Federal Transit Administration



National Transit Summaries and Trends

For the 1993 National Transit Database Section 15 Report Year



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.

National Transit Summaries and Trends

For the 1993 National Transit Database Section 15 Report Year

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Federal Transit Administration

May 1995

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List of Exhibits

Executive Summary

Overview

The *National Transit Summaries and Trends (NTST)* provides a national overview of the mass transit industry. The *NTST* highlights the aggregate financial and operational characteristics and trends of mass transit for the five-year period 1989-1993 and the ten-year period 1984-1993. Key statistics and performance indicators are presented.

This report presents a National Transit Profile, as well as profiles for urbanized areas of under 200,000; 200,000 to one million; and over one million population. The National Transit Profile is contained within this Executive Summary. Exhibits presented later in the *NTST* reflect National Transit Profile information by size of urbanized area. The National Transit Profile provides aggregate transit service performance and financial information for 1993. Performance indicators are used to measure the effectiveness and efficiency of transit service supplied, and the cost effectiveness of that service. These performance indicators are presented by mode of service and by type of service (directly operated versus purchased transportation services). Performance indicators by size of urbanized area are presented in selected instances.

A new chapter has been created for 1993: Key Characteristics by Urbanized Areas. The chapter on Key Modal Characteristics of Individual Transit Agencies introduced in last year's *NTST* has been expanded to discuss automated guideway operations. Chapters are also included for capital funding, operating funding and expenses, as well as service supplied and consumed. A separate chapter concerning safety has been created containing expanded data and discussion. Reliability and maintenance data are presented in the final chapter.

The following observations have been made based on data received in the 1993 Report Year.

Capital Funding

- Capital funding of the nation's public transit systems increased by approximately 8.5 percent from 1992 to 1993. Capital investment has increased 52 percent since 1989. Fixed guideway systems investments accounted for 70 percent of capital expenditures. Federal capital assistance accounted for 42 percent of capital funding in 1993.

Operating Funding and Expenses

- Passenger fares accounted for 36.5 percent of the $16.8 billion required to operate transit services in 1993, while local assistance accounted for 31 percent. State assistance provided another 21 percent, while Federal assistance represented approximately five percent. Other sources of funding account for the remaining 6.5 percent.

Service Supplied and Consumed

- Over 7.4 billion unlinked trips used some mode of transit service in 1993, amassing 36.2 billion passenger miles. There were almost 2.6 billion miles of vehicle revenue service provided with over 70,000 transit vehicles operating daily in maximum service.

Safety, Reliability, and Maintenance Effectiveness

- The 1993 National Transit Database data reflect an excellent safety record for transit. The national rate of transit patron injuries is 11.5 per ten million passenger miles, all modes combined. Transit service is also highly reliable. For example, directly operated bus service had only one maintenance roadcall per 4,337 miles of operation, a 25 percent improvement since 1989.

National Transit Profile
1993

General Information (System Wide)

Service Consumption*	
Annual Passenger Miles	36,224.9
Annual Unlinked Trips	7,432.7
Average Weekday Unlinked Trips	25.0
Average Saturday Unlinked Trips	12.6
Average Sunday Unlinked Trips	7.7

Service Supplied	
Annual Vehicle Revenue Miles*	2,593.2
Annual Vehicle Revenue Hours*	174.9
Total Fleet	88,292
Vehicles Operated in Maximum Service	70,307
Base Period Requirement	32,155

Vehicles Operated in Maximum Service

Directly Operated

	Vehicles	Agencies **
Bus	40,583	352
Heavy Rail	8,187	14
Commuter Rail	3,755	9
Light Rail	773	17
Demand Response	2,617	185
Other	1,616	36
Total	**57,531**	**613**

Purchased Transportation

	Vehicles	Agencies **
Bus	3,458	118
Heavy Rail	0	0
Commuter Rail	459	10
Light Rail	0	0
Demand Response	8,645	253
Other	214	19
Total	**12,776**	**400**

Financial Information (System Wide)

Sources of Operating Funds Expended*	
Passenger Fares	$6,117.1
Local Funds	5,165.5
State Funds	3,475.1
Federal Assistance	913.0
Other Funds	1,087.2
Total Operating Funds Expended	**$16,757.9**

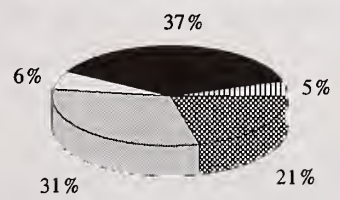
Summary of Operating Expenses*	
Salaries/Wages/Benefits	$11,601.8
Materials & Supplies	1,423.8
Purchased Transportation	867.6
Other Operating Expenses	1,579.5
Total Operating Expenses	**$15,472.7**
Reconciling Cash Expenditures	$914.3

Sources of Capital Funds Expended*	
Local Funds	$2,033.4
State Funds	1,316.7
Federal Assistance	2,383.5
Total Capital Funds Expended	**$5,733.6**

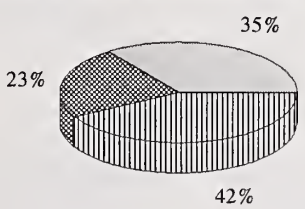
Uses of Capital Funds*

	Rolling Stock	Facilities and Other	Total
Bus	$742.6	$758.9	$1,501.5
Heavy Rail	409.1	1,496.1	1,905.2
Commuter Rail	266.1	1,379.0	1,645.1
Light Rail	46.5	417.8	464.3
Demand Response	48.1	20.7	68.8
Other	42.1	104.0	146.1
Total	**$1,554.5**	**$4,176.5**	**$5,731.0**

Sources of Operating Funds Expended



Sources of Capital Funds Expended



* Millions

** Number of Transit Agencies reporting this mode

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Introduction

Purpose of this Publication

The *1993 National Transit Summaries and Trends (NTST)* highlights aggregated financial and operational characteristics and trends for key statistics and performance indicators of the nation's mass transit industry. The *NTST* is developed from the National Transit Database and thus represents a portion of the 1993 National Transit Database Annual Report. This is the fourth annual edition of the *NTST* and is designed to provide a picture of the mass transit industry in 1993, as well as five-year and ten-year overviews of selected transit industry statistics. The *NTST* is intended to serve as a reference for transit professionals, researchers and policy makers, describing the condition of urban mass transportation in the United States.

Comments Welcomed

Several organizational changes as well as additional data presented have been made from the 1992 edition of the *NTST* in response to comments received. Suggestions and comments regarding this document are encouraged and welcomed.

Report Organization and Overview

The *NTST* is organized to first offer a National Transit Profile followed by chapters on Key Modal Characteristics of Individual Agencies; Key Characteristics by Urbanized Areas; Capital Funding; Operating Funding and Expenses; Service Supplied and Consumed; Safety; and Reliability and Maintenance Effectiveness. An appendix displaying an aggregated National Transit Database Report is included by individual reporting form for the first time.

Chapter 1: National Transit Profile

The National Transit Profile provides aggregate operating statistics and financial data for the transit industry. Profiles are also presented by size of urbanized area. Key financial and operating data, along with related performance indicators, are provided for the ten-year period 1984-1993.

Chapter 2: Key Modal Characteristics of Individual Transit Agencies

Data regarding operations and performance indicators for major individual transit agencies for bus and demand response are presented in this chapter. The same type of data is also presented for all agencies operating heavy rail, commuter rail, light rail, trolleybus, ferryboat, and automated guideway transit agencies. The latter three modes are discussed due to their uniqueness and their respective dominance within the modal category referred to as Other.

Chapter 3: Key Characteristics by Urbanized Areas

This chapter offers insight into the characteristics of transit services based on urbanized area (UZA) size. Data is presented for UZAs under 200,000 population, for UZAs that have populations of 200,000 to one million, and for UZAs over one million population.

Chapter 4: Capital Funding

This chapter discusses sources of capital funding and its uses (for rolling stock, facilities or other uses) by mode and size of urbanized area.

Chapter 5: Operating Funding and Expenses

Sources of operating funding, as well as the cost of operating service are discussed in this chapter. Cost effectiveness and efficiency of service are evaluated through analysis of performance measures relating to operating expense and service supplied. The various components of cost (functions and object classes) are discussed.

Chapter 6: Service Supplied and Consumed

This chapter provides an analysis of service effectiveness, and discussing amounts and kinds of transit services provided and utilized. Performance measures are used to evaluate the effectiveness of transit service by reflecting ridership and operating costs by various measures of service supplied. These measures are presented by mode and by type of service (directly operated or purchased transportation).

Chapter 7: Safety

This chapter discusses various measures of data designed to offer insight into safety-related issues regarding transit.

Chapter 8: Reliability and Maintenance Effectiveness

This chapter presents various measures of reliability of service and effectiveness of vehicle maintenance. Data concerning maintenance expense and service interruptions are included.

Appendix

The National Transit Database has been aggregated by reporting form for the 1993 Report Year.

Inflation

All revenue and cost information is represented in dollars as actually reported. Data has not been adjusted to reflect the impact of inflation. The Consumer Price Index (Urban) increased from 124.0 in December, 1989 to 144.5 in December, 1993, an increase of 16.5 percent. The increase from December, 1992 to December, 1993 was three percent.

Rounding

It should be noted that 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 add to 100.

Number of Reporters

The National Transit Database records reporters in several different ways. One way is to record the actual number of individual reporters in each report year. For the 1993 Report

Number of Transit Agencies Reporting by Mode and Type of Service 1989-1993 **Exhibit 1**

Type of Service	1989	1990	1991	1992	1993
Bus					
Directly Operated	367	374	356	339	352
Purchased Transportation	93	103	102	107	118
Total	460	477	458	446	470
Heavy Rail					
Directly Operated	12	12	12	13	14
Purchased Transportation	-	-	-	-	-
Total	12	12	12	13	14
Commuter Rail					
Directly Operated	10	12	10	9	9
Purchased Transportation	8	7	8	9	10
Total	18	19	18	18	19
Light Rail					
Directly Operated	13	13	14	15	17
Purchased Transportation	1	1	1	1	-
Total	14	14	15	16	17
Demand Response					
Directly Operated	164	173	170	173	185
Purchased Transportation	202	212	219	226	253
Total	366	385	389	399	438
Other					
Directly Operated	32	36	40	41	36
Purchased Transportation	10	11	13	18	19
Total	42	47	53	59	55
Total					
Directly Operated	598	620	602	590	613
Purchased Transportation	314	334	343	361	400
Total	912	954	945	951	1,013

Year, the number of individual reporters is 523. Of this number, 28 transit agencies received exemptions from detailed reporting. Thus, 495 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 Urbanized Area served. See Exhibit 1 above and Chapter 3. The National Transit Database can also be summarized by the number of modes and types of service by individual mode. Mode and type of service information provide a better representation of the National Transit Database reporting as most transit agencies operate more than one mode and have more than one type of service.

As shown in **Exhibit 1**, the number of National Transit Database reporters by mode and type of service has grown by nine percent since 1989. Subsequently, some of the increases in data are attributable to this increased number of reporters as well as the growth in the size and number of individual transit agencies.

As is also reflected in **Exhibit 1**, the number of reporters for bus has declined slightly since 1990. This is primarily due to several reporting changes implemented to reduce reporting burden. The number of demand response reporters has increased steadily each year and there are now 16 percent more demand response reporters than in 1989.

The number of reports indicating purchased transportation of transit service has also increased. As shown in **Exhibit 1**, this is most noticeable in the number of bus and demand response reporters. The number of reports reflecting purchased bus service has increased by 15 percent since 1989, while the number of reports incorporating purchased demand response service has increased by 12 percent since 1989. The bus increase is related to a change in reporting thresholds as one means of reducing the reporting burden.

Purchased Transportation

If a transit agency has multiple providers of purchased transportation services, the data for all the providers is aggregated for the subject mode, regardless of the number of contracts. An exception involves those purchased transportation providers operating 100 vehicles in annual maximum service. Such providers submit a separate National Transit Database report from the perspective of directly operated service. There are 20 Purchased Transportation reporters who reported as Directly Operated rather than Purchased Transportation in 1993, as reflected in **Exhibit 2**.

Exhibit 2

Key Statistical Indicators for Purchased Transportation Agencies Who Report as Directly Operated 1993

Mode	Number of Agencies	Operating Expense (000s)	Unlinked Passenger Trips (000s)	Passenger Miles (000s)	Vehicle Revenue Hours (000s)	Vehicle Revenue Miles (000s)	Vehicles Operated in Maximum Service
Bus	15	$346,739.5*	214,197.0	1,421,328.8	6,308.6	88,940.3	2,671
Commuter Rail	2	122,729.0	33,690.7	726,728.8	87.3	2,832.3	489
Demand Response	3	23,898.8	1,913.5	15,756.5	833.0	10,695.6	504
Total	20	$493,367.3**	249,801.2	2,163,814.1	7,228.9	102,468.2	3,664
% Directly Operated		3.2%	3.4%	6.0%	4.1%	4.0%	5.2%

* Aggregate of individual transit agencies exclude value reported as adjustments made to reflect New Jersey Transit's purchased contract agencies of $25,675,005 verses combined operating expense for five agencies of $132,064,520.

** Figure is lower than 508.02 expense for all transit agencies of $530,526,400 on Operating Expenses Form (301) line 12 column f. The 508.02 expense reflects costs incurred by buyer (transit agency) and not by the provider (seller).

Exemption for Five or Fewer Vehicles

Beginning with the 1991 Report Year, FTA granted reporting exemptions to agencies with three or fewer non-fixed guideway vehicles operated in maximum service. This threshold was increased to five vehicles for the 1992 Report Year, and was effective at this level for the 1993 Report Year as well. Twenty-eight (28) agencies requested and were granted the exemption for 1993 as compared to 24 for the 1992 Report Year. Reporters who received this exemption do not submit data and therefore are not included in the database for capital, operating funding, operating expenses and non-financial data. However, they are included in data related to Urbanized Areas reporting and in totals for transit agencies (Exhibit 1 and Chapter 3).

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. In 1992, reporters fully allocated joint expenses for each mode by function and object class. This was also the case in 1993.

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. Most of these measures are presented by mode and type of service.

Chapter 1
National Transit Profile

Introduction

This chapter commences with **Exhibit 3**, the National Transit Profile, which provides an overview of the mass transit industry by displaying aggregated reported data for the U.S. mass transit systems in 1993. Included among these data are indications of the service supplied and consumed, the uses of capital funding, a summary of operating expenses, and the sources of operating and capital funding. This information is also depicted for each of five major modes of service: bus, heavy rail, commuter rail, light rail, and demand response. Additionally, performance indicators for each mode are graphically depicted, providing measures of service and cost effectiveness and efficiency.

The chapter concludes with exhibits reflecting ten years of national transit data, including vehicle revenue miles, unlinked passenger trips, operating expense and passenger fare revenue, along with associated performance measures.

Service Supplied and Service Consumed

In 1993, the nation's transit industry provided over 2.5 billion miles of revenue service to its customers. During the ten-year period from 1984 to 1993, there has been a slight but steady increase in vehicle revenue miles each year for all modes. Vehicle revenue miles operated have increased by more than 22 percent since 1984, due to new starts and expansion of existing services.

In the aggregate, transit service consumed, as measured by unlinked passenger trips, decreased during the 1984-1993 timeframe by nearly 15 percent. However, upon examination of each mode, only bus service showed a substantive decline in ridership during this period. All other modes of service showed increases in ridership, or have remained relatively stable. Annual bus ridership declined by more than one billion riders when comparing ridership in 1984 to that of 1993. Bus service in 1993 accounted for 20 percent fewer riders than in 1984, yet it still accounted for over 62 percent of the unlinked passenger trips made via transit in 1993 as compared to 67 percent in 1984. Heavy rail has also displayed declining ridership, carrying eight percent fewer riders in 1993 than 1984. In contrast, such modes as commuter rail, light rail and demand response carried substantially greater numbers of riders in 1993 than in 1984. These modes show ridership increases of more than 20 percent, almost 23 percent and slightly more than 141 percent, respectively, in 1993 when compared with 1984.

Looking back to service supplied as represented by vehicle revenue miles of service provided, the rail modes and demand response show substantial increases in service supplied, while bus shows a minimal increase for the 1984-1993 period. Vehicle revenue miles for bus increased by more than 11 percent during the ten-year period, while heavy

Exhibit 3
National Transit Profile
1993

General Information (System Wide)

Service Consumption*	
Annual Passenger Miles	36,224.9
Annual Unlinked Trips	7,432.7
Average Weekday Unlinked Trips	25.0
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Service Supplied	
Annual Vehicle Revenue Miles*	2,593.2
Annual Vehicle Revenue Hours*	174.9
Total Fleet	88,292
Vehicles Operated in Maximum Service	70,307
Base Period Requirement	32,155

Vehicles Operated in Maximum Service

Directly Operated

	Vehicles	Agencies **
Bus	40,583	352
Heavy Rail	8,187	14
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Passenger Fares	$6,117.1
Local Funds	5,165.5
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Local Funds	$2,033.4
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Uses of Capital Funds*

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Commuter Rail	266.1	1,379.0	1,645.1
Light Rail	46.5	417.8	464.3
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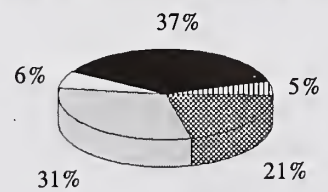
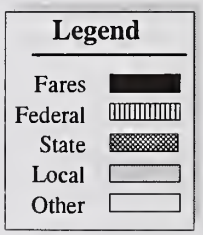
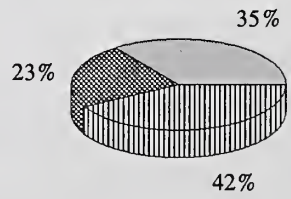
Total	**$1,554.5**	**$4,176.5**	**$5,731.0**

Sources of Operating Funds Expended





Sources of Capital Funds Expended



* Millions

** Number of Transit Agencies reporting this mode

Exhibit 3 (continued) **National Transit Profile by Mode**

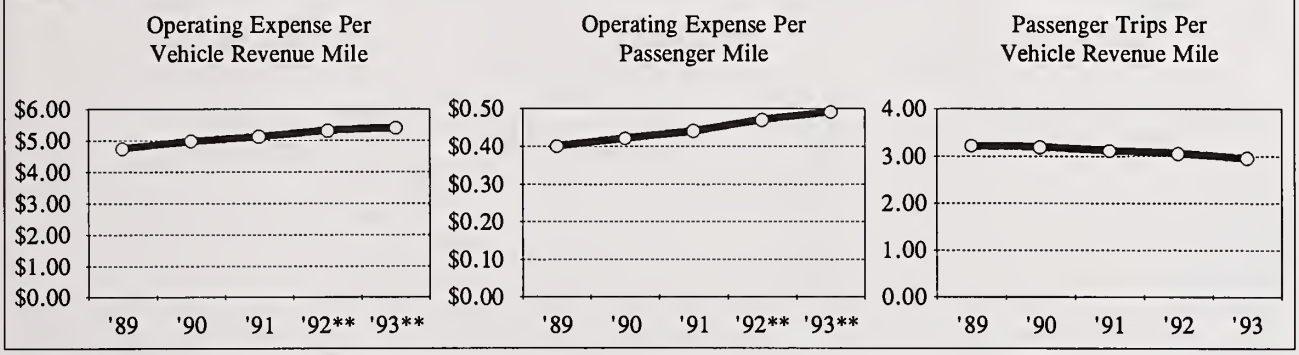
Characteristics

	Bus	Heavy Rail
Operating Expense*	$8,513.6	$3,668.6
Capital Funding*	$1,501.6	$1,905.2
Annual Passenger Miles*	17,363.8	10,230.8
Annual Vehicle Revenue Miles*	1,578.3	505.2
Annual Unlinked Trips*	4,638.5	2,045.6
Average Weekday Unlinked Trips*	15.5	6.8
Annual Vehicle Revenue Hours*	122.7	24.7
Fixed Guideway Directional Route Miles	1184.4	1451.7
Total Fleet	54,191	10,282
Average Fleet Age in Years	8.4	17.8
Vehicles Operated in Maximum Service	44,041	8,187
Peak to Base Ratio	1.8	1.8
Percent Spares	23%	26%

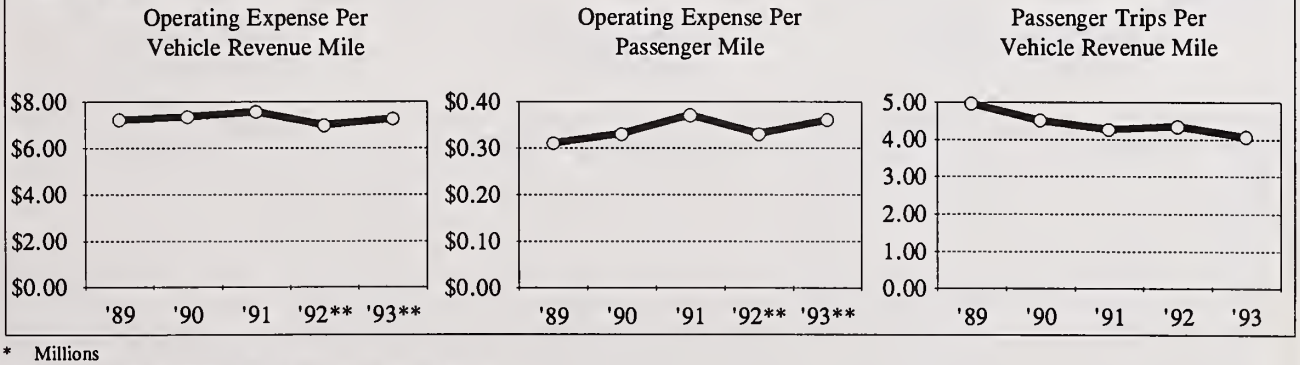
Performance Measures

Service Efficiency		
Operating Expense/Vehicle Revenue Mile	$5.39	$7.26
Operating Expense/Vehicle Revenue Hour	$69.39	$148.46
Cost Effectiveness		
Operating Expense/Passenger Mile	$0.49	$0.36
Operating Expense/Unlinked Passenger Trip	$1.84	$1.79
Service Effectiveness		
Unlinked Passenger Trips/Vehicle Revenue Mile	2.94	4.05
Unlinked Passenger Trips/Vehicle Revenue Hour	37.80	82.78

Bus



Heavy Rail



* Millions

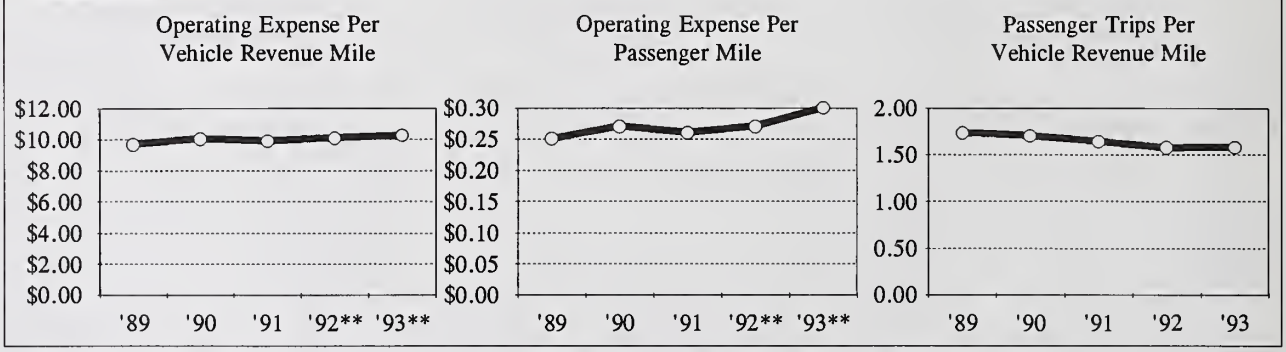
** Joint expenses eliminated and allocated to individual modes.

Source: 1993 National Transit Database

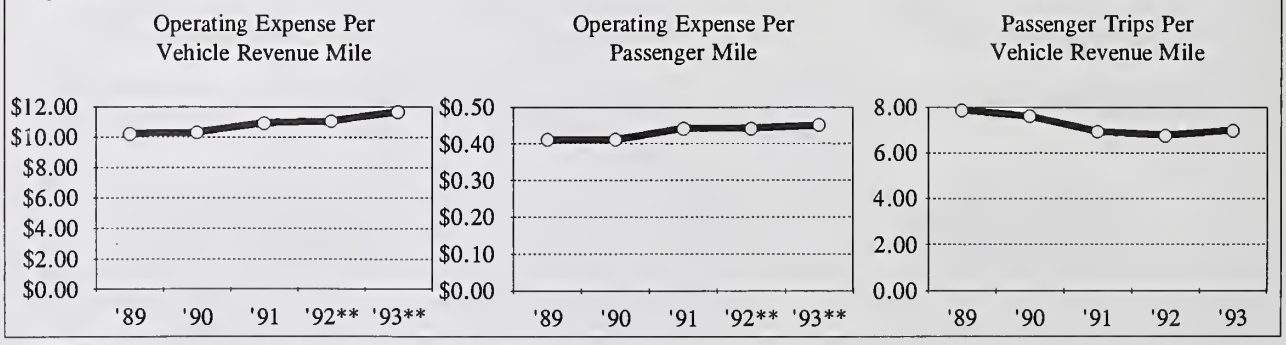
Exhibit 3 (continued) **National Transit Profile by Mode**

Characteristics	Commuter Rail	Light Rail
Operating Expense*	$2,079.9	$314.1
Capital Funding*	$1,645.1	$464.3
Annual Passenger Miles*	6,912.0	703.7
Annual Vehicle Revenue Miles*	203.4	26.9
Annual Unlinked Trips*	320.8	187.5
Average Weekday Unlinked Trips*	1.2	0.6
Annual Vehicle Revenue Hours*	6.0	1.9
Fixed Guideway Directional Route Miles	5875.1	537.4
Total Fleet	4,981	1,001
Average Fleet Age in Years	18.8	14.3
Vehicles Operated in Maximum Service	4,214	773
Peak to Base Ratio	2.3	1.7
Percent Spares	18%	29%
Performance Measures		
Service Efficiency		
Operating Expense/Vehicle Revenue Mile	$10.22	$11.66
Operating Expense/Vehicle Revenue Hour	$346.51	$162.07
Cost Effectiveness		
Operating Expense/Passenger Mile	$0.30	$0.45
Operating Expense/Unlinked Passenger Trip	$6.48	$1.68
Service Effectiveness		
Unlinked Passenger Trips/Vehicle Revenue Mile	1.58	6.96
Unlinked Passenger Trips/Vehicle Revenue Hour	53.44	96.75

Commuter Rail



Light Rail



* Millions

** Joint expenses eliminated and allocated to individual modes.

Source: 1993 National Transit Database

Exhibit 3 (continued) **National Transit Profile by Mode**

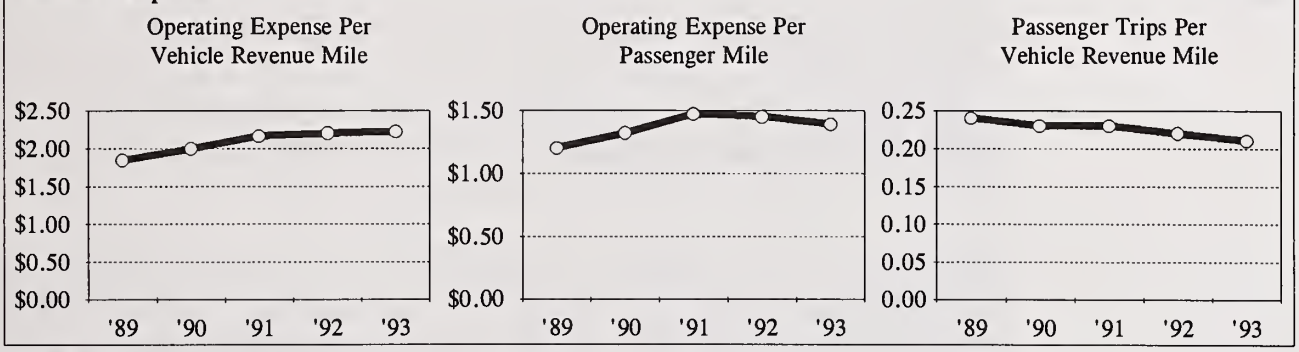
Characteristics

	Demand Response
Operating Expense*	$540.1
Capital Funding*	$68.7
Annual Passenger Miles*	389.5
Annual Vehicle Revenue Miles*	243.4
Annual Unlinked Trips*	52.0
Average Weekday Unlinked Trips*	0.3
Annual Vehicle Revenue Hours*	16.8
Fixed Guideway Directional Route Miles	0.0
Total Fleet	15,226
Average Fleet Age in Years	3.8
Vehicles Operated in Maximum Service	11,262
Peak to Base Ratio	N/A
Percent Spares	35%

Performance Measures

Service Efficiency	
Operating Expense/Vehicle Revenue Mile	$2.22
Operating Expense/Vehicle Revenue Hour	$32.06
Cost Effectiveness	
Operating Expense/Passenger Mile	$1.39
Operating Expense/Unlinked Passenger Trip	$10.38
Service Effectiveness	
Unlinked Passenger Trips/Vehicle Revenue Mile	0.21
Unlinked Passenger Trips/Vehicle Revenue Hour	3.09

Demand Response



* Millions

** Joint expenses eliminated and allocated to individual modes.

Source: 1993 National Transit Database

rail, commuter rail and light rail vehicle revenue miles increased by over 18 percent, more than 30 percent, and slightly more than 65 percent, respectively. Demand response grew by slightly more than 210 percent while Other modes increased more than 40 percent.

Operating Expense

When examining historical operating expenses using current-year dollars, the increase in operating expenses for the transit industry over the 1984-1993 period appears dramatic. However, after some seemingly significant increases from 1984 to 1986, the average annual increase since 1986 has been less than five percent annually, and the increase from 1991 to 1992 was only 0.6 percent. From 1992 to 1993, operating expenses declined by nearly 0.2 percent. However, it should be noted that there have been substantial cost increases from 1984 to 1993 in the operation of light rail and demand response services. Some of this is the effect of an increased base of reporters. These two modes also show the most dramatic percentage increases in supply of service as represented by vehicle revenue miles. Thus, some of the significant operating expense increases are the result of new and extended light rail and demand response services during the ten-year period.

Exhibit 4 provides summaries of vehