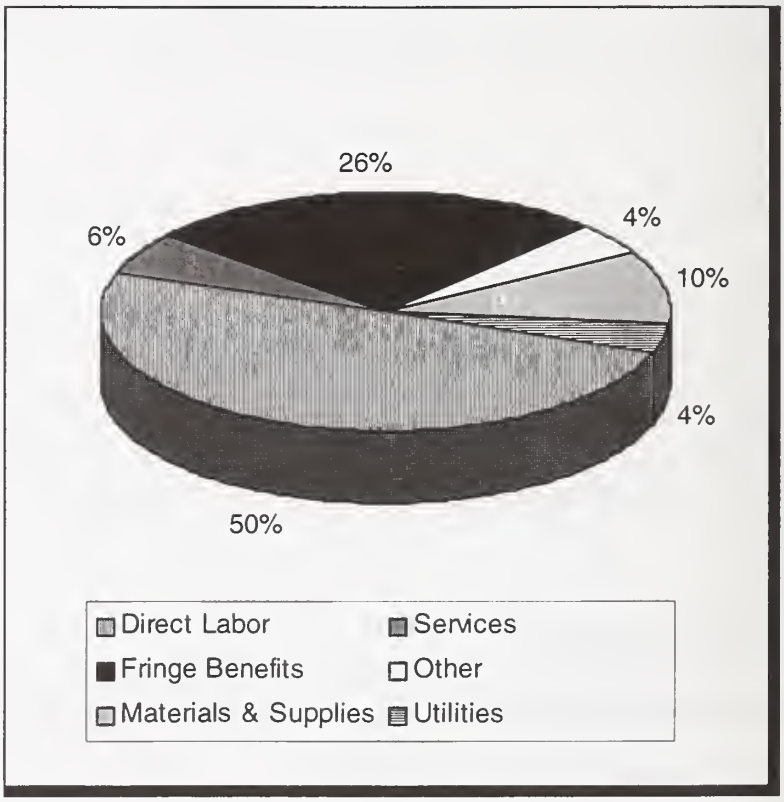
For this publication, casualty and liability costs, taxes, and miscellaneous expenses are grouped together as "other" when discussing operating expense by object class. Operating expense by object class and function is compared by mode.

Operating Expense by Object Class

Labor and fringe benefits are the two largest classes of operating expense. As indicated in **Exhibit 3-8**, these two classes total 79.8 percent of operating expenses for 1997, showing the labor-intensive nature of the transit industry and underscoring the industry's sensitivity to labor cost increases.

Exhibit 3-8

Distribution of Total Operating Expense by Object Class 1997



Materials and supplies includes fuel and lubricants, tires and tubes, and other miscellaneous items. This object class accounted for 10.3 percent of the operating expenses.

The services object class includes professional and technical services, such as legal or audit fees, and contracted services, such as grounds maintenance or security. Services account for 6.1 percent of operating expense. Utilities represent 4.2 percent of the total operating expenses. These are costs associated with electricity (used to propel rail transit vehicles), and general building and station utilities. Other expenses comprise all remaining object classes, accounting for 4.7 percent combined.

Operating Expense by Mode and Object Class

The distribution of operating expense by mode and object class is shown in **Exhibit 3-9**. Reconciling cash expenditures are not reported by mode. Direct labor and fringe benefits represent the largest expense classes for all modes. Purchased transportation manifests its significant role through the 63.4 percent of Demand Response operating expense attributable to this object class.

Exhibit 3-9

Operating Expense by Mode and Object Class and Reconciling Cash Expenditures (Millions) 1997

Object Class	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	Total
Direct Labor	$4,638.0	$2,042.3	$934.6	$225.6	$164.2	$202.5	**$8,207.3**
Fringe Benefits	2,386.6	1,063.5	589.6	120.0	62.4	81.0	**$4,303.1**
Materials and Supplies	1,047.4	257.0	195.4	31.8	32.4	54.1	**$1,618.0**
Utilities	129.2	320.1	161.4	38.2	4.7	8.8	**$662.3**
Services	551.3	165.4	135.7	45.0	34.4	24.7	**$956.5**
Other	431.3	108.1	145.0	19.2	21.4	16.7	**$741.7**
Expense Transfers	(165.6)	(482.8)	(161.0)	(8.3)	(0.0)	(2.6)	**($820.3)**
Operating Expenses - Directly Operated Service	**$9,018.6**	**$3,473.7**	**$2,000.7**	**$471.4**	**$319.4**	**$385.1**	**$15,668.7**
Purchased Transportation	403.4	0.0	274.0	0.0	553.1	64.2	**$1,294.6**
TOTAL	**$9,421.9**	**$3,473.7**	**$2,274.7**	**$471.4**	**$872.5**	**$449.3**	**$16,963.3**
Reconciling Cash Expenditures							**$938.6**

Materials and supplies account for 11.6 percent of Bus operating expense, which is significantly more than materials and supplies expense for other modes. Fuel costs, tires, and other general vehicle maintenance items that Bus service demands explain why Bus accounted for 64.7 percent of materials and supplies expense for all modes combined.

Operating Expense by Function and Object Class

Operating expense by function and object class is presented in **Exhibit 3-10**. The exhibit shows how operating expense is distributed over the functions and how allocations to object classes vary by function. Reconciling cash expenditures are included, however, the expenditures are not allocated by function and object class.

Exhibit 3-10

Operating Expense by Function and Object Class and Reconciling Cash Expenditures (Millions) 1997

Mode	Type of Service	Vehicle Operation	Vehicle Maintenance	Non-Vehicle Maintenance	General Administration	Total
Bus	DO	$5,080.3	$1,940.1	$384.1	$1,614.1	**$9,018.6**
Bus	PT	248.0	68.2	9.7	77.4	**$403.4**
Heavy Rail	DO	1,448.3	569.8	921.2	534.3	**$3,473.7**
Commuter Rail	DO	814.2	485.8	347.6	353.2	**$2,000.7**
Commuter Rail	PT	112.8	63.5	47.6	50.1	**$274.0**
Light Rail	DO	194.6	106.2	92.3	78.3	**$471.4**
Demand Response	DO	196.6	47.7	7.9	67.2	**$319.4**
Demand Response	PT	353.9	63.0	11.1	125.1	**$553.1**
Other	DO	235.3	68.1	30.8	50.9	**$385.1**
Other	PT	47.4	11.4	0.5	4.9	**$64.2**
Total Directly Operated		**$7,969.3**	**$3,217.8**	**$1,783.9**	**$2,698.0**	**$15.668.7**
Total Purchased Transportation		**$762.0**	**$206.1**	**$68.9**	**$257.6**	**$1,294.6**
Grand Total		**$8,731.3**	**$3,423.8**	**$1,852.8**	**$2,955.6**	**$16,963.3**

The allocation of operating expense by function and object class is displayed in **Exhibit 3-10**. Direct labor and fringe benefits represent a substantial amount of the expenses for vehicle operations and maintenance expenses. Over 86 percent of the total cost allocated to vehicle operations is expended with labor and fringe benefits, while the rates for vehicle maintenance and non-vehicle maintenance are 73.3 and 91.1 percent respectively. The share of labor and fringe benefits for general administration is 61.8 percent. This is smaller than the rates for vehicle and non-vehicle maintenance, but more than all other object classes combined, demonstrating the sensitivity of the transit industry to labor-related issues.

General administration reflects much greater proportions of costs attributed to the services and "other" object classes than is found with other functions. This is not unusual given that the level of services needed to support administrative activities such as legal services, finance and accounting, purchasing and stores, planning, marketing, and engineering is far greater than the level of services needed to support operations and maintenance functions.

Other expenses, such as casualty and liability costs, taxes, interest payments, depreciation, and leases and rentals are also attributed to administrative activities.

Operating Expense by Mode and Function

Operating expenses by function and mode are displayed in **Exhibit 3-11**. A reporting change was introduced in 1997 requiring transit agencies to detail purchased transportation expenses by function. In past years, only the total expenses were reported by mode. **Exhibit 3-11** shows operating expenses for each mode detailed by type of service (directly operated or purchased transportation) except for Heavy Rail and Light Rail, which are reported only as directly operated.

Operating Expense by Mode and Function
(Millions)
1997

Exhibit E-11

Mode	Type of Service	Vehicle Operation	Vehicle Maintenance	Non-Vehicle Maintenance	General Administration	Total
Bus	DO	$5,080.3	$1,940.1	$384.1	$1,614.1	$9,018.6
Bus	PT	248.0	68.2	9.7	77.4	$403.4
Heavy Rail	DO	1,448.3	569.8	921.2	534.3	$3,473.7
Commuter Rail	DO	814.2	485.8	347.6	353.2	$2,000.7
Commuter Rail	PT	112.8	63.5	47.6	50.1	$274.0
Light Rail	DO	194.6	106.2	92.3	78.3	$471.4
Demand Response	DO	196.6	47.7	7.9	67.2	$319.4
Demand Response	PT	353.9	63.0	11.1	125.1	$553.1
Other	DO	235.3	68.1	30.8	50.9	$385.1
Other	PT	47.4	11.4	0.5	4.9	$64.2
Total Directly Operated		**$7,969.3**	**$3,217.8**	**$1,783.9**	**$2,698.0**	**$15.668.7**
Total Purchased Transportation		**$762.0**	**$206.1**	**$68.9**	**$257.6**	**$1,294.6**
Grand Total		**$8,731.3**	**$3,423.8**	**$1,852.8**	**$2,955.6**	**$16,963.3**

The exhibit shows that rail modes have a smaller share of operating expenditures with vehicle operations than Bus and Demand Response. The main reason for this is the higher maintenance costs incurred by rail modes which require a more complex operating infrastructure to maintain their fleets and other operating systems.

A comparison between Bus and Demand Response reveals that Demand Response accounts for a larger share of vehicle operations than Bus. This can be explained in part by the fact that most of the Demand Response service is offered by small agencies which do not incur high expenses with the maintenance of facilities and other operating systems required by agencies operating large Bus fleets in densely populated urbanized areas.

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Service Supplied and Consumed

Introduction

This chapter discusses general trends in service supplied and consumed, as well as measures of service effectiveness and efficiency based on specific performance indicators. Service supplied in the National Transit Database (NTD) includes variables such as vehicle revenue miles and hours, total vehicle miles and hours (revenue miles and hours plus deadhead mileage and time) and vehicles operated in maximum service.

Service consumed is measured by unlinked passenger trips and passenger miles. While service supplied is deterministic and controlled by transit agencies, variables of service consumed are non-deterministic and are determined by transit agencies through sampling. The Federal Transit Administration (FTA) requires that any sampling procedure meet a confidence level of 95 percent and a precision of 10 percent to be accepted for reporting to the NTD.

The most common measures of cost efficiency (the link between inputs, such as labor, capital, and fuel, and outputs, such as vehicle revenue miles and hours) are the ratios between operating expense and vehicle revenue mile or operating expense and vehicle revenue hour. The *National Transit Summaries and Trends (NTST)* presents measures of efficiency using the operating expenses per vehicle revenue mile ratio. Other measures of efficiency can also be easily obtained from the exhibits related to service supplied and operating expenses.

Cost effectiveness (the link between inputs, such as labor, capital, and fuel, and service consumption, such as unlinked passenger trips, passenger miles, operating revenue, and safety) is analyzed through evaluation of the operating expenses per unlinked passenger trips and operating expenses per passenger mile ratios.

Service effectiveness (the link between service outputs, such as vehicle revenue miles and hours, and service consumption, such as unlinked passenger trips and passenger miles) is presented in this chapter by the ratio between unlinked passenger trips and vehicle revenue miles.

Chapter Organization

Chapter 4 begins with discussions of service supplied and consumed by mode from 1993 through 1997. Performance measures are then presented to show the effectiveness and efficiency of service supplied and consumed. Finally, indicators of service supplied and consumed, as well as performance measures, are provided based on urbanized area (UZA) size.

Vehicle Revenue Miles by Mode

Vehicle revenue miles by mode for the 1993-1997 time frame are displayed in **Exhibit 4-1**. Light Rail is the mode with the largest increase in service supplied for the 1993-1997 time frame at 48 percent, the largest increase in revenue miles which resulted from new start ups in the last 5 years. Annual vehicle revenue miles for Demand Response rose 43.7 percent between 1993 and 1997. Commuter Rail, Heavy Rail, and Bus experienced less substantial growth with 12.9 percent, 6.8 percent, and 1.7 percent respectively. Demand Response's growth in revenue miles is explained in part by the fact that many transit agencies started providing service during the 1993-1997 time frame in compliance with the Americans with Disabilities Act.

Exhibit 4-1

Vehicle Revenue Miles by Mode
(Millions)
1993-1997

Mode	1993	1994	1995	1996	1997
Bus	1,578.3	1,585.8	1,590.8	1,577.3	1,605.7
Heavy Rail	505.2	516.0	521.8	527.8	539.7
Commuter Rail	203.4	209.5	217.8	221.4	229.6
Light Rail	26.9	33.3	33.9	36.7	39.8
Demand Response	243.4	272.8	297.3	307.9	349.8
Other	35.9	62.1	70.8	79.5	88.5
Total	**2,593.1**	**2,679.5**	**2,732.4**	**2,750.6**	**2,853.1**

Vehicle Revenue Hours by Mode

The change in vehicle revenue hours over the 1993-1997 time frame is shown in **Exhibit 4-2**. Growing steadily each year, Demand Response had the largest increase at 41 percent. Light Rail, Commuter Rail, and Heavy Rail increased by 35.1 percent, 13.3 percent, and 5.5 percent respectively, compared with 1993. Bus had the smallest increase, with 1.5 percent during the 1993 - 1997 time frame.

Exhibit 4-2

Vehicle Revenue Hours by Mode
(Millions)
1993-1997

Mode	1993	1994	1995	1996	1997
Bus	122.7	123.0	123.4	122.8	124.6
Heavy Rail	24.7	25.0	25.2	25.5	26.1
Commuter Rail	6.0	6.2	6.5	6.7	6.8
Light Rail	1.9	2.3	2.3	2.5	2.6
Demand Response	16.9	19.6	20.5	21.4	23.8
Other	2.7	4.2	5.3	5.1	6.1
Total	**174.9**	**180.3**	**183.3**	**184.1**	**189.9**

The data for miles and hours for the last five years seems to indicate that the growth in service supplied is primarily related to expansion in geographic areas covered by transit modes rather than increases in frequency of existing services

Vehicles Operated in Maximum Service by Mode

Variations in the number of vehicles operated in maximum service over the 1993-1997 time frame are presented in **Exhibit 4-3**. Similar to past patterns shown for vehicle revenue miles and hours in previous exhibits, Demand Response is the individual mode with the largest increase in the number of vehicles operated in maximum service between 1993 and 1997. Demand Response increased by 21.6 percent during this time frame. Demand Response is the only mode with an increase greater than the overall increase of 8.2 percent in the 1993-1997 time frame. The large increase in the number of vehicles operated in maximum service for Demand Response is partially explained by its low capacity nature and the growing demand for this mode. Light Rail experienced a decreasing trend in vehicles operated in maximum service between 1993 and 1995 despite the fact that the number of agencies operating this mode increased from 16 in 1993 to 19 in 1995. However, the service distribution supplied among Light Rail operators varies, and many large agencies report over 34 percent of all data for Light Rail. For example, Boston and Philadelphia have experienced decreases in the service supplied for Light Rail between 1993 and 1995. These decreases offset the expansion in the number of new systems during the 1993 - 1995 time frame. Light Rail also shows an increase in the number of vehicles operated in maximum service between 1995 and 1997 and this increase is explained by the new system in Dallas and expanded service in new systems like Denver, which began revenue service in 1995, but did not reach full capacity until 1997.

Exhibit 4-3

Vehicles Operated in Maximum Service by Mode
1993-1997

Mode	1993	1994	1995	1996	1997
Bus	44,041	43,723	43,577	42,817	43,708
Heavy Rail	8,187	8,277	7,973	8,129	8,245
Commuter Rail	4,214	4,349	4,413	4,395	4,484
Light Rail	773	769	746	786	803
Demand Response	11,262	12,828	12,825	12,779	13,699
Other	1,830	3,702	4,414	4,620	5,163
Total	**70,307**	**73,648**	**73,948**	**73,526**	**76,102**

Service Supplied: Modal Comparison

Exhibit 4-4 compares modal shares of the service supplied measures examined in this chapter. Evident is the dominance of Bus service, accounting for 56.3, 65.6, and 57.4 percent of vehicle revenue miles, revenue hours, and number of vehicles operated in maximum service, respectively. Bus and Demand Response have a larger share of vehicle revenue hours when compared with vehicle reve-

Exhibit 4-4

Modal Comparison of Service Supplied
1997

Mode	Percentage of Vehicle Revenue Miles	Percentage of Vehicle Revenue Hours	Percentage of Vehicles in Maximum Service
Bus	56.3%	65.6%	57.4%
Heavy Rail	18.9%	13.7%	10.8%
Commuter Rail	8.0%	3.6%	5.9%
Light Rail	1.4%	1.4%	1.1%
Demand Response	12.3%	12.6%	18.0%
Other	3.1%	3.2%	6.8%
Total	**100.0%**	**100.0%**	**100.0%**

nue miles. Also, the data indicates that Bus is slower than Demand Response. Bus systems operate on fixed routes with fixed stops and incur dwell time in traffic. Dwell time represents an important component of the traveling time for Bus. Service supplied data for Demand Response reveals the low capacity nature of this mode when contrasted with Bus and rail modes. Demand Response's shares of total vehicles operated in maximum service is 18 percent, but its share of vehicle revenue miles and hours is only 12.6 percent.

Among rail modes, Heavy Rail and Commuter Rail are fixed guideway modes that usually do not share the right-of-way with other modes or general traffic. Therefore, their shares of vehicle revenue miles are greater than their shares of vehicle revenue hours. Light Rail has the smallest share of vehicle revenue miles, vehicle revenue hours, and vehicles operated in maximum service.

Service Consumed: Unlinked Passenger Trips by Mode

Changes in unlinked passenger trips over the past five years are shown in **Exhibit 4-5**. Overall, ridership increased 5.2 percent from 1996 to 1997. Bus ridership increased by 2.1 percent in 1997 compared with 1996, reaching the same level as 1993. Heavy Rail is the mode with the highest increase in 1997 at 12.6 percent. Commuter Rail shows a trend of consistent annual increases between 1993 and 1997. Ridership increased by 11.3 percent over that time frame. Light Rail shows a ridership increase of 37.9 percent between 1993 and 1997. Demand Response ridership increased by 15.4 percent during the 1993-1997 time frame.

Passenger Miles by Mode

Another measure of service consumption, passenger miles, is a variable reported by agencies in the NTD. Passenger miles are available by mode and type of service and are usually determined through sampling.

Unlinked Passenger Trips by Mode
(Millions)
1993-1997

Exhibit 4-5

Mode	1993	1994	1995	1996	1997
Bus	4,638.5	4,629.4	4,579.1	4,505.6	4,602.0
Heavy Rail	2,045.6	2,169.3	2,033.5	2,157.0	2,429.5
Commuter Rail	320.8	339.0	343.5	352.2	357.2
Light Rail	187.5	282.2	249.3	258.7	259.4
Demand Response	52.0	54.1	54.9	54.5	60.0
Other	188.4	227.7	243.4	236.6	246.1
Total	**7,432.7**	**7,701.6**	**7,503.7**	**7,564.6**	**7,954.2**

The dominance of Bus is again evident when examining passenger miles by mode. Bus accounts for 43.6 percent of all passenger miles, followed by Heavy Rail at 30.1 percent and Commuter Rail at 20 percent. Light Rail and Demand Response account for 2.6 percent and 1.2 percent, respectively.

As seen in **Exhibit 4-6**, passenger miles increased by 10.7 percent during the 1993-1997 time frame. Bus experienced a slight increase in passenger miles between 1993 and 1997 (0.8 percent). Light Rail and Demand Response experienced the largest increases in passenger miles for the 1993-1997 time frame (45.4 and 19.8 percent respectively) following the trend observed for unlinked passenger trips for these two modes.

Passenger Miles by Mode
(Millions)
1993-1997

Exhibit 4-6

Mode	1993	1994	1995	1996	1997
Bus	17,363.7	17,195.4	17,024.0	16,802.2	17,509.2
Heavy Rail	10,231.0	10,668.0	10,558.8	11,530.2	12,056.1
Commuter Rail	6,912.0	7,996.0	8,244.0	8,350.4	8,037.5
Light Rail	703.7	831.0	858.7	955.2	1,023.7
Demand Response	389.5	376.6	397.2	390.4	466.2
Other	625.2	814.6	887.8	955.7	1,022.7
Total	**36,224.9**	**37,881.5**	**37,970.6**	**38,984.1**	**40,115.4**

Passenger miles increased by 2.9 percent in 1997 from 1996 and only Commuter Rail experienced a decrease in relation to 1996. The mode with the highest increase in 1997 was Demand Response, with 19.4 percent, when compared with 1996.

Service Consumed: Modal Comparison

The distribution of unlinked passenger trips and passenger miles by mode is shown in **Exhibit 4-7**, as well as the average trip length for each mode. Bus had the biggest share of service consumed with 57.7 percent of all unlinked passenger trips and 43.6 percent of all passenger miles, in 1997. Heavy Rail displayed a similar share of unlinked passenger trips and passenger miles and consumed the second largest share of service. Commuter Rail's share of passenger miles was much higher than its share of unlinked passenger trips, resulting from the long trip length of this mode. Light Rail and Demand Response account for a small share of service consumed, both in terms of ridership and passenger miles.

Exhibit 4-7

Distribution of Unlinked Passenger Trips and Passenger Miles With Average Trip Length by Mode 1997

Mode	Percentage of Total Unlinked Passenger Trips	Percentage of Total Passenger Miles	Average Trip Length in Miles
Bus	57.7%	43.6%	3.8
Heavy Rail	30.4%	30.0%	5.0
Commuter Rail	4.5%	20.0%	22.5
Light Rail	3.2%	2.5%	3.9
Demand Response	1.1%	1.3%	6.0
Other	3.1%	2.5%	4.2
Total	**100.0%**	**100.0%**	
Weighted Average			**5.0**

Performance Indicators

Certain performance indicators are used to assess the effectiveness and efficiency of transit service delivery. Operating expense per vehicle revenue mile is one measure of service efficiency, while operating expense per unlinked passenger trip and operating expense per passenger mile offer measures of cost effectiveness. Service effectiveness is analyzed by examining the ratio between unlinked passenger trips and vehicle revenue miles.

Service Efficiency: Operating Expense per Vehicle Revenue Mile by Mode

Service efficiency, as measured by operating expense per vehicle revenue mile, is displayed in **Exhibit 4-8**. Demand Response has the smallest cost per mile at $2.49 per vehicle revenue mile, followed by Bus at $5.87 per vehicle revenue mile. Rail modes displayed higher operating expense per revenue mile than Bus and Demand Response. The cost per mile increased for all modes except Heavy Rail and Commuter Rail during the 1993 - 1997 time frame, with Heavy

Operating Expense per Vehicle Revenue Mile by Mode
1993-1997

Exhibit 4-8

Mode	1993	1994	1995	1996	1997
Bus	$5.39	$5.59	$5.64	$5.70	$5.87
Heavy Rail	7.26	7.34	6.75	6.44	6.44
Commuter Rail	10.22	10.63	10.13	10.36	9.91
Light Rail	11.66	12.38	11.07	12.01	11.84
Demand Response	2.22	2.32	2.32	2.44	2.49

Rail decreasing 11.3 percent and Commuter Rail by 3 percent. Among the modes that experienced increases, Demand Response had a 12.2 percent increase followed by Bus with 8.9 percent and Light Rail at 1.5 percent increase.

Cost Effectiveness: Operating Expense per Unlinked Passenger Trip by Mode

Each mode's cost effectiveness measured by operating expenses per unlinked passenger trip is displayed in **Exhibit 4-9**. Light Rail, Heavy Rail, and Bus are the most cost effective modes with costs per trip ranging from $1.43 to $2.05 per passenger. However, Commuter Rail and Demand Response are much less effective. Demand Response has a higher cost per unlinked passenger trip than any other mass transit mode. Commuter Rail has poor cost effectiveness as measured by operating expense per unlinked passenger trip but has much better effectiveness if the measure is operating expense per passenger mile.

Operating Expense per Unlinked Passenger Trip by Mode
1993-1997

Exhibit 4-9

Mode	1993	1994	1995	1996	1997
Bus	$1.84	$1.91	$1.96	$2.00	$2.05
Heavy Rail	1.79	1.75	1.73	1.58	1.43
Commuter Rail	6.48	6.57	6.42	6.51	6.37
Light Rail	1.68	1.46	1.51	1.70	1.82
Demand Response	10.38	11.73	12.57	13.76	14.54

Demand Response experienced the greatest increase in operating expense per passenger trip for the 1993 - 1997 time frame at 35.2 percent. Demand Response is the mode where ridership growth always adversely affects its cost effectiveness. Bus increased by 14.9 percent during the 1993 - 1997 time frame while Light Rail increased by 8.3 percent. Heavy Rail and Commuter Rail decreased in operating expense per unlinked passenger trip for the 1993 - 1997 time frame.

Operating Expense per Passenger Mile by Mode

Another assessment of cost effectiveness is provided through a comparison of operating expense per passenger mile by mode in **Exhibit 4-10**. Commuter Rail and Heavy Rail are the most cost effective modes when cost per passenger mile

Exhibit 4-10

Operating Expense per Passenger Mile by Mode
1993-1997

Mode	1993	1994	1995	1996	1997
Bus	$0.49	$0.52	$0.53	$0.54	$0.54
Heavy Rail	0.36	0.35	0.33	0.30	0.29
Commuter Rail	0.30	0.28	0.27	0.27	0.28
Light Rail	0.45	0.50	0.44	0.46	0.46
Demand Response	1.39	1.68	1.74	1.92	1.87

is examined. This is due to their greater vehicle capacity, higher ridership, and longer trips taken on these modes. Conversely, Demand Response has the highest cost per passenger mile due to its low vehicle capacity.

The change in operating cost per passenger mile by mode from 1993 to 1997 reveals that all modes experienced increases in cost per mile during this period except Heavy Rail and Commuter Rail. The largest increases occurred in Demand Response with 32.4 percent, and Bus, with 10.2 percent.

Service Effectiveness: Unlinked Passenger Trips per Vehicle Revenue Mile by Mode

Each mode's service effectiveness is measured by comparing service used to service supplied. In this chapter, it is measured by the ratio of unlinked passenger trips to vehicle revenue miles. As **Exhibit 4-11** shows, Light Rail had the best service effectiveness followed by Heavy Rail. These two modes have higher service effectiveness than other modes; however, the nature of the service for each mode must be considered. Heavy and Light Rail systems are designed to operate within corridors with high population densities, and are served by feeder Bus services and park-and-ride facilities to increase capture areas of potential riders. These two modes carry more ridership per vehicle revenue mile based on their design as higher capacity modes. Commuter Rail usually links areas of attraction separated by long distances and has its ridership concentrated during peak hours, which is reflected in its high peak-to-base ratio. These factors combined result in a much smaller ratio of unlinked passenger trips per revenue mile for Commuter Rail compared with Light Rail and Heavy Rail.

Exhibit 4-11

Unlinked Passenger Trips per Vehicle Revenue Mile by Mode
1993-1997

Mode	1993	1994	1995	1996	1997
Bus	2.94	2.92	2.88	2.86	2.87
Heavy Rail	4.05	4.20	3.90	4.09	4.50
Commuter Rail	1.58	1.62	1.58	1.59	1.56
Light Rail	6.96	8.48	7.35	7.06	6.52
Demand Response	0.21	0.20	0.18	0.18	0.17

Bus reflects a more moderate utilization because Bus services are provided on routes through highly dense areas of transit-dependent markets and operate during peak hours of ridership. In addition, Bus services are also provided during off-peak hours in less densely populated areas. Thus, in the aggregate, the combination of high and low effective routes results in the moderate service effectiveness of Bus, and a large variance in the distribution of its service effectiveness across transit agencies. Demand Response is designed to have much lower capacity and greater flexibility and convenience for the user. Thus, Demand Response displays lower ridership along with significant miles of operation compared to other modes.

Demand Response has a consistent trend of ridership increases from 1993 to 1997. Revenue miles also show an increasing trend but at a much higher rate than ridership due to the nature of the service and its low capacity. As a result, Demand Response has decreased service effectiveness. For Demand Response, which has poor cost and service effectiveness compared with high capacity modes, increases in the demand for service require more financial assistance from the public sector or fare increases to cover an increasing operating deficit.

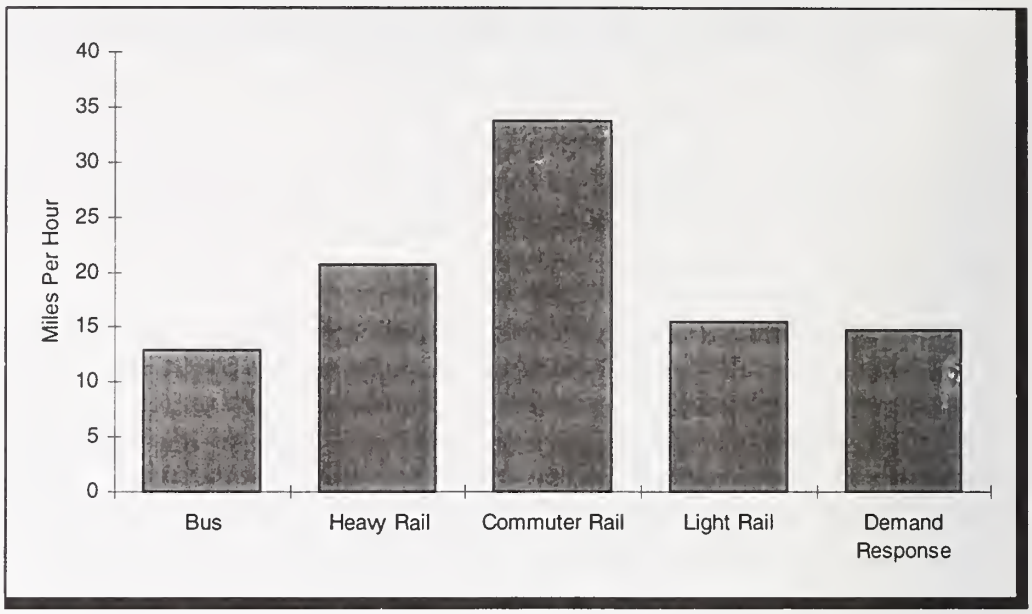
The change in unlinked passenger trips per vehicle revenue mile by mode from 1993 to 1997 shows that all modes except Heavy Rail experienced decreases during this period. Bus, Commuter Rail, Light Rail, and Demand Response displayed decreases of 24 percent, 1.3 percent, 6.3 percent, and 19 percent, respectively, for the 1993-1997 time frame. Heavy Rail shows an increase in service effectiveness of 11.1 percent for the same period.

Average Operating Speed

Average operating speed varies greatly among the modes. As **Exhibit 4-12** shows, Bus, Light Rail, and Demand Response services operate at much slower speeds than Heavy Rail or Commuter Rail. Bus service operates in mixed traffic with frequent stops for boarding and alighting. Many Light Rail systems must also contend with mixed traffic while operating at-grade. The station/stop spacing of Light Rail also requires more frequent stopping for passenger boarding and alighting compared with other rail modes. Demand Response service also operates in mixed traffic and deals with significantly longer boarding and alighting times for physically challenged patrons. Heavy Rail and Commuter Rail operate along exclusive fixed guideways, with Heavy Rail stopping more frequently due to a shorter station spacing than Commuter Rail.

Exhibit 4-12

Average Operating Speed by Mode (Miles/Hour)
1997



Service Supplied and Consumed by Mode for Purchased Transportation 1994-1997

Exhibit 4-13 shows service supplied and service consumed data for purchased transportation for the 1994-1997 time frame. Purchased transportation data reported from a directly operated perspective is included in this exhibit; therefore, comparisons between this exhibit and the purchased transportation data included in the *National Transit Profile (Chapter 1)* should be avoided. The operating expense data included in this exhibit is the expense incurred by public agencies purchasing the services. In the aggregate, vehicles operated in maximum service, miles, and hours of service for purchased transportation increased in 1997. Ridership increased by 15.7 percent and passenger miles rose at a lower rate (3.5 percent). At the modal level, Bus showed an increase in service supplied and unlinked passenger trips in 1997 (15.1 percent and 22.2 percent respectively). Purchased Bus service has a commuter orientation, as the percentage of unlinked passenger trips to the national total (6.5 percent) is smaller than the percentage of passenger miles (9.0 percent). Demand Response showed increases in miles and hours of service (4.3 and 2.3 percent respectively). Ridership increased by 2.1 percent while passenger miles increased 10.3 percent.

Service Supplied and Consumed for Purchased Transportation(*) 1994-1997

Exhibit 4-13

	Mode	Operating Expense (millions)	Vehicle Revenue Miles (millions)	Vehicle Revenue Hours (millions)	Vehicles operated in maximum service	Unlinked Passenger Trips (millions)	Passenger Miles (millions)
1997	Bus	$758.2	185.1	12.7	5,286	360.8	1,860.1
	Commuter Rail	277.2	32.6	1.0	678	46.5	1,037.2
	Demand Response	689.6	264.8	18.0	10,497	44.0	333.1
	Other	68.4	47.5	3.2	2,836	64.7	383.7
	Total	**$1,793.5**	**529.9**	**34.9**	**19,297**	**516.0**	**3,614.0**
	% of National Total	**10.6%**	**18.6%**	**18.4%**	**25.3%**	**6.5%**	**9.0%**
1996	Bus	$661.0	160.8	11.0	4,894	295.3	1,665.7
	Commuter Rail	319.0	36.2	1.0	769	50.0	1,202.0
	Demand Response	588.9	253.9	17.6	10,715	43.1	302.0
	Other	58.6	39.2	2.2	2,405	57.7	322.1
	Total	**$1,627.5**	**490.1**	**31.8**	**18,783**	**446.1**	**3,491.8**
	% of National Total	9.4%	**17.8%**	**17.3%**	**25.5%**	**5.9%**	9.0%
1995	Bus	$684.0	159.7	10.7	4,859	278.1	1,685.0
	Commuter Rail	194.0	19.1	0.5	522	21.9	662.8
	Demand Response	466.4	218.9	15.2	9,976	39.5	273.5
	Other	56.8	37.0	2.7	2,587	65.5	317.3
	Total	**$1,401.2**	**434.8**	**29.1**	**17,944**	**405.1**	**2,938.5**
	% of National Total	**8.7%**	**15.9%**	15.9%	**24.3%**	**5.4%**	**7.7%**
1994	Bus	$680.4	165.6	11.2	4,924	333.8	1,817.5
	Commuter Rail	293.6	35.0	0.9	1,001	56.3	1,387.9
	Demand Response	439.8	205.1	14.7	10,295	39.9	268.3
	Other	48.2	28.4	1.6	1,960	49.7	248.1
	Total	**$1,462.0**	**434.1**	**28.5**	**18,180**	**479.6**	**3,721.7**
	% of National Total	**9.0%**	**16.2%**	**15.8%**	**24.7%**	**6.2%**	9.8%

(*) This exhibit was adjusted to reflect a data change reported in 1997 relating to contractual relationships. The contractual relationship, between a public transit agency and private providers located in New York-Northeastern New Jersey area, did not meet the requirements of purchased transportation in the NTD within the designated time frame. As a result, the data for these private providers were taken out of the exhibit.

Vehicle Revenue Miles by UZA Size and Mode

Vehicle revenue miles by UZA size and mode can be seen in **Exhibit 4-14**. It displays the significant share of vehicle revenue miles provided within UZAs with populations greater than 1 million. In total, 78.7 percent of all vehicle revenue miles were operated in these larger areas, followed by 14.6 percent and 6.7 percent in medium and small UZAs, respectively. The amount and mode of service varies by UZA size. Most obvious are the rail services, which operate almost exclusively in large areas. The three rail modes combined account for 35.9 percent of all revenue miles in large UZAs. Bus accounts for 51.7 percent of vehicle revenue miles in these areas, followed by Demand Response with 9 percent. Service within the mid-ize urbanized areas is also dominated by Bus with 74.8 percent. Demand Response service, however, accounts for a larger portion of service, with a 22.3 percent share. The Demand Response share is largest in small UZAs, where it provides 28.6 percent of all service operated.

Exhibit 4-14

Vehicle Revenue Miles by UZA Size and Mode
(Millions)
1997

UZA Size	Mode						Total
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
Over 1 Million	1,162.3	539.7	229.1	38.7	202.6	73.7	**2,246.1**
200,000 to 1 Million	310.9	-	0.5	1.0	92.7	10.6	**415.7**
Under 200,000	132.5	-	-	0.0	54.7	4.1	**191.3**
Total	**1,605.7**	**539.7**	**229.6**	**39.7**	**350.0**	**88.4**	**2,853.1**

Vehicles Operated in Maximum Service by UZA Size and Mode

The number of vehicles operated in maximum service by UZA size and mode is displayed in **Exhibit 4-15**. Patterns in vehicle revenue miles are also provided with the number of vehicles. First, Heavy Rail, Commuter Rail, and Light Rail are operated almost exclusively in the largest UZAs. Combined, these modes account for 23.5 percent of the total vehicles operated in maximum service. Second, Bus is the dominant mode in all UZAs, regardless of size. Finally, the share of Demand Response vehicles has an inverse relationship to urbanized area size. The greatest share of 40.7 percent occurs in the small UZAs, then decreases to 26.7 percent in the medium areas and further drops to 13.5 percent in the large areas.

Exhibit 4-15

Vehicles Operated in Maximum Service by UZA Size and Mode
1997

UZA Size	Mode						Total
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
Over 1 Million	31,872	8,245	4,472	767	7,741	4,225	**57,322**
200,000 to 1 Million	8,185	-	12	32	3,234	632	**12,095**
Under 200,000	3,651	-	-	4	2,714	306	**6,675**
Total	**43,708**	**8,245**	**4,484**	**803**	**13,689**	**5,163**	**76,092**

Unlinked Passenger Trips by UZA Size and Mode

The unlinked passenger trips by UZA size and mode can be seen in **Exhibit 4-16**. It displays the change in transit ridership from 1993 to 1997 by UZA size and mode. There were ridership increases in all areas. For the 1993-1997 time frame, the ridership for large UZAs increased by 7.9 percent. This exhibit shows that transit ridership is concentrated in the large UZAs. In total, 88.4 percent of all transit trips occurred in these areas. The mid-size areas followed with nearly 8.6 percent, and the small areas accounted for only 3 percent of the total transit ridership during this period.

Unlinked Passenger Trips by UZA Size and Mode
(Millions)
1993-1997

Exhibit 4-16

UZA Size	Year	Mode						Total
		Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
Over 1 Million	1993	3,757	2,046	320	179	28	182	6,512
	1994	3,748	2,169	339	273	29	220	6,779
	1995	3,714	2,034	343	241	30	235	6,596
	1996	3,672	2,157	352	251	29	228	6,688
	1997	3,723	2,429	357	252	33	237	7,030
200,000 to 1 Million	1993	661	-	0	8	12	5	686
	1994	658	-	0	9	13	5	686
	1995	651	-	0	8	13	6	679
	1996	612	-	0	8	14	6	640
	1997	655	-	0	8	15	7	684
Under 200,000	1993	221	-	-	0	12	2	235
	1994	223	-	-	0	12	2	237
	1995	214	-	-	0	12	3	229
	1996	222	-	-	0	11	3	236
	1997	225	-	-	0	13	3	240
Total	**1993**	**4,638**	**2,046**	**321**	**188**	**52**	**188**	**7,433**
	1994	**4,629**	**2,169**	**339**	**282**	**54**	**228**	**7,702**
	1995	**4,579**	**2,034**	**344**	**249**	**55**	**243**	**7,504**
	1996	**4,506**	**2,157**	**352**	**259**	**55**	**237**	**7,565**
	1997	**4,602**	**2,429**	**357**	**259**	**60**	**246**	**7,954**

Among the various modes, Bus experienced small ridership decreases in large and mid-size urbanized areas. Heavy Rail, Commuter Rail, and Light Rail posted ridership gains of 18.7 percent, 11.6 percent, and 40.8 percent respectively for the 1993-1997 timeframe. The increase in Light Rail is due mainly to the implementation of new systems, while the increase for Heavy Rail is due to increased demand in existing systems.

Passenger Miles by UZA Size and Mode

The change in passenger miles by UZA size and mode between 1993 and 1997 is provided in **Exhibit 4-17**. Overall, there was a 9.5 percent increase in passenger miles in small UZAs between 1993 and 1997. Passenger miles in mid-size UZAs increased 3.5 percent and by 11.4 percent in large urbanized areas between 1993 and 1997.

Passenger miles, like transit ridership, are concentrated in large UZAs. Given the interaction between these two measures historically, approximately 90.5 percent of all passenger miles occurred in these larger UZAs. The remaining 9.5 percent was split between the mid-size UZAs, at 7.0 percent, and the small UZAs with 2.5 percent. Examination of the modal data indicates that all modes show growth among all UZAs over the five-year period. Demand response's growth was 20.8 percent in small areas, 14.4 percent in mid-size UZAs, and 32

Exhibit 4-17

Passenger Miles by UZA Size and Mode
(Millions)
1993-1997

UZA Size	Year	Mode						Total
		Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
Over 1 Million	1993	14,014	10,231	6,906	684	209	546	**32,590**
	1994	13,760	10,668	7,990	811	203	717	**34,150**
	1995	13,679	10,559	8,238	841	217	794	**34,328**
	1996	13,614	11,530	8,344	939	211	833	**35,471**
	1997	14,057	12,056	8,031	1,007	255	892	**36,298**
200,000 to 1 Million	1993	2,540	-	6	19	104	52	**2,721**
	1994	2,593	-	6	19	96	65	**2,779**
	1995	2,518	-	6	18	99	53	**2,694**
	1996	2,346	-	6	16	104	73	**2,545**
	1997	2,590	-	7	17	119	85	**2,817**
Under 200,000	1993	810	-	-	0	77	27	**914**
	1994	843	-	-	0	77	33	**953**
	1995	827	-	-	0	81	41	**949**
	1996	842	-	-	0	76	50	**968**
	1997	862	-	-	0	93	45	**1,001**
Total	**1993**	**17,364**	**10,231**	**6,912**	**704**	**389**	**625**	**36,225**
	1994	**17,196**	**10,668**	**7,996**	**830**	**376**	**815**	**37,881**
	1995	**17,024**	**10,559**	**8,244**	**859**	**397**	**888**	**37,971**
	1996	**16,802**	**11,530**	**8,350**	**955**	**391**	**955**	**38,984**
	1997	**17,509**	**12,056**	**8,038**	**1,024**	**466**	**1,023**	**40,115**

percent in large UZAs between 1993 and 1997. The other area of significant growth occurred in Light Rail passenger miles, which posted a 47.2 percent increase in large UZAs. Heavy Rail experienced an increase in passenger miles for the 1993-1997 time frame at 17.8 percent. Bus experienced small growth in passenger miles for all areas. Commuter Rail displayed an increase in passenger miles between 1993 and 1997, at 16.3 percent.

Operating Expense per Vehicle Revenue Mile by UZA Size and Mode

Operating expense per vehicle revenue mile by UZA size for each mode is displayed in **Exhibit 4-18**. The cost per mile for Bus and Demand Response service has a direct relationship with UZA size: cost increases with population size. The cost per Bus vehicle revenue mile in large UZAs is 81 percent greater than in small UZAs, and 53 percent greater than in mid-size UZAs. The differences are not as great for Demand Response, in which the cost per mile in large UZAs is nearly 15 percent higher than in small UZAs and 6.2 percent greater than in mid-size UZAs. The opposite is true for Light Rail and Commuter Rail where the cost per mile in large UZAs is lower than in mid-size UZAs.

Operating Expense per Vehicle Revenue Mile by UZA Size and Mode
1997

Exhibit 4-18

UZA Size	Mode				
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
Over 1 Million	$6.55	$6.44	$9.90	$11.78	$2.58
200,000 to 1 Million	4.28	-	13.18	14.60	2.43
Under 200,000	3.58	-	-	4.97	2.24
Weighted Average	**$5.87**	**$6.44**	**$9.91**	**$11.84**	**$2.49**

Operating Expense per Unlinked Passenger Trip by UZA Size and Mode

The cost effectiveness of each mode by UZA size, as measured by the cost per unlinked passenger trip, is shown in **Exhibit 4-19**. The cost effectiveness of Bus service does not vary greatly by UZA size. Demand Response is more cost effective in small UZAs than in mid-size and large UZAs, contrasting against high capacity modes such as Commuter Rail and Light Rail that show better cost effectiveness in large UZAs.

Operating Expense per Unlinked Passenger Trip by UZA Size and Mode
1997

Exhibit 4-19

UZA Size	Mode				
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
Over 1 Million	$2.05	$1.43	$6.36	$1.81	$16.11
200,000 to 1 Million	2.03	-	21.75	1.95	15.35
Under 200,000	2.11	-	-	1.97	9.51
Weighted Average	**$2.05**	**$1.43**	**$6.37**	**$1.82**	**$14.54**

Operating Expense per Passenger Mile by UZA Size and Mode

Operating expense per passenger mile by UZA area size and mode is displayed in **Exhibit 4-20**. This measure of cost effectiveness displays some of the same trends as those found in the cost per trip ratios. Bus shows a cost per passenger mile slightly smaller for mid-size-UZAs when compared to large and small UZAs. Light Rail and Commuter Rail show better cost effectiveness in large UZAs when compared to small UZA's. The cost per passenger mile for Demand Response increases with urbanized area size.

Operating Expense per Passenger Mile by UZA Size and Mode
1997

Exhibit 4-20

UZA Size	Mode				
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
Over 1 Million	$0.54	$0.29	$0.28	$0.45	$2.05
200,000 to 1 Million	0.51	-	1.01	0.92	1.90
Under 200,000	0.55	-	-	0.94	1.32
Weighted Average	**$0.54**	**$0.29**	**$0.28**	**$0.46**	**$1.87**

Average Operating Speed by UZA Size and Mode

Average operating speed for each mode by UZA size is presented in **Exhibit 4-21** Bus service in large UZAs operates 10 percent slower than in mid-size and small UZAs.

Average Operating Speed by UZA Size and Mode
1997

Exhibit 4-21

UZA Size	Mode				
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
Over 1 Million	12.5	20.7	33.8	15.7	14.5
200,000 to 1 Million	13.9	-	41.4	10.9	15.3
Under 200,000	13.9	-	-	5.0	14.2
Weighted Average	**12.9**	**20.7**	**33.8**	**15.5**	**14.7**

Safety and Security

Introduction

This chapter discusses data trends on operations safety, which is an important measure of service quality, and presents security data. A reporting change was introduced in 1997 requiring transit agencies to report safety and security for purchased transportation. In the past, the data was available for directly operated service only. The exhibits included in this chapter include the 1997 data stratified by type of service (directly operated or purchased transportation). However, trend analyzes will be carried out for directly operated service only. The only mode strongly affected by the new requirements is Demand Response, due to the large number of public agencies contracting paratransit service.

Chapter Organization

The chapter discusses safety of transit operations as measured by collision and non-collision incidents, and comparisons among injuries, fatalities, and property damage. Data is available for directly operated service between 1993 and 1995, and by mode and type of service in 1997; therefore, absolute figures for injuries, fatalities, and property damage are understated prior to 1997. This is especially true for modes such as Demand Response which have a substantial amounts of data reported as purchased transportation in the National Transit Database. The figures for Heavy Rail and Light Rail are not understated, because they are reported as directly operated.

Safety

Several exhibits in this chapter present ratios between variables related to safety, such as incidents, injuries, and fatalities and those related to service consumption, such as unlinked passenger trips. These exhibits more accurately reflect safety trends spanning the last 5 years because service consumption data is stratified by type of service.

Collision incidents are those that involve one or more transit agency vehicles colliding with any other vehicle, obstacle, or person. Non-collision incidents involve the following:

- Derailments
- Buses or other transit vehicles leaving the roadway
- Personal injuries incurred while inside the transit vehicle resulting from sudden braking or unexpected swerving
- Falls or other mishaps experienced while boarding or alighting
- Injuries sustained at stations or bus stops

All incidents resulting in an injury or fatality and all incidents with transit property damage in excess of $1,000 are reported, as well as incidents involving fire.

Security

Security in the National Transit Database (NTD) follows the FBI *Uniform Crime Reporting Handbook*, 1984 and is divided into two main categories:

- Offenses (Reports) which include violent and property crime:
  - — Violent Crime:
    - – Homicide
    - – Forcible rape
    - – Robbery
    - – and Aggravated assault
  - — Property Crime:
    - – Burglary
    - – Theft
    - – Motor vehicle theft and
    - – Arson.
- Offenses (Arrests) which include less serious crimes such as:
  - — Other assaults
  - — Vandalism
  - — Sex offenses
  - — Drug abuse violations
  - — Driving under the influence
  - — Drunkenness
  - — Disorderly conduct
  - — Trespassing
  - — Fare evasion
  - — Curfew and loitering laws

Data are reported by mode and type of service. In addition, only agencies located in urbanized areas over 200,000 population are required to report security data.

Total Reported Incidents by Mode
1993-1997

Exhibit 5-1

Mode	1993	1994	1995	1996	1997		
	DO	DO	DO	DO	DO	PT	TOTAL
Bus	45,545	47,924	42,143	39,893	39,958	1,238	**41,196**
Heavy Rail	15,082	15,862	14,316	13,748	15,207	0	**15,207**
Commuter Rail	2,111	3,115	2,847	2,449	3,078	199	**3,277**
Light Rail	1,182	1,413	1,271	1,350	1,174	0	**1,174**
Demand Response	973	1,051	1,167	1,284	1,464	1,897	**3,361**
Other	1,340	1,964	1,194	985	1,128	9	**1,137**
Total	**66,233**	**71,329**	**62,938**	**59,709**	**62,009**	**3,343**	**65,352**

Total Reported Incidents by Mode

Exhibit 5-1 provides total reportable incidents by mode from 1993 to 1997. The total number of incidents for directly operated service decreased between 1994 and 1996 by 16.2 percent but increased by 3.8 percent from 1996 to 1997. Light Rail was the only modes with less incidents in 1997, compared to 1996. Demand Response shows a consistent trend increase in incidents. This results, in part, by expanded service supplied by new agencies reporting this mode. Commuter Rail and Heavy Rail posted the higher increases in incidents in 1997 (25.7 percent and 10.6 percent respectively). The data for purchased transportation reveals that most of the incidents involved Demand Response and account for 56.4 percent of all incidents for this mode.

Total Fatalities by Mode

The number of fatalities for directly operated service increased from 1996 to 1997 by 3.8 percent. At the modal level, Heavy Rail reported a decrease in the number of fatalities for the 1993-1997 time frame at 7.2 percent. Commuter Rail also decreased by 8.1 percent between 1993 and 1997. As expected, the number of fatalities by mode for any given year tends to be greater for modes with the highest levels of ridership, such as Bus, Heavy Rail.

Total Fatalities by Mode
1993-1997

Exhibit 5-2

Mode	1993	1994	1995	1996	1997		
	DO	DO	DO	DO	DO	PT	TOTAL
Bus	83	105	80	99	108	2	**110**
Heavy Rail	83	85	79	74	77	0	**77**
Commuter Rail	86	112	92	72	79	23	**102**
Light Rail	15	13	15	6	3	0	**3**
Demand Response	2	2	6	11	7	9	**16**
Other	1	1	2	3	1	1	**2**
Total	**270**	**318**	**274**	**265**	**275**	**35**	**310**

Total Injuries by Mode

Total injuries by mode are presented in **Exhibit 5-3**. These figures include injuries experienced by passengers in both collision and non-collision incidents and also injuries experienced by non-passengers, such as auto passengers involved in an auto and bus incident.

Exhibit 5-3

Total Injuries by Mode
1993-1997

Mode	1993	1994	1995	1996	1997		
	DO	DO	DO	DO	DO	PT	TOTAL
Bus	38,300	41,663	40,474	39,155	38,620	1,010	39,630
Heavy Rail	10,532	11,666	11,238	11,093	12,285	0	12,285
Commuter Rail	1,560	2,374	2,374	1,953	2,388	177	2,565
Light Rail	982	1,181	1,303	1,604	1,087	0	1,087
Demand Response	649	721	932	882	1,125	1,086	2,211
Other	1,034	1,189	1,268	956	1,030	6	1,036
Total	**53,057**	**58,794**	**57,589**	**55,643**	**56,535**	**2,279**	**58,814**

Total Property Damage by Mode

Total property damage for each major mode is presented in **Exhibit 5-4**. In the aggregate, property damage decreased by 3.5 percent in 1997 compared to 1996 for directly operated service. Bus experienced a small decline of 0.8 percent compared to 1996. Property damage decreased in 1997 for every mode except Heavy Rail and Demand Response. Heavy Rail increased approximately 36 percent while Demand Response had an increase of 22.4 percent.

Exhibit 5-4

Total Property Damage by Mode
(Thousands)
1993-1997

Mode	1993	1994	1995	1996	1997		
	DO	DO	DO	DO	DO	PT	TOTAL
Bus	$30,463.6	$29,949.0	$35,922.3	$34,491.7	$34,196.9	$2.0	$36,188.1
Heavy Rail	9,003.8	1,597.0	2,853.6	6,387.7	8,690.4	0.0	8,690.4
Commuter Rail	3,911.6	5,140.6	4,628.5	11,080.1	8,472.9	0.4	8,878.1
Light Rail	801.1	784.7	1,669.3	3,839.0	2,061.8	0.0	2,061.8
Demand Response	549.8	778.7	985.0	1,469.6	1,799.5	2.3	4,112.3
Other	388.3	452.3	3,470.0	453.4	466.0	0.0	500.3
Total	**$45,118.2**	**$38,702.3**	**$49,528.7**	**$57,721.5**	**$55,687.5**	**$4.7**	**$60,431.0**

Total Incidents per Vehicle Mile by Mode

Incidents per vehicle miles are presented in **Exhibit 5-5**. Light Rail is the mode with the highest rate of incidents per vehicle mile followed by Heavy Rail and Bus.

Total Incidents per Vehicle Miles by Mode
1997

Exhibit 5-5

Mode	Incidents	Vehicle Miles (Millions)	Incidents Per Million Vehicle Miles
Bus	41,196	1,605.7	25.7
Heavy Rail	15,207	539.7	28.2
Commuter Rail	3,277	229.6	14.3
Light Rail	1,174	39.8	29.5
Demand Response	3,361	350.1	9.6
Other	1,137	88.5	12.9
Total	**65,352**	**2,853.3**	
Weighted Average			**22.9**

Total Injuries per Unlinked Passenger Trips (Millions)

The relative safety of rail modes as measured by the ratio between injuries and unlinked passenger trips compared with Bus and Demand Response is presented in **Exhibit 5-6**. Demand Response's rate of 25.1 injuries per unlinked passenger trips is approximately 6 times greater than Light Rail's rate of 4.2 injuries per unlinked passenger trips.

Total Injuries per Unlinked Passenger Trips by Mode
1997

Exhibit 5-6

Mode	Injuries	Unlinked Passenger Trips (Millions)	Injuries Per Million Unlinked Passenger Trips
Bus	39,630	4,602.0	8.6
Heavy Rail	12,285	2,429.5	5.1
Commuter Rail	2,565	357.2	7.2
Light Rail	1,087	259.4	4.2
Demand Response	2,211	88.2	25.1
Other	1,036	246.1	4.2
Total	**58,814**	**7,982.4**	
Weighted Average			**7.4**

Fatalities per 100 Million Unlinked Passenger Trips

Exhibit 5-7 displays the high incidence of fatalities per 100 million unlinked passenger trips for Commuter Rail with a rate of 28.6 fatalities per 100 million passenger trips. Demand Response shows a rate of 18.1 fatalities per 100 million unlinked passenger trips. The rates for Heavy Rail and Light Rail are 3.2 and 1.2 respectively.

Exhibit 5-7

Total Fatalities per Unlinked Passenger Trips by Mode
1997

Mode	Fatalities	Unlinked Passenger Trips (Millions)	Fatalities Per 100 Million Unlinked Passenger Trips
Bus	110	4,602.0	2.4
Heavy Rail	77	2,429.5	3.2
Commuter Rail	102	357.2	28.6
Light Rail	3	259.4	1.2
Demand Response	16	88.2	18.1
Other	2	246.1	0.8
Total	**310**	**7,982.4**	
Weighted Average			**3.9**

Collision and Non-Collision Incidents by Mode

The number of collision and non-collision incidents by mode is presented in **Exhibit 5-8**. Bus accounted for the greatest portion of collision incidents with 86.9 percent. For non-collision incidents, Bus accounted for 46 percent and Heavy Rail accounted for 39 percent.

Exhibit 5-8

Collision and Non-Collision Incidents by Mode
1997

Mode	Collision Incidents	Non-Collision Incidents	Total
Bus	23,675	17,521	**41,196**
Heavy Rail	356	14,851	**15,207**
Commuter Rail	230	3,047	**3,277**
Light Rail	353	821	**1,174**
Demand Response	2,290	1,071	**3,361**
Other	352	785	**1,137**
Total	**27,256**	**38,096**	**65,352**

Transit Security—Violent and Property Crime (Reports)

Exhibit 5-9 presents reports of violent and property crime by mode for 1997. These are offenses reported based on records of calls for service, complaints, and/or investigations. Offense counts are recorded not findings of a court, coroner, jury, or decision of a prosecutor.

Exhibit 5-9

Reports of Violent and Property Crime by Mode
1997

	Violent Crime				Property Crime			
Mode	Homicide	Rape	Robbery	Aggravated Assault	Theft	Vehicle Theft	Burglary	Arson
Bus	6	10	856	1,276	2,878	196	88	30
Commuter Rail	4	6	170	55	2,109	139	212	21
Demand Response	0	1	0	8	31	1	1	0
Heavy Rail	8	8	3,394	1,051	8,321	1,630	1,343	16
Light Rail	1	4	222	143	479	179	48	5
Other	0	0	87	512	381	1	6	0
TOTAL	19	29	4,729	3,045	14,199	2,146	1,698	72

The exhibit shows that Heavy Rail report most of the incidents followed by Bus. Heavy Rail accounted for nearly 33 percent of the reports of homicide and rape and 72 percent of all reports of robbery. Most reports of violent and property crime for Bus were by agencies located in large metropolitan areas.

Transit Security—Offenses (Arrests)

Exhibit 5-10 shows the number of arrests reported in 1997. Bus and Heavy Rail reported most of the arrests.

Exhibit 5-10

Arrests by Mode
1997

Mode	Other Assaults	Vandalism	Sex Offenses	Drug Abuse Violations	Driving Under the Influence	Drunkenness	Disorderly Conduct	Trespassing	Fare Evasion	Loitering
Bus	1,354	5,121	357	1,955	100	4,822	6,549	1,199	1,790	755
Commuter Rail	128	487	43	448	18	129	961	2,758	186	44
Demand Response	10	3	1	6	0	45	31	1	1	0
Heavy Rail	881	1,128	517	1,530	22	1,601	15,309	1,398	46,106	530
Light Rail	195	2,084	79	336	31	1,258	1,177	463	912	80
Other	26	398	0	27	28	155	415	206	4,257	10
TOTAL	2,594	9,221	997	4,302	199	8,010	24,442	6,025	53,252	1,419

Reliability and Maintenance Effectiveness

Introduction

This chapter discusses measures of service quality, such as vehicle maintenance reliability and the effectiveness of transit maintenance. Additionally, trend analysis on uses of alternative fuels is presented.

Chapter Organization

Chapter 6 reviews service reliability in terms of the number of vehicle revenue miles between roadcalls and discusses maintenance effectiveness by examining maintenance expense per vehicle mile of service by mode. Finally, a discussion of the use of alternative fuels for the 1993 - 1997 time frame is presented.

General Notes

Before reviewing this chapter, some items should be noted. Roadcalls discussed herein are revenue service interruptions for mechanical failure as defined in the *1997 Reporting Manual*. Revenue service interruptions for mechanical reasons are defined as interruptions that prevent a vehicle from running and that require someone other than the vehicle operator or crew to restore the vehicle to an operating condition. Thus, only revenue service interruptions caused by failure of some mechanical element of the revenue vehicle are considered. These interruptions include breakdowns of air equipment, brushes, fuel system, engine, steering and front axle, rear axle and suspension, torque convertors, electrical units, and heating and cooling systems. Please note that roadcalls do not measure the number of times that vehicles in revenue service are removed from service. Many situations exist in which a vehicle in revenue service is placed out of service for non-mechanical reasons. For example, accidents are events not necessarily counted as roadcalls in the National Transit Database because an accident may be unrelated to the vehicle's mechanical failure.

NTD reporting deals with maintenance data only for directly operated service in the *1997* report year.

Maintenance Performance Measures: Maintenance Expense per Vehicle Mile

Maintenance costs will vary greatly by mode due to differences in infrastructure, such as vehicle type, complexity and fixed guideway. Rail modes have higher maintenance costs partially due to their fixed guideway nature. **Exhibit 6-1** displays the maintenance costs per vehicle mile for the 1993-1997 period. All modes experienced decreases in maintenance costs per mile except Bus and Demand Response. Among rail modes, Light Rail has the highest maintenance cost at $4.87 per vehicle mile. Bus had the highest increase at 8.8 percent for the 1993-1997 time frame.

Exhibit 6-1

Maintenance Expense per Vehicle Mile by Mode
1993-1997

Mode	1993	1994	1995	1996	1997
Bus	$1.25	$1.31	$1.34	$1.33	$1.36
Heavy Rail	2.76	2.83	2.79	2.72	2.67
Commuter Rail	3.97	4.30	3.96	4.15	3.85
Light Rail	4.73	5.08	4.78	4.95	4.87
Demand Response	0.39	0.36	0.35	0.37	0.41

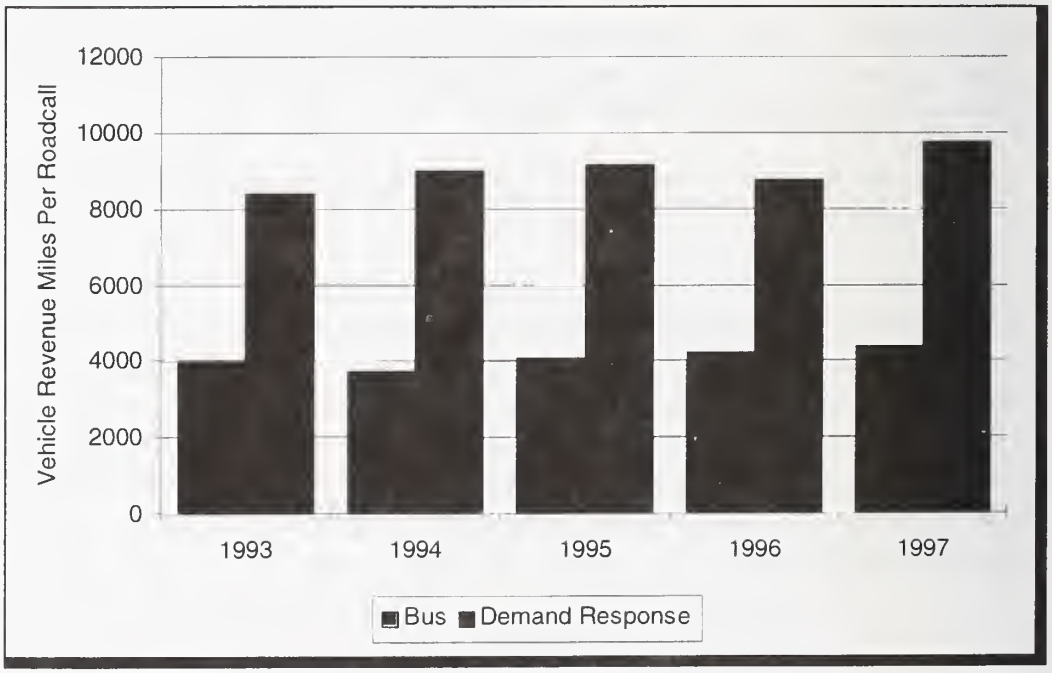
Vehicle Revenue Miles per Mechanical Roadcall

Reporting of roadcall data for the NTD was required only for directly operated non-fixed guideway modes in the 1997 report year. Transit Agencies do not use uniform and consistent criteria in reporting revenue interruptions for rail modes. Thus, the only data available that are sufficient for a historical comparison are the data for the Bus and Demand Response modes because other non-fixed guideway modes have small participation in the NTD.

As shown in **Exhibit 6-2**, Bus shows a trend of increase in miles between roadcalls for the 1994–1997 period at 17.6 percent. Demand Response experienced an increase in revenue miles per mechanical roadcall from 1993 to 1995, decreasing in 1996 and increased again in 1997 by 11.5 percent.

Exhibit 6-2

Vehicle Revenue Miles per Mechanical Roadcall
Directly Operated Service
1993-1997



The ratio of vehicle maintenance expense to the total operating expense for directly operated service is presented in **Exhibit 6-3.**

Ratio of Vehicle Maintenance Expenses to Total Operating Expenses
Directly Operated Service
(Millions)
1993-1997

Exhibit 6-3

Year	Vehicle Maintenance Expenses	Total Operating Expenses	Ratio of Vehicle Maintenance Expenses to Total Operating Expenses
1993	2,888.5	14,605.0	19.8%
1994	3,101.0	15,331.5	20.2%
1995	3,110.5	15,075.9	20.6%
1996	3,115.0	15,032.6	20.7%
1997	3,217.8	15,668.9	20.5%

Uses of Alternative Fuels

Exhibit 6-4 presents the variations in the use of alternative fuels as a percentage of the total fuel consumption for the 1993-1997 time frame. The total fuel consumed for a given year includes diesel, gasoline and other fuels such as compressed natural gas, methanol, ethanol and other alternative fuels. In the aggregate, alternative fuel consumption accounted for 5.9 percent of the total consumed in 1997, and this figure is over three times greater than 1993 (1.9 percent).

Uses of Alternative Fuels (%)
1993-1997

Exhibit 6-4

Alternative Fuel Types	1993	1994	1995	1996	1997
Compressed Natural Gas	0.2	0.5	1.9	2.3	3.3
Methanol	1.0	2.6	2.3	1.4	0.2
Ethanol	0.0	0.1	0.2	0.7	1.2
Other	0.6	1.3	0.7	1.1	1.2
Total	**1.9**	**4.4**	**5.1**	**5.5**	**5.9**

Compressed natural gas is the fuel type with the largest share in 1997 at 3.3 percent.

Key Modal Characteristics and Uses of Capital by Transit Agencies

Introduction

The exhibits and discussion in this chapter provide data on operations, performance, infrastructure, and uses of capital for the fifteen largest Bus and Demand Response transit agencies and for all transit agencies operating Heavy Rail, Commuter Rail, Light Rail, Trolleybus, Ferryboat, and Automated Guideway systems. Operational data is presented for both directly operated and purchased transportation services.

Chapter Organization

Three exhibits are presented for each of the following modes: Bus, Heavy Rail, Commuter Rail, Light Rail, Demand Response, Trolleybus, Ferryboat, and Automated Guideway. **Exhibits 7-1 through 7-31** provide data on service, performance indicators, infrastructure, and uses of capital for each mode.

For each mode, four exhibits are presented with a brief synopsis of the data. The first exhibit reflects basic information on each system's operations including operating expense, vehicle miles, vehicle hours, unlinked passenger trips, and passenger miles. The second exhibit offers measures of cost, service effectiveness and efficiency. The third exhibit profiles infrastructure characteristics such as directional route miles, miles of track, and stations. The fourth exhibit presents capital investment information by category of use (rolling stock, facilities and other) for all modes listed above except Demand Response.

Bus Agencies

The fifteen Bus agencies addressed in **Exhibits 7-1, 7-2, 7-3** and **7-4** are those with the largest number of vehicles operated in maximum service (public agencies directly operating their services and private providers under contract to public agencies). These 15 agencies dominate the service categories presented in **Exhibit 7-1**, and account for more than 51 percent of the unlinked Bus passenger trips made in the United States in 1997. These agencies also account for over 45 percent of Bus passenger miles as well as 38.1 percent of Bus revenue miles and 42.4 percent of Bus revenue hours.

Exhibit 7-1

Key Bus Operating Characteristics of Individual Agencies 1997

ST	Agency Name	Type of Service	Operating Expense (000s)	Vehicle Revenue Mile (000s)	Vehicle Revenue Hour (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	LA-LACMTA-Metro	DO	$601,370.5	71,876.5	5,930.5	342,949.9	1,074.0	1,256,309.2
CA	LA-LACMTA-Metro	PT	16,499.0	7,037.6	411.0	9,518.3	32.0	44,187.8
CA	**TOTAL**		**617,869.5**	**78,914.1**	**6,341.5**	**352,468.2**	**1,106.0**	**1,300,497.0**
CO	Denver-RTD	DO	121,592.6	23,987.1	1,331.7	55,693.2	190.6	253,393.0
CO	Denver-RTD	PT	30,608.5	7,259.5	483.8	10,649.8	33.9	45,764.9
CO	**TOTAL**		**152,201.2**	**31,246.6**	**1,815.5**	**66,343.0**	**224.5**	**299,157.9**
DC	Washington-WMATA	DO	271,643.4	33,742.6	3,023.3	125,035.2	430.0	419,473.3
IL	Chicago-RTA-CTA	DO	481,331.0	64,932.6	6,453.8	287,628.3	932.6	721,987.9
MA	Boston-MBTA	DO	182,105.6	22,470.2	2,140.0	103,925.3	343.9	258,784.3
MA	Boston-MBTA	PT	6,175.7	4,648.9	166.4	1,805.9	6.4	27,918.9
MA	**TOTAL**		**188,281.3**	**27,119.1**	**2,306.4**	**105,731.2**	**350.3**	**286,703.3**
MD	Baltimore-Maryland-MTA	DO	135,410.6	18,060.8	1,649.5	77,653.2	266.1	241,523.8
MD	Baltimore-Maryland-MTA	PT	8,821.4	1,940.2	78.7	1,344.6	5.2	36,754.6
MD	**TOTAL**		**144,232.0**	**20,001.1**	**1,728.2**	**78,997.8**	**271.3**	**278,278.4**
MN	Minneapolis-St. Paul-MCTO	DO	133,936.8	22,909.0	1,656.7	62,044.6	206.1	265,768.5
MN	Minneapolis-St. Paul-MCTO	PT	164.4	52.3	3.5	20.8	0.1	102.1
MN	**TOTAL**		**134,101.2**	**22,961.4**	**1,660.1**	**62,065.4**	**206.2**	**265,870.6**
NJ	New Jersey Transit	DO	400,148.5	63,119.9	4,147.1	129,618.6	444.0	788,879.3
NJ	New Jersey Transit	PT	20,705.7	6,783.5	511.3	12,419.8	43.8	49,604.5
NJ	**TOTAL**		**420,854.2**	**69,903.4**	**4,658.3**	**142,038.4**	**487.8**	**838,483.8**
NY	New York City DOT	PT	225,286.1	21,384.6	2,285.0	87,799.2	289.8	351,153.5
NY	NY-MTA-NYCTA	DO	1,079,992.9	86,844.4	11,279.8	635,046.6	2,056.1	1,376,040.0
PA	Philadelphia-SEPTA	DO	302,259.3	33,781.3	2,733.5	157,634.7	522.1	477,855.6
PA	Philadelphia-SEPTA	PT	257.9	99.5	4.6	17.1	0.1	291.7
PA	**TOTAL**		**302,517.1**	**33,880.7**	**2,738.1**	**157,651.7**	**522.2**	**478,147.3**
PA	Pittsburgh-PAT	DO	154,709.3	24,166.1	1,809.8	63,583.2	214.9	239,424.5
TX	Dallas-DART	DO	135,791.2	18,066.9	1,398.6	41,682.0	142.6	156,306.6
TX	Dallas-DART	PT	32,712.3	8,636.3	492.4	8,832.2	33.8	78,628.6
TX	**TOTAL**		**168,503.5**	**26,703.2**	**1,891.0**	**50,514.2**	**176.4**	**234,935.2**
TX	Houston-Metro	DO	180,623.1	36,283.8	2,485.8	80,586.5	267.2	412,804.7
TX	Houston-Metro	PT	$11,121.9	2,819.9	169.6	5,779.3	22.7	32,026.2
TX	**TOTAL**		**191,745.0**	**39,103.6**	**2,655.3**	**86,365.8**	**289.9**	**444,830.9**
WA	Seattle-Metro	DO	204,535.9	30,808.5	2,212.4	68,792.4	229.7	449,185.4
		DO Total	**$4,385,450.7**	**551,049.7**	**48,252.3**	**2,231,873.7**	**7,320.0**	**7,317,736.2**
		PT Total	**$352,352.9**	**60,662.3**	**4,606.1**	**138,186.9**	**467.8**	**666,432.9**
		Total	**$4,737,803.6**	**611,712.0**	**52,858.4**	**2,370,060.6**	**7,787.7**	**7,984,169.1**
		Percent of DO Bus	**48.6%**	**45.6%**	**50.1%**	**62.9%**	**61.4%**	**56.4%**
		Percent of PT Bus	**46.5%**	**40.9%**	**44.7%**	**48.9%**	**47.3%**	**44.2%**
		Percent of National Total	**50.3%**	**38.1%**	**42.4%**	**51.5%**	**50.9%**	**45.6%**

Performance indicators for the top fifteen Bus providers are displayed in **Exhibit 7-2.** On average, the top fifteen have a higher cost per vehicle revenue mile and vehicle revenue hour than the national average (25.4 percent and 16.9 percent higher respectively). The top fifteen's service effectiveness is better than the national average (nearly 22 percent higher as measured by unlinked passenger trips per vehicle revenue mile). It should be noted that performance indicators are given for agencies without indication of the ratios for the public and private component of their services.

As demonstrated in **Exhibit 7-2**, 3.49 unlinked passenger trips per vehicle revenue mile are realized on average by the combination of the top fifteen Bus systems compared with 2.87 for all Bus agencies. However, it should be noted that, only eight of the top fifteen agencies demonstrate greater unlinked passenger trips per vehicle revenue mile than the 2.87 average for all Bus agencies.

Key Bus Performance Indicators of Individual Agencies
1997

Exhibit 7-2

ST	Agency Name	Operating Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
		Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	LA-LACMTA-Metro	$7.83	$97.43	$1.75	$0.48	4.47	55.58	205.08	12.44
CO	Denver-RTD	4.87	83.84	2.29	0.51	2.12	36.54	164.78	17.21
DC	Washington-WMATA	8.05	89.85	2.17	0.65	3.71	41.36	138.75	11.16
IL	Chicago-RTA-CTA	7.41	74.58	1.67	0.67	4.43	44.57	111.87	10.06
MA	Boston-MBTA	6.94	81.63	1.78	0.66	3.90	45.84	124.31	11.76
MD	Baltimore-Maryland-MTA	7.21	83.46	1.83	0.52	3.95	45.71	161.02	11.57
MN	Minneapolis-St. Paul-MCTO	5.84	80.78	2.16	0.50	2.70	37.39	160.15	13.83
NJ	New Jersey Transit	6.02	90.34	2.96	0.50	2.03	30.49	180.00	15.01
NY	New York City DOT	10.53	98.59	2.57	0.64	4.11	38.42	153.68	9.36
NY	NY-MTA-NYCTA	12.44	95.75	1.70	0.78	7.31	56.30	121.99	7.70
PA	Philadelphia-SEPTA	8.93	110.49	1.92	0.63	4.65	57.58	174.63	12.37
PA	Pittsburgh-PAT	6.40	85.48	2.43	0.65	2.63	35.13	132.29	13.35
TX	Dallas-DART	6.31	89.11	3.34	0.72	1.89	26.71	124.24	14.12
TX	Houston-Metro	4.90	72.21	2.22	0.43	2.21	32.53	167.52	14.73
WA	Seattle-Metro	6.64	92.45	2.97	0.46	2.23	31.09	203.03	13.93
	Average of Agencies	**$7.36**	**$88.40**	**$2.25**	**$0.59**	**3.49**	**41.02**	**154.89**	**12.57**
	National Average for Bus Mode	**$5.87**	**$75.64**	**$2.05**	**$0.54**	**2.87**	**36.95**	**140.52**	**12.89**

Exhibit 7-2 also reflects the low service efficiency of these fifteen Bus agencies. Operating expense per vehicle revenue mile and per vehicle revenue hour for these agencies are $7.36 and $88.40, respectively, compared with $5.87 per vehicle revenue mile and $75.64 per vehicle revenue hour for all Bus agencies. In terms of operating expense per unlinked passenger trip and operating expense per passenger mile, these fifteen agencies averaged $2.25 and $0.59, respectively. Nationally, the average figures for Bus are $2.05 and $0.54.

Exhibit 7-3 indicates that the majority of the fifteen agencies have at least some exclusive or shared rights-of-way for their Bus operations, with 10 of the systems having more than 20 directional route miles of such rights-of-way. Data in **Exhibit 7-3** reflect fixed guideway operated by each Bus transit agency. In many of the larger metropolitan areas, several Bus agencies operate on the same fixed guideway segments. These fifteen agencies also account for over 40 percent of the buses operated in maximum service.

Exhibit 7-4 provides capital investment information for the Bus operators presented in the previous exhibits.

Exhibit 7-3

Key Bus Infrastructure Characteristics of Individual Agencies
1997

ST	Agency Name	Fixed Guideway Directional Route Miles	Directional Route Miles Exclusive ROW	Directional Route Miles Controlled ROW	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	LA-LACMTA-Metro	45.9	44.4	1.5	1,754	2,548	9.7
CO	Denver-RTD	58.9	32.3	26.6	696	849	7.9
DC	Washington-WMATA	50.7	0.0	50.7	1,155	1,299	12.0
IL	Chicago-RTA-CTA	3.7	3.7	0.0	1,551	1,882	7.3
MA	Boston-MBTA	2.4	2.4	0.0	855	1,070	7.0
MD	Baltimore-Maryland-MTA	20.0	0.0	20.0	770	959	9.4
MN	Minneapolis-St. Paul-MCTO	139.9	55.8	84.1	755	894	7.3
NJ	New Jersey Transit	29.6	0.0	29.6	1,726	2,098	10.3
NY	NY-MTA-NYCTA	39.4	2.3	37.1	3,246	3,867	7.9
NY	New York City DOT	0.0	0.0	0.0	819	1,033	8.8
PA	Philadelphia-SEPTA	3.6	2.5	1.1	1,076	1,299	7.8
PA	Pittsburgh-PAT	41.3	41.3	0.0	756	911	5.7
TX	Dallas-DART	45.9	36.6	9.3	463	543	10.8
TX	Houston-Metro	148.3	143.7	4.6	935	1,202	7.9
WA	Seattle-Metro	143.8	137.6	6.2	894	1,114	7.4
	Individual Agencies Total	**773.4**	**502.6**	**270.8**	**17,451**	**21,568**	
	Weighted Average						**8.6**
	Total Bus Mode	**1,663.0**	**826.1**	**837.5**	**43,708**	**54,946**	
	Weighted Average						**8.1**

Exhibit 7-4

Uses of Bus Capital Funds by Individual Agencies
(Thousands)
1997

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	LA-LACMTA-Metro	$58,935.8	$68,929.1	$127,864.9
CO	Denver-RTD	34,031.3	11,861.1	$45,892.5
DC	Washington-WMATA	340.9	27,458.1	$27,799.0
IL	Chicago-RTA-CTA	24,856.5	23,541.9	$48,398.3
MA	Boston-MBTA	18,061.4	6,944.4	$25,005.8
MD	Baltimore-Maryland-MTA	38.1	10,749.5	$10,787.6
MN	Minneapolis-St. Paul-MCTO	3,350.2	5,892.5	$9,242.7
NJ	New Jersey Transit	4,551.0	115,381.0	$119,932.0
NY	New York City DOT	267.5	16,966.6	$17,234.0
NY	NY-MTA-NYCTA	87,463.2	44,791.1	$132,254.2
PA	Philadelphia-SEPTA	112,788.2	30,073.7	$142,861.9
PA	Pittsburgh-PAT	14,205.4	93,784.2	$107,989.6
TX	Dallas-DART	926.1	11,315.4	$12,241.4
TX	Houston-Metro	49,427.5	92,557.7	$141,985.2
WA	Seattle-Metro	62,759.7	21,458.0	$84,217.6
	Total	**$472,002.7**	**$581,704.1**	**$1,053,706.9**
	Percent of National Bus Total	**41.2%**	**53.7%**	**47.3%**

Heavy Rail Agencies

The Heavy Rail agencies listed represent the total number of Heavy Rail operators in the United States, providing a combined total of 8,245 vehicles in maximum service. The dominance of three New York City metropolitan area agencies is demonstrated by the data presented. These agencies are the New York City Transit Authority, Staten Island Rapid Transit Operating Authority, and the Port Authority Trans-Hudson Corporation. **Exhibit 7-5** shows that 58.0 percent of operating expenses in the United States in 1997 are accounted for by these three agencies. These agencies also provided 59.1 percent of passenger car revenue miles operated, 67.0 percent of the passenger car revenue hours operated, 61.6 percent of passenger miles, and 68 percent of all Heavy Rail passengers.

Exhibit 7-5

Key Heavy Rail Operating Characteristics of Individual Agencies
1997

ST	Agency Name	Type of Service	Operating Expense (000s)	Train Revenue Miles (000s)	Passenger Car Revenue Miles (000s)	Passenger Car Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	LA-LACMTA-Metro	DO	$31,417.1	493.9	1,737.1	88.5	11,628.3	37.8	22,487.4
CA	San Francisco-BART	DO	257,370.2	6,638.7	48,523.2	1,406.9	80,489.7	274.7	967,427.6
DC	Washington-WMATA	DO	339,095.8	8,919.2	37,983.7	1,508.4	198,003.4	682.6	1,078,247.3
FL	Miami-MDTA	DO	49,988.9	1,501.3	5,739.1	229.6	14,019.9	47.0	108,155.9
GA	Atlanta-MARTA	DO	98,823.2	5,814.5	27,101.4	931.4	90,991.0	246.1	547,885.7
IL	Chicago-RTA-CTA	DO	310,458.4	10,283.0	50,686.5	2,257.0	151,010.4	503.1	902,389.0
MA	Boston-MBTA	DO	160,478.6	4,956.5	22,933.9	1,042.5	113,714.9	369.9	393,908.4
MD	Baltimore-Maryland-MTA	DO	32,006.6	871.9	4,231.0	169.0	12,599.8	44.9	66,046.1
NJ	Philadelphia-PATCO	DO	26,208.8	1,171.0	4,017.0	138.5	10,659.6	37.5	93,996.3
NY	NY-MTA-NYCTA	DO	1,855,109.9	34,385.6	304,094.4	16,685.3	1,579,782.5	5,318.8	7,101,712.0
NY	NY-MTA-Staten Island	DO	20,001.0	526.5	2,103.5	102.1	4,617.6	17.3	33,609.0
NY	Port Authority-PATH	DO	141,060.0	1,715.6	12,833.6	680.3	67,998.1	232.6	296,974.3
OH	Cleveland-RTA	DO	20,729.4	1,336.3	2,046.4	93.7	7,694.8	26.1	56,561.1
PA	Philadelphia-SEPTA	DO	130,959.3	3,137.4	15,639.5	731.3	86,244.6	292.5	386,667.7
	Total		$3,473,707.3	81,751.4	539,670.3	26,064.4	2,429,454.6	8,130.9	12,056,067.6

As seen in **Exhibit 7-6**, six of the reporting transit agencies exceed the average of 4.50 unlinked passenger trips per vehicle revenue mile and seven exceed the average of 93.21 unlinked passenger trips per vehicle revenue hour. This reflects high service effectiveness for these operators.

Exhibit 7-7 also reflects the dominance of the New York City agencies. Nearly 51 percent of all Heavy Rail stations are served by the three agencies; 36 percent of the route miles and 42.4 percent of the track miles are reported by the New York City area. These three agencies accounted for over 62 percent of the vehicles operated in maximum service and nearly 61 percent of the vehicles available for maximum service.

Exhibit 7-8 provides capital investment information for Heavy Rail in 1997.

Exhibit 7-6

Key Heavy Rail Performance Indicators of Individual Agencies 1997

ST	Agency Name	Operating Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
		Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	LA-LACMTA-Metro	$18.09	$354.85	$2.70	$1.40	6.69	131.34	253.99	19.62
CA	San Francisco-BART	5.30	182.94	3.20	0.27	1.66	57.21	687.65	34.49
DC	Washington-WMATA	8.93	224.80	1.71	0.31	5.21	131.26	714.82	25.18
FL	Miami-MDTA	8.71	217.72	3.57	0.46	2.44	61.06	471.06	25.00
GA	Atlanta-MARTA	3.65	106.10	1.09	0.18	3.36	97.70	588.26	29.10
IL	Chicago-RTA-CTA	6.13	137.56	2.06	0.34	2.98	66.91	399.83	22.46
MA	Boston-MBTA	7.00	153.94	1.41	0.41	4.96	109.08	377.87	22.00
MD	Baltimore-Maryland-MTA	7.56	189.34	2.54	0.48	2.98	74.54	390.71	25.03
NJ	Philadelphia-PATCO	6.52	189.21	2.46	0.28	2.65	76.96	678.60	29.00
NY	NY-MTA-NYCTA	6.10	111.18	1.17	0.26	5.20	94.68	425.63	18.23
NY	NY-MTA-Staten Island	9.51	195.80	4.33	0.60	2.20	45.21	329.02	20.59
NY	Port Authority-PATH	10.99	207.36	2.07	0.47	5.30	99.96	436.55	18.87
OH	Cleveland-RTA	10.13	221.31	2.69	0.37	3.76	82.15	603.85	21.85
PA	Philadelphia-SEPTA	8.37	179.09	1.52	0.34	5.51	117.94	528.77	21.39
	Average	**$6.44**	**$133.27**	**$1.43**	**$0.29**	**4.50**	**93.21**	**462.55**	**20.71**

Exhibit 7-7

Key Heavy Rail Infrastructure Characteristics of Individual Agencies 1997

ST	Agency Name	Fixed Guideway Directional Route Miles	Miles of Track	Number of Stations	Number of Accessible Stations	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	LA-LACMTA-Metro	10.0	12.2	8	8	24	30	6.0
CA	San Francisco-BART	190.1	246.3	39	39	480	668	17.4
DC	Washington-WMATA	184.9	198.7	75	75	618	764	14.2
FL	Miami-MDTA	42.2	53.2	21	0	86	136	15.0
GA	Atlanta-MARTA	92.2	115.0	36	36	182	238	13.9
IL	Chicago-RTA-CTA	206.3	287.8	141	0	938	1,150	13.7
MA	Boston-MBTA	75.8	107.7	53	33	325	408	14.9
MD	Baltimore-Maryland-MTA	29.4	34.4	14	14	54	100	12.4
NJ	Philadelphia-PATCO	31.5	38.4	13	3	96	121	24.4
NY	NY-MTA-NYCTA	492.9	834.2	468	30	4,837	5,790	24.5
NY	NY-MTA-Staten Island	28.6	32.5	22	2	36	64	26.0
NY	Port Authority-PATH	28.6	43.1	13	6	260	342	24.8
OH	Cleveland-RTA	38.2	41.9	18	6	30	59	14.0
PA	Philadelphia-SEPTA	76.1	102.3	76	4	279	358	26.9
	Total	**1,527**	**2,147.7**	**997**	**256**	**8,245**	**10,228**	
	Weighted Average							**21.1**

Commuter Rail Agencies

Exhibits 7-9, 7-10, 7-11, and **7-12** present all fifteen Commuter Rail systems. This mode is dominated by four agencies: two agencies serving the New York City metropolitan area, one serving New Jersey, and one serving the Chicago metropolitan area. As shown in **Exhibit 7-9**, the systems serving the metropolitan areas of New York-New Jersey and Chicago accounted for 78.1 percent of the total operating expenses for Commuter Rail systems, 76.9 percent of the passenger car revenue miles, 75.8 percent of the passenger car revenue hours, 77.7 percent of the unlinked passenger trips, and 79.6 percent of the passenger miles.

Uses of Heavy Rail Capital Funds by Individual Agencies (Thousands) 1997

Exhibit 7-8

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	LA-LACMTA-Metro	$0.0	$863.3	**$863.3**
CA	San Francisco-BART	29,141.0	197,647.8	**$226,788.8**
DC	Washington-WMATA	4,902.2	381,114.1	**$386,016.4**
FL	Miami-MDTA	906.9	11,605.9	**$12,512.8**
GA	Atlanta-MARTA	8,019.2	67,807.4	**$75,826.5**
IL	Chicago-RTA-CTA	16,954.4	118,383.8	**$135,338.2**
MA	Boston-MBTA	1,689.8	55,433.6	**$57,123.4**
MD	Baltimore-Maryland-MTA	473.3	25,003.1	**$25,476.4**
NJ	Philadelphia-PATCO	907.5	11,054.1	**$11,961.6**
NY	NY-MTA-NYCTA	205,649.9	1,044,086.5	**$1,249,736.3**
NY	NY-MTA-Staten Island	0.0	4,140.5	**$4,140.5**
NY	Port Authority-PATH	0.0	38,529.0	**$38,529.0**
OH	Cleveland-RTA	0.0	18,223.4	**$18,223.4**
PA	Philadelphia-SEPTA	29,682.6	73,878.3	**$103,560.9**
	Total	**$298,326.8**	**$2,047,770.7**	**$2,346,097.5**

Key Commuter Rail Operating Characteristics of Individual Agencies 1997

Exhibit 7-9

ST	Agency Name	Service	Operating Expense (000s)	Train Revenue Miles (000s)	Passenger Car Revenue Miles (000s)	Passenger Car Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	LA-SCRRA	DO	$57,700.4	1,296.9	5,226.4	126.3	5,534.6	21.3	199,683.0
CA	San Diego-NCTD	PT	12,721.9	210.4	792.5	18.9	910.0	3.2	25,747.9
CA	SF-CalTrain	PT	43,141.3	917.0	3,786.4	118.5	7,040.0	24.4	156,874.9
CT	Hartford-Conn DOT	PT	6,534.7	168.0	496.0	12.0	300.5	1.2	6,501.9
FL	Ft. Lauderdale-TCRA	PT	20,571.1	623.0	2,492.0	72.5	2,315.4	7.5	69,462.6
IL	Chicago-RTA-Metra	DO	343,374.0	6,188.5	33,162.0	1,045.1	66,217.4	246.7	1,434,360.1
IN	NW IN-NICTD	DO	21,736.3	703.1	2,731.1	77.5	3,384.4	12.1	92,056.7
MA	Boston-MBTA	PT	114,374.7	2,901.8	17,044.4	540.8	27,813.1	99.7	517,434.8
MD	Baltimore-Maryland-MTA	PT	44,538.9	906.8	4,558.3	113.4	4,656.4	18.3	139,905.3
NJ	New Jersey Transit	DO	352,424.3	7,404.7	40,858.4	1,211.0	49,513.3	172.1	1,101,596.1
NJ	New Jersey Transit	PT	7,860.8	132.3	1,378.1	26.6	1,345.5	5.3	49,646.2
		Total	**360,285.1**	**7,537.0**	**42,236.5**	**1,237.6**	**50,858.7**	**177.5**	**1,151,242.2**
NY	NY-MTA-Long Island RR	DO	601,926.1	7,277.7	57,711.8	1,723.5	96,535.0	338.0	2,115,830.2
NY	NY-MTA-Metro North RR	DO	471,738.6	6,769.9	43,568.0	1,148.8	64,057.5	222.0	1,700,280.1
PA	Philadelphia-Penn DOT	PT	4,300.0	184.5	553.5	10.6	177.4	0.5	12,941.8
PA	Philadelphia-SEPTA	DO	151,825.5	4,904.0	13,783.2	501.1	25,464.7	89.1	356,505.9
TX	Dallas-DART	PT	4,529.4	37.4	93.6	14.2	175.2	0.9	1,542.2
VA	VA-VRE	PT	15,410.8	284.9	1,372.1	40.2	1,758.5	7.0	57,116.2
		DO Total	**$2,000,725.3**	**34,544.8**	**197,041.0**	**5,833.2**	**310,708.9**	**1,101.4**	**7,000,312.1**
		PT Total	**$273,983.6**	**6,366.1**	**32,566.8**	**967.5**	**46,491.9**	**168.1**	**1,037,173.8**
		Total	**$2,274,708.9**	**40,910.9**	**229,607.8**	**6,800.7**	**357,198.8**	**1,269.5**	**8,037,485.9**

Private sector participation in generating Commuter Rail service is small, following a trend found in all transit modes except Demand Response. In 1997, contracting Commuter Rail services totaled 12.0 percent of the total operating expense for this mode. In fact, Commuter Rail has the largest share of service provided through contracting after Demand Response, occupying first place among mass transit modes. Ten of the fifteen Commuter Rail systems have all or part of their service provided through purchased transportation. In most cases, private providers are freight rail companies that have retained the ownership of the facilities and/or rolling stock.

Performance indicators for Commuter Rail are displayed in **Exhibit 7-10**. The cost per revenue mile for Commuter Rail systems varies from $6.71 per revenue mile to $48.39 per revenue mile. The two largest operators of Commuter Rail are located in the New York City metropolitan area (Long Island Railroad and Metro North). The long trip lengths and highly concentrated ridership during peak hours are the main factors affecting the cost effectiveness of Commuter Rail based on unlinked passenger trips and passenger miles. Due to the long trip lengths of Commuter Rail, the cost per passenger mile is on average much smaller than the cost per unlinked passenger trip

Exhibit 7-10

Key Commuter Rail Performance Indicators of Individual Agencies 1997

		Operating Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
ST	Agency Name	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	LA-SCRRA	$11.04	$457.02	$10.43	$0.29	1.06	43.84	1,581.60	41.40
CA	San Diego-NCTD	16.05	673.05	13.98	0.49	1.15	48.14	1,362.18	41.93
CA	SF-CalTrain	11.39	364.18	6.13	0.28	1.86	59.43	1,324.26	31.96
CT	Hartford-Conn DOT	13.18	545.56	21.75	1.01	0.61	25.09	542.82	41.41
FL	Ft. Lauderdale-TCRA	8.25	283.92	8.88	0.30	0.93	31.96	958.71	34.39
IL	Chicago-RTA-Metra	10.35	328.57	5.19	0.24	2.00	63.36	1,372.50	31.73
IN	NW IN-NICTD	7.96	280.54	6.42	0.24	1.24	43.68	1,188.12	35.25
MA	Boston-MBTA	6.71	211.51	4.11	0.22	1.63	51.43	956.88	31.52
MD	Baltimore-Maryland-MTA	9.77	392.93	9.57	0.32	1.02	41.08	1,234.28	40.21
NJ	New Jersey Transit	8.53	291.12	7.08	0.31	1.20	41.10	930.25	34.13
NY	NY-MTA-Long Island RR	10.43	349.25	6.24	0.28	1.67	56.01	1,227.66	33.49
NY	NY-MTA-Metro North RR	10.83	410.62	7.36	0.28	1.47	55.76	1,480.00	37.92
PA	Philadelphia-Penn DOT	7.77	403.98	24.23	0.33	0.32	16.67	1,215.88	52.00
PA	Philadelphia-SEPTA	11.02	303.01	5.96	0.43	1.85	50.82	711.50	27.51
TX	Dallas-DART	48.39	317.96	25.85	2.94	1.87	12.30	108.26	6.57
VA	VA-VRE	11.23	383.78	8.76	0.27	1.28	43.79	1,422.39	34.17
	Average	$9.91	$334.48	$6.37	$0.28	1.56	52.52	1,181.87	33.76

Boston was the most cost effective system in 1997 in terms of expenses per passenger mile and in terms of expenses per unlinked passenger trip. Commuter Rail's service effectiveness, as measured by unlinked passenger trips per vehicle revenue mile, is poor compared with other modes. However, this is not an

indication of low service utilization. The main reason for the low Commuter Rail service effectiveness relates to concentrated ridership during peak hours combined with the long distances traveled by commuters.

Exhibit 7-11 also demonstrates the dominance of New York City agencies, New Jersey and Chicago relative to infrastructure. Commuter Rail systems serving these areas account for 75.9 percent of the vehicles operated in maximum service, 51.8 percent of the fixed guideway directional route miles, and 56.6 percent of the Commuter Rail stations.

Key Commuter Rail Infrastructure Characteristics of Individual Agencies 1997 **Exhibit 7-11**

ST	Agency Name	Fixed Guideway Directional Route Miles	Miles of Track	Number of Stations	Number of Accessible Stations	Vehicles Operated for Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	LA-SCRRA	758.8	565.6	45	45	118	139	5.9
CA	San Diego-NCTD	82.2	108.0	8	8	20	21	3.0
CA	SF-CalTrain	153.6	129.5	34	14	81	93	11.9
CT	Hartford-Conn DOT	101.2	102.9	8	8	12	41	26.5
FL	Ft. Lauderdale-TCRA	140.0	145.1	18	18	25	34	7.2
IL	Chicago-RTA-Metra	939.4	1,145.9	226	104	951	1,114	24.3
IN	NW IN-NICTD	151.0	101.9	18	7	53	56	11.7
MA	Boston-MBTA	575.0	484.8	102	50	308	346	8.3
MD	Baltimore-Maryland-MTA	373.4	455.1	40	19	113	134	25.1
NJ	New Jersey Transit	1,192.8	1,206.1	163	27	726	944	19.7
NY	NY-MTA-Long Island RR	638.2	701.1	134	15	982	1,187	26.2
NY	NY-MTA-Metro North RR	535.4	796.4	106	19	739	880	19.9
PA	Philadelphia-Penn DOT	144.0	144.0	14	3	9	12	20.5
PA	Philadelphia-SEPTA	419.2	671.2	177	30	282	341	22.6
VA	VA-VRE	175.0	190.0	18	18	59	71	22.4
	Total	**6,379.2**	**6,948.6**	**1,111**	**385**	**4,478**	5,413	
	Weighted Average							**20.6**

Uses of Capital funds for Commuter Rail operators is depicted in **Exhibit 7-12**.

Exhibits 7-13, **7-14,** and **7-15** provide data for all Light Rail operators while **Exhibit 7-16** provides data for all agencies that invested capital dollars in Light Rail systems in 1997. **Light Rail Agencies**

Exhibit 7-12

Uses of Commuter Rail Capital Funds by Individual Agencies
(Thousands)
1997

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	LA-SCRRA	$9,226.6	$45,967.2	**$55,193.8**
CA	San Diego-NCTD	11,959.5	3,956.8	**$15,916.3**
CA	SF-CalTrain	76,230.0	98,171.3	**$174,401.3**
FL	Ft. Lauderdale-TCRA	2,332.0	17,472.1	**$19,804.1**
IL	Chicago-RTA-Metra	69,592.7	92,128.4	**$161,721.0**
IN	NW IN-NICTD	1,571.7	6,541.9	**$8,113.6**
MA	Boston-MBTA	20,584.0	386,512.6	**$407,096.6**
MD	Baltimore-Maryland-MTA	8,276.9	14,233.6	**$22,510.5**
NJ	New Jersey Transit	90,363.1	304,574.4	**$394,937.5**
NY	NY-MTA-Long Island RR	28,653.9	162,590.7	**$191,244.6**
NY	NY-MTA-Metro North RR	16,531.3	260,357.8	**$276,889.0**
PA	Philadelphia-SEPTA	19,084.4	34,446.5	**$53,530.9**
TX	Dallas-DART	17,524.0	-2,839.7	**$14,684.3**
TX	Fort Worth-The T	0.0	3,082.0	**$3,082.0**
VA	VA-VRE	484.2	17,759.5	**$18,243.7**
	Total	**$372,414.3**	**$1,444,955.0**	**$1,817,369.3**

Exhibit 7-13 demonstrates that the five following agencies, Massachusetts Bay Transportation Authority (MBTA) in Boston, Southeastern Pennsylvania Transportation Authority (SEPTA) in Philadelphia, San Francisco Municipal Railway (Muni), Los Angeles County Metropolitan Transportation Authority (LACMTA) in Los Angeles, and the San Diego Trolley, dominate service consumed statistics. These agencies reported 65.4 percent of the unlinked passenger trips made via Light Rail and 58.2 percent of the accumulated passenger miles.

In terms of service supplied, these five agencies also accounted for a majority of passenger car revenue miles and hours. Combined, they reported 54.6 percent of the passenger car revenue miles and 54.9 percent of passenger car revenue hours.

Performance measures for Light Rail are provided in **Exhibit 7-14**. The agencies with the best service effectiveness as measured by unlinked passenger trips per vehicle revenue mile are Seattle-Metro, Boston (MBTA), Philadelphia (SEPTA), and San Francisco-Muni. These agencies carry over 8 unlinked passenger trips per vehicle revenue mile while the national average is 6.52 unlinked passenger trips per vehicle revenue mile. The most efficient agencies (operating expense

Key Light Rail Operating Characteristics of Individual Agencies 1997

Exhibit 7-13

ST	Agency Name	Type of Service	Operating Expense (000s)	Train Revenue Miles (000s)	Passenger Car Revenue Miles (000s)	Passenger Car Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	LA-LACMTA-Metro	DO	$75,584.5	3,001.8	4,435.6	195.3	22,659.2	70.3	169,831.1
CA	Sacramento-RT	DO	14,789.8	858.1	1,852.2	101.7	7,862.0	26.4	38,393.2
CA	San Diego- The Trolley	DO	23,170.9	2,106.3	5,059.1	228.6	18,286.6	52.2	121,606.0
CA	San Francisco-Muni	DO	54,305.4	3,739.5	3,739.5	368.2	36,738.2	119.7	99,836.4
CA	San Jose-SCCTD	DO	25,143.8	1,303.6	1,888.0	119.2	6,728.4	22.0	31,036.6
CO	Denver-RTD	DO	7,424.0	411.5	648.3	43.9	4,428.1	14.8	12,026.6
LA	New Orleans-RTA	DO	5,729.6	723.5	723.5	79.5	5,604.8	16.3	13,940.3
MA	Boston-MBTA	DO	78,450.3	4,031.3	5,434.5	362.3	66,999.7	205.8	145,523.3
MD	Baltimore-Maryland-MTA	DO	19,935.3	1,072.6	2,296.0	133.6	6,771.5	22.7	43,847.4
MO	St. Louis-Bi-State	DO	18,087.7	1,406.9	2,584.5	103.5	14,485.8	42.6	90,880.7
NJ	New Jersey Transit	DO	5,350.8	656.2	656.2	40.3	4,294.1	14.8	12,552.7
NY	Buffalo-NFTA	DO	13,895.8	436.7	896.9	73.0	6,918.8	23.7	15,924.9
OH	Cleveland-RTA	DO	14,094.0	951.8	1,180.8	74.6	5,337.2	17.0	30,685.8
OR	Portland-Tri-Met	DO	20,021.8	897.5	1,578.6	105.5	10,432.4	32.1	54,727.7
PA	Philadelphia-SEPTA	DO	44,310.5	3,084.9	3,084.9	255.1	25,002.7	76.5	59,031.8
PA	Pittsburgh-PAT	DO	25,315.8	1,718.3	1,718.3	111.8	7,420.7	25.3	39,328.0
TN	Memphis-MATA	DO	1,331.7	146.1	146.1	22.6	871.9	2.3	595.2
TX	Dallas-DART	DO	23,136.6	1,024.1	1,793.5	127.2	7,971.7	25.7	43,192.9
TX	Galveston-Island Transit	DO	212.9	42.8	42.8	8.7	108.0	0.3	226.9
WA	Seattle-Metro	DO	1,116.0	42.2	42.2	11.7	482.4	1.5	520.6
	Total		$471,407.3	27,655.9	39,801.5	2,566.3	259,404.3	811.9	1,023,708.1

Key Light Rail Performance Indicators of Individual Agencies 1997

Exhibit 7-14

		Operating Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
ST	Agency Name	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	LA-LACMTA-Metro	$17.04	$387.00	$3.34	$0.45	5.11	116.02	869.56	22.71
CA	Sacramento-RT	7.98	145.44	1.88	0.39	4.24	77.31	377.56	18.21
CA	San Diego- The Trolley	4.58	101.37	1.27	0.19	3.61	80.00	531.99	22.13
CA	San Francisco-Muni	14.52	147.47	1.48	0.54	9.82	99.77	271.11	10.15
CA	San Jose-SCCTD	13.32	210.96	3.74	0.81	3.56	56.45	260.40	15.84
CO	Denver-RTD	11.45	169.05	1.68	0.62	6.83	100.83	273.86	14.76
LA	New Orleans-RTA	7.92	72.05	1.02	0.41	7.75	70.48	175.30	9.10
MA	Boston-MBTA	14.44	216.54	1.17	0.54	12.33	184.93	401.67	15.00
MD	Baltimore-Maryland-MTA	8.68	149.19	2.94	0.45	2.95	50.68	328.15	17.18
MO	St. Louis-Bi-State	7.00	174.72	1.25	0.20	5.60	139.92	877.85	24.96
NJ	New Jersey Transit	8.15	132.80	1.25	0.43	6.54	106.58	311.55	16.29
NY	Buffalo-NFTA	15.49	190.33	2.01	0.87	7.71	94.77	218.12	12.28
OH	Cleveland-RTA	11.94	188.97	2.64	0.46	4.52	71.56	411.43	15.83
OR	Portland-Tri-Met	12.68	189.71	1.92	0.37	6.61	98.85	518.57	14.96
PA	Philadelphia-SEPTA	14.36	173.72	1.77	0.75	8.10	98.02	231.43	12.09
PA	Pittsburgh-PAT	14.73	226.51	3.41	0.64	4.32	66.40	351.88	15.37
TN	Memphis-MATA	9.11	59.01	1.53	2.24	5.97	38.64	26.37	6.47
TX	Dallas-DART	12.90	181.85	2.90	0.54	4.44	62.66	339.49	14.10
TX	Galveston-Island Transit	4.97	24.61	1.97	0.94	2.52	12.49	26.23	4.95
WA	Seattle-Metro	26.43	95.65	2.31	2.14	11.42	41.35	44.62	3.62
	Average	$11.84	$183.69	$1.82	$0.46	6.52	101.08	398.91	15.51

per vehicle revenue mile) are St. Louis-Bi-State, San Diego Trolley, and Galveston. These agencies have a cost per mile of less than $7, well below the national average of $11.84 per revenue mile.

Exhibit 7-15 shows that the same five agencies mentioned in **Exhibit 7-13** accounted for 57.8 percent of the vehicles operated in maximum service, over 46.6 percent of the Light Rail stations, and 46.4 percent of the directional route miles.

Exhibit 7-15

Key Light Rail Infrastructure Characteristics of Individual Agencies 1997

ST	Agency Name	Fixed Guideway Directional Route Miles	Miles of Track	Number of Stations	Number of Accessible Stations	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	LA-LACMTA-Metro	82.4	85.8	36	36	48	69	8.0
CA	Sacramento-RT	36.2	34.0	28	0	32	36	8.9
CA	San Diego- The Trolley	48.3	48.3	41	41	64	85	7.2
CA	San Francisco-Muni	49.7	54.2	11	0	100	136	23.1
CA	San Jose-SCCTD	39.0	41.1	34	5	33	53	14.0
CO	Denver-RTD	10.6	12.7	15	15	16	17	2.9
LA	New Orleans-RTA	16.0	13.7	9	9	22	36	59.6
MA	Boston-MBTA	55.9	77.5	95	9	141	173	14.2
MD	Baltimore-Maryland-MTA	43.6	35.3	24	24	30	35	5.0
MO	St. Louis-Bi-State	34.0	36.2	18	18	26	31	4.3
NJ	New Jersey Transit	8.3	8.3	11	0	16	22	50.5
NY	Buffalo-NFTA	12.4	14.1	14	7	23	27	12.9
OH	Cleveland-RTA	30.8	33.0	33	5	26	47	16.0
OR	Portland-Tri-Met	30.2	33.4	27	26	25	30	12.1
PA	Philadelphia-SEPTA	69.3	171.0	64	0	111	147	17.9
PA	Pittsburgh-PAT	38.1	46.5	13	13	38	59	14.5
TN	Memphis-MATA	4.3	4.0	20	20	9	10	23.9
TX	Dallas-DART	40.8	46.7	20	20	36	40	1.0
TX	Galveston-Island Transit	4.9	4.9	3	3	4	4	9.0
WA	Seattle-Metro	3.7	2.1	14	14	3	5	69.2
	Total	**658.5**	**802.8**	**530**	**265**	**803**	**1,062**	
	Weighted Average							**15.9**

Exhibit 7-16 shows data on capital invested in Light Rail systems in 1997.

Demand Response Agencies

The fifteen Demand Response agencies listed in **Exhibits 7-17, 7-18, and 7-19** are those reporting the most vehicles operating in maximum service. As **Exhibit 7-17** demonstrates, these agencies reported 30 percent of the total Demand Response service operated in the United States in terms of vehicle revenue miles. These agencies carried 25.4 percent of the nation's Demand Response riders and accounted for 27 percent of the Demand Response passenger miles.

Performance measure indicators for Demand Response are displayed in **Exhibit 7-18**. The exhibit demonstrates that six of these fifteen Demand Response agencies operated more efficiently than the national average, in terms of service supplied, based on cost per vehicle revenue mile. A majority of these agencies were not as cost effective as the national average, based on cost per unlinked passenger trip or per passenger mile. Service effectiveness for the top fifteen agencies is low, with only two better than the national average, as measured by unlinked

Uses of Light Rail Capital Funds by Individual Agencies
(Thousands)
1977

Exhibit 7-16

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	LA-LACMTA-Metro	$0.0	$4,922.8	**$4,922.8**
CA	Sacramento-RT	0.0	16,644.8	**$16,644.8**
CA	San Diego- The Trolley	678.9	59,327.0	**$60,005.9**
CA	San Francisco-Muni	60,405.1	69,828.9	**$130,234.0**
CA	San Jose-SCCTD	281.7	36,863.2	**$37,144.9**
CO	Denver-RTD	5,583.2	14,499.1	**$20,082.3**
LA	New Orleans-RTA	2,575.5	7,081.9	**$9,657.5**
MA	Boston-MBTA	71,025.7	16,451.9	**$87,477.7**
MD	Baltimore-Maryland-MTA	8,887.2	34,718.2	**$43,605.4**
MO	St. Louis-Bi-State	5,230.1	10,424.1	**$15,654.2**
NJ	New Jersey Transit	0.0	4,132.1	**$4,132.1**
NY	Buffalo-NFTA	0.0	858.6	**$858.6**
OH	Cincinnati-SORTA	0.0	5,210.5	**$5,210.5**
OH	Cleveland-RTA	0.0	12,602.2	**$12,602.2**
OR	Portland-Tri-Met	12,647.8	223,042.7	**$235,690.5**
PA	Philadelphia-SEPTA	8,261.3	674.4	**$8,935.7**
PA	Pittsburgh-PAT	247.1	20,238.9	**$20,486.0**
TN	Memphis-MATA	1,553.6	5,048.9	**$6,602.5**
TX	Dallas-DART	20,679.3	78,724.5	**$99,403.8**
UT	Salt Lake City-UTA	13,395.5	40,281.8	**$53,677.3**
WA	Seattle-Metro	108.8	109.6	**$218.3**
	Total	**$211,560.9**	**$661,686.0**	**$873,246.9**

passenger trips per vehicle revenue mile. This low service effectiveness is expected given the fact that Demand Response service becomes less effective as the demand for this mode increases. This results from Demand Response's low capacity combined with its operational characteristics.

Exhibit 7-17

Key Demand Response Operating Characteristics of Individual Agencies 1997

ST	Agency Name	Type of Service	Operating Expense (000s)	Vehicle Revenue Miles (000s)	Vehicle Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	LA-Access	PT	$24,817.9	8,077.7	299.1	915.2	2.9	11,415.7
CA	LA-OCTA	PT	14,895.6	4,337.7	325.5	757.8	2.8	6,942.5
CO	Denver-RTD	DO	689.5	82.8	7.6	101.8	0.3	1,308.7
CO	Denver-RTD	PT	9,467.3	4,181.8	244.2	428.7	1.5	2,922.8
CO	**TOTAL**		**10,156.9**	**4,264.6**	**251.7**	**530.5**	**1.8**	**4,231.5**
FL	Ft. Lauderdale-Bct	PT	11,706.2	6,770.9	324.7	710.5	2.5	7,721.7
HI	Honolulu-DTS	DO	2,322.2	974.5	69.3	164.7	2.3	1,935.0
HI	Honolulu-DTS	PT	8,604.6	2,852.0	208.9	485.5	2.3	6,672.3
HI	**TOTAL**		**10,926.8**	**3,826.4**	**278.2**	**650.2**	**4.6**	**8,607.3**
IL	Chicago-RTA-CTA	PT	13,353.3	3,426.4	332.2	626.0	2.0	5,234.4
IL	Chicago-RTA-Pace	DO	148.1	89.0	5.7	33.3	0.1	204.9
IL	Chicago-RTA-Pace	PT	17,285.3	7,461.8	468.0	1,471.5	5.5	9,045.7
IL	**TOTAL**		**17,433.4**	**7,550.8**	**473.7**	**1,504.8**	**7.6**	**9,250.5**
MA	Boston-MBTA	PT	20,222.7	7,857.2	572.0	1,056.6	3.5	14,535.9
PA	Philadelphia-SEPTA	DO	4,019.7	921.7	149.4	286.9	2.0	2,008.5
PA	Philadelphia-SEPTA	PT	23,206.4	6,933.7	789.3	1,576.6	5.6	11,035.9
PA	**TOTAL**		**27,226.1**	**7,855.3**	**938.7**	**1,863.5**	**7.6**	**13,044.3**
PA	Pittsburgh-PAT	PT	24,747.7	14,313.9	860.1	2,094.0	7.2	12,664.7
TX	Dallas-DART	PT	19,412.9	7,078.0	474.6	666.7	2.4	7,648.9
TX	Houston-Metro	PT	13,990.5	9,020.2	456.0	1,057.6	3.6	10,533.9
TX	San Antonio-VIA	DO	11,422.1	4,803.1	256.5	549.1	1.9	5,890.3
TX	San Antonio-VIA	PT	4,607.1	3,359.8	152.7	371.4	1.4	5,132.5
TX	**TOTAL**		**16,029.2**	**8,162.9**	**409.2**	**920.5**	**3.3**	**11,022.8**
WA	Seattle-Metro	PT	28,721.1	8,889.2	538.5	1,336.0	4.7	9,745.4
WI	Milwaukee-Paratransit	PT	11,280.9	7,126.1	707.4	1,154.2	3.8	6,990.5
		DO Total	**$18,601.5**	**6,871.1**	**488.5**	**1,135.7**	**8.5**	**16,376.8**
		PT Total	**$232,966.3**	**98,259.9**	**6,420.8**	**14,082.2**	**49.7**	**123,008.4**
		Total	**$251,567.9**	**105,131.0**	**6,909.3**	**15,217.9**	**58.2**	**139,385.2**
		Percentage of DO	**6.2%**	**6.5%**	**6.6%**	**6.0%**	**6.1%**	**10.2%**
		Percentage of PT	**33.8%**	**36.8%**	**35.7%**	**32.5%**	**32.3%**	**37.5%**
		Percentage of National Total	**28.8%**	**30.0%**	**29.0%**	**25.4%**	**28.2%**	**28.8%**

Data about infrastructure for Demand Response are displayed in **Exhibit 7-19**. It shows that 4,267 Demand Response vehicles are operated in maximum service by the fifteen agencies presented. This represents 33.3 percent of all Demand Response vehicles operated nationally in maximum service.

Key Demand Response Performance Indicators of Individual Agencies 1997

Exhibit 7-18

ST	Agency Name	Operating Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
		Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	LA-Access	$3.07	$82.99	$27.12	$2.17	0.11	3.06	38.17	27.01
CA	LA-OCTA	3.43	45.76	19.66	2.15	0.17	2.33	21.33	13.32
CO	Denver-RTD	2.38	40.35	19.15	2.40	0.12	2.11	16.81	16.94
FL	Ft. Lauderdale-Bct	1.73	36.05	16.47	1.52	0.10	2.19	23.78	20.85
HI	Honolulu-DTS	2.86	39.28	16.80	1.27	0.17	2.34	30.94	13.76
IL	Chicago-RTA-CTA	3.90	40.20	21.33	2.55	0.18	1.88	15.76	10.31
IL	Chicago-RTA-Pace	2.31	36.81	11.59	1.88	0.20	3.18	19.53	15.94
MA	Boston-MBTA	2.57	35.36	19.14	1.39	0.13	1.85	25.41	13.74
PA	Philadelphia-SEPTA	3.47	29.00	14.61	2.09	0.24	1.99	13.90	8.37
PA	Pittsburgh-PAT	1.73	28.77	11.82	1.95	0.15	2.43	14.73	16.64
TX	Dallas-DART	2.74	40.90	29.12	2.54	0.09	1.40	16.12	14.91
TX	Houston-Metro	1.55	30.68	13.23	1.33	0.12	2.32	23.10	19.78
TX	San Antonio-VIA	1.96	39.17	17.41	1.45	0.11	2.25	26.94	19.95
WA	Seattle-Metro	3.23	53.34	21.50	2.95	0.15	2.48	18.10	16.51
WI	Milwaukee-Paratransit	1.58	15.95	9.77	1.61	0.16	1.63	9.88	10.07
	Average of Agencies	$2.57	$39.64	$17.91	$1.95	0.15	2.23	20.97	15.87
	National Average for Demand Response	$2.49	$36.58	$14.54	$1.87	0.17	2.51	19.59	14.70

Key Demand Response Infrastructure Characteristics of Individual Agencies 1997

Exhibit 7-19

ST	Agency Name	Operating Expense (000s)	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	LA-Access	$24,817.9	200	243	2.1
CA	LA-OCTA	14,895.6	177	197	3.3
CO	Denver-RTD	10,156.9	259	714	6.8
FL	Ft. Lauderdale-Bct	11,706.2	186	227	1.2
HI	Honolulu-DTS	10,926.8	187	202	1.3
IL	Chicago-RTA-CTA	13,353.3	241	286	1.7
IL	Chicago-RTA-Pace	17,433.4	336	372	2.6
MA	Boston-MBTA	20,222.7	304	380	4.5
PA	Philadelphia-SEPTA	27,226.1	402	495	2.5
PA	Pittsburgh-PAT	24,747.7	403	487	4.5
TX	Dallas-DART	19,412.9	174	206	1.6
TX	Houston-Metro	13,990.5	351	2,101	0.0
TX	San Antonio-VIA	16,029.2	238	423	3.3
WA	Seattle-Metro	28,721.1	340	535	2.4
WI	Milwaukee-Paratransit	11,280.9	346	502	0.1
	Agencies Total	**$264,921.1**	**4,144**	**7,370**	
	Weighted Average				**2.2**
	Total Demand Response Mode	**$872,525.4**	**13,707**	**19,820**	
	Weighted Average				**3.4**

Trolleybus Agencies

Exhibits 7-20, 7-21, 7-22, and **7-23** provide data on the five Trolleybus agencies included in the NTD. This mode consists of rubber-tired vehicles supplied with electric power from overhead lines. This mode has remained relatively stable since 1991 in both service supplied and consumed. As seen in **Exhibit 7-20**, the San Francisco-Muni transit agency accounted for 53.1 percent of the vehicle revenue miles operated, 57.1 percent of the vehicle revenue hours, 66.9 percent of the Trolleybus riders carried, and 61.9 percent of the passenger miles realized.

Exhibit 7-20

Key Trolleybus Operating Characteristics of Individual Agencies
1997

ST	Agency Name	Type of Service	Operating Expense (000s)	Vehicle Revenue Miles (000s)	Vehicle Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	San Francisco-Muni	DO	$78,145.9	7,104.7	1,007.5	80,810.9	249.9	117,152.0
MA	Boston-MBTA	DO	8,072.0	747.9	78.6	3,567.7	12.7	8,095.8
OH	Dayton-RTA	DO	7,452.4	1,135.7	106.8	3,795.7	12.3	7,822.1
PA	Philadelphia-SEPTA	DO	11,610.3	1,126.4	101.4	8,846.0	29.5	14,677.0
WA	Seattle-Metro	DO	34,908.2	3,255.8	470.3	23,732.1	76.5	41,423.5
		Total	$140,188.8	13,370.5	1,764.5	120,752.4	381.0	189,170.3

Exhibit 7-21 shows that San Francisco-Muni is generally the most cost effective Trolleybus system.

Exhibit 7-21

Key Trolleybus Performance Indicators of Individual Agencies
1997

		Operating Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
ST	Agency Name	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	San Francisco-Muni	$11.00	$77.57	$0.97	$0.67	11.37	80.21	116.28	7.05
MA	Boston-MBTA	10.79	102.75	2.26	1.00	4.77	45.42	103.06	9.52
OH	Dayton-RTA	6.56	69.75	1.96	0.95	3.34	35.52	73.21	10.63
PA	Philadelphia-SEPTA	10.31	114.55	1.31	0.79	7.85	87.28	144.81	11.11
WA	Seattle-Metro	10.72	74.23	1.47	0.84	7.29	50.46	88.08	6.92
	Average	$10.48	$79.45	$1.16	$0.74	9.03	68.43	107.21	7.58

As shown in **Exhibit 7-22**, the San Francisco-Muni transit agency operates 51.4 percent of the Trolleybus vehicles operated in maximum service. Seattle-Metro is the second largest agency with 27.7 percent of the vehicles operating in maximum service. Seattle-Metro also accounts for 27.8 percent of the directional route miles, compared with 31.3 percent for San Francisco-Muni.

Key Trolleybus Infrastructure Characteristics of Individual Agencies
1997

Exhibit 7-22

ST	Agency Name	Fixed Guideway Directional Route Miles	Vehicles Operated in Maximum Service	Vehicles Available in Maximum Service	Average Fleet Age
CA	San Francisco-Muni	131.5	258	343	18.4
MA	Boston-MBTA	21.6	23	41	21.0
OH	Dayton-RTA	107.6	33	40	17.4
PA	Philadelphia-SEPTA	42.5	49	66	18.0
WA	Seattle-Metro	116.6	139	165	15.1
	Total	**419.8**	**502**	**655**	
	Weighted Average				**17.5**

Uses of Capital funds for Trolleybus operators is shown in **Exhibit 7-23**.

Uses of Trolleybus Capital Funds by Individual Agencies
(Thousands)
1997

Exhibit 7-23

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	San Francisco-Muni	$1,920.5	$2,037.7	$3,958.2
MA	Boston-MBTA	0.0	31,243.2	31,243.2
OH	Dayton-RTA	7,140.8	3,328.9	10,469.7
WA	Seattle-Metro	(18.7)	8,464.3	8,445.6
	Total	**$9,042.6**	**$45,074.1**	**$54,116.8**

Ferryboat Agencies

Exhibits **7-24, 7-25, 7-26**, and **7-27** offer information on the nation's Ferryboat agencies included in the NTD.

Exhibit 7-24 shows that the Washington State Department of Transportation operating in Seattle reports over 50.3 percent of the vehicle revenue miles operated, nearly 45 percent of the vehicle revenue hours operated, 33.2 percent of the unlinked passenger trips, and 46.9 percent of the passenger miles.

Purchased transportation consumes 8.2 percent of the total operating expenses for Ferryboat and generates 23.2 percent of the total vehicle revenue miles.

Exhibit 7-24

Key Ferryboat Operating Characteristics of Individual Agencies 1997

ST	Agency Name	Type of Service	Operating Expense (000s)	Vehicle Revenue Miles (000s)	Vehicle Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	Oakland-AOFS	PT	$2,217.2	82.1	8.2	538.8	1.6	3,386.2
CA	Oakland-Vallejo Transit	PT	2,522.1	109.1	3.8	269.7	0.6	8,091.9
CA	SF-Golden Gate	DO	12,004.5	138.5	11.0	1,509.9	5.0	16,336.8
LA	New Orleans-Cresent City	DO	4,773.2	43.3	21.6	2,803.5	7.9	1,401.7
MA	Boston-MBTA	PT	4,252.6	115.9	28.5	822.4	3.1	7,602.5
ME	Portland-CBL	DO	2,161.8	76.5	15.8	824.0	2.5	2,801.7
NY	New York City DOT	DO	34,786.6	169.5	16.3	16,855.5	55.2	87,648.6
NY	Port Authority-PATH	PT	4,889.0	88.9	10.5	2,266.5	8.5	3,853.2
PR	San Juan-Port Authority	DO	7,642.5	105.2	20.0	1,095.6	2.9	1,751.4
VA	Norfolk-TRT	PT	550.2	12.2	6.1	435.5	1.0	217.7
WA	Bremerton-Kitsap Transit	PT	515.1	28.9	7.2	479.7	1.6	466.5
WA	Seattle-Washington DOT	DO	123,260.7	1,013.7	126.0	13,968.3	32.3	119,352.2
WA	Tacoma-Pierce Ferry	PT	1,579.8	31.0	4.7	178.3	0.4	1,308.8
		DO Total	**$184,629.5**	**1,546.7**	**210.8**	**37,056.7**	**105.7**	**229,292.3**
		PT Total	**$16,526.0**	**468.1**	**69.0**	**4,990.9**	**16.9**	**24,926.9**
		Total	**$201,155.4**	**2,014.8**	**279.8**	**42,047.7**	**122.7**	**254,219.2**

Exhibit 7-25 reflects the high cost of Ferryboat service while showing its high service effectiveness. The Staten Island Ferry operated by the New York City Department of Transportation realized over 99 unlinked passenger trips per mile and over 1,034 unlinked passenger trips per hour.

Exhibit 7-25

Key Ferryboat Performance Indicators of Individual Agencies 1997

		Operating Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
ST	Agency Name	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
CA	Oakland-AOFS	$27.0	$268.9	$4.1	$0.7	6.6	65.3	410.7	10.0
CA	Oakland-Vallejo Transit	23.1	664.4	9.4	0.3	2.5	71.1	2,131.7	28.7
CA	SF-Golden Gate	86.7	1088.2	8.0	0.7	10.9	136.9	1,480.9	12.6
LA	New Orleans-Cresent City	110.3	220.7	1.7	3.4	64.8	129.6	64.8	2.0
MA	Boston-MBTA	36.7	149.3	5.2	0.6	7.1	28.9	266.9	4.1
ME	Portland-CBL	28.3	137.2	2.6	0.8	10.8	52.3	177.8	4.9
NY	New York City DOT	205.2	2134.1	2.1	0.4	99.4	1,034.1	5,377.2	10.4
NY	Port Authority-PATH	55.0	467.2	2.2	1.3	25.5	216.6	368.2	8.5
PR	San Juan-Port Authority	72.7	381.7	7.0	4.4	10.4	54.7	87.5	5.3
VA	Norfolk-TRT	45.0	89.9	1.3	2.5	35.6	71.2	35.6	2.0
WA	Bremerton-Kitsap Transit	17.8	71.6	1.1	1.1	16.6	66.7	64.9	4.0
WA	Seattle-Washington DOT	121.6	978.0	8.8	1.0	13.8	110.8	947.0	8.0
WA	Tacoma-Pierce Ferry	51.0	336.7	8.9	1.2	5.8	38.0	279.0	6.6
	Average	**$99.84**	**$719.03**	**$4.78**	**$0.79**	**20.9**	**150.3**	**908.7**	**7.2**

Exhibit 7-26 again demonstrates the significance of the Washington State Department of Transportation's Ferryboat service in terms of infrastructure. Over 33 percent of the vehicles operated in maximum service are reported by this agency.

Key Ferryboat Infrastructure Characteristics of Individual Agencies
1997

Exhibit 7-26

ST	Agency Name	Fixed Guideway Directional Route Miles	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	Oakland-AOFS	27.6	3	4	12.8
CA	Oakland-Vallejo Transit	79.6	2	3	2.0
CA	SF-Golden Gate	38.7	4	4	23.7
LA	New Orleans-Cresent City	3.0	5	5	27.6
MA	Boston-MBTA	42.2	11	12	16.2
ME	Portland-CBL	20.0	4	5	17.2
NY	New York City DOT	10.4	4	7	21.4
NY	Port Authority-PATH	3.4	4	5	7.4
PR	San Juan-Port Authority	10.0	4	9	11.4
VA	Norfolk-TRT	1.0	2	3	11.0
WA	Bremerton-Kitsap Transit	3.5	3	4	47.5
WA	Seattle-Washington DOT	245.8	24	24	32.5
WA	Tacoma-Pierce Ferry	11.1	1	2	32.5
	Total	**496.3**	**71**	**87**	
	Weighted Average				**22.4**

Uses of Capital funds for Ferryboat operators is shown in **Exhibit 7-27**.

Uses of Ferryboat Capital Funds by Individual Agencies
(Thousands)
1997

Exhibit 7-27

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	Oakland-AOFS	$0.00	$8.48	$8.48
CA	Oakland-Vallejo Transit	8,819.7	0.0	8,819.7
CA	SF-Golden Gate	3,541.6	306.7	3,848.3
MA	Boston-MBTA	0.0	1,044.4	1,044.4
ME	Portland-CBL	143.4	22.6	166.0
NY	New York City DOT	810.7	4,840.9	5,651.5
PR	San Juan-Port Authority	0.0	3,274.4	3,274.4
VA	Norfolk-TRT	60.8	2,176.0	2,236.8
WA	Seattle-Washington DOT	99,049.7	28,134.4	127,184.0
WA	Tacoma-Pierce Ferry	0.0	5,849.4	5,849.4
	Total	**$112,425.8**	**$45,657.2**	**$158,083.0**

Automated Guideway Agencies

Information concerning the four Automated Guideway agencies is provided in **Exhibit 7-28**. Miami has the highest share of operating expenses, service supplied, and consumed.

Exhibit 7-28

Key Automated Guideway Operating Characteristics of Individual Agencies 1997

ST	Agency Name	Type of Service	Operating Expense (000s)	Train Revenue Miles (000s)	Passenger Car Revenue Miles (000s)	Passenger Car Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
FL	Jacksonville-JTA	DO	$660.9	8.9	8.9	1.1	57.0	1.0	32.2
FL	Miami-MDTA	DO	13,730.0	957.9	957.9	88.0	4119.0	13.6	4278.8
MI	Detroit-DTC	DO	8,006.7	449.3	449.3	38.7	1711.0	4.7	2431.3
		DO Total	**$22,397.6**	**1,416.1**	**1,416.1**	**127.7**	**5,887.0**	**19.2**	**6,742.2**
		Total	**$22,397.6**	**1,416.1**	**1,416.1**	**127.7**	**5,887.0**	**19.2**	**6,742.2**

Performance measures for Automated Guideway systems are displayed in **Exhibit 7-29**. Miami is the system with the best efficiency (cost per car revenue mile) followed by Detroit.

Exhibit 7-29

Key Automated Guideway Performance Indicators of Individual Agencies 1997

		Operating Expense				Passenger Trips		Passenger Miles	Vehicle Revenue Miles
ST	Agency Name	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Unlinked Passenger Trip (UPT)	Per Passenger Mile (PM)	Per Vehicle Revenue Mile (VRM)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (VRH)	Per Vehicle Revenue Hour (MPH)
FL	Jacksonville-JTA	$74.36	$628.81	$11.59	$20.54	6.42	54.27	30.62	8.46
FL	Miami-MDTA	$14.33	$156.11	$3.33	$3.21	4.30	46.83	48.65	10.89
MI	Detroit-DTC	$17.82	$206.74	$4.68	$3.29	3.81	44.18	62.78	11.60
	Average	**$15.82**	**$175.35**	**$3.80**	**$3.32**	**4.16**	**46.09**	**52.79**	**11.09**

Infrastructure data for Automated Guideway agencies are shown in **Exhibit 7-30**. It shows that Automated Guideway systems have limited infrastructure and serve small portions of the metropolitan areas where they are located. Miami is the system with the highest amount of fixed guideway directional route miles and vehicles operated in maximum service.

Key Automated Guideway Infrastructure Characteristics of Individual Agencies
1997

Exhibit 7-30

ST	Agency Name	Fixed Guideway Directional Route Miles	Miles of Track	Number of Stations	Number of Accessible Stations	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
FL	Jacksonville-JTA	1.2	0.6	3	3	1	1	8.0
FL	Miami-MDTA	8.5	9.4	21	0	15	29	6.9
MI	Detroit-DTC	2.9	2.9	13	13	8	8	11.0
	Total	**12.6**	**12.9**	**37**	**16**	**24**	**38**	
	Weighted Average							**8.1**

Uses of Capital funds for Automated Guideway operators is depicted in **Exhibit 7-31**.

Uses of Automated Guideway Capital Funds by Individual Agencies
(Thousands)
1997

Exhibit 7-31

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
FL	Jacksonville-JTA	$4,649.93	$22,222.62	**$26,872.55**
FL	Miami-MDTA	$0.00	$5,712.42	**$5,712.42**
MI	Detroit-DTC	$7,587.17	$0.00	**$7,587.17**
	Total	**$12,237.10**	**$27,935.04**	**$40,172.15**

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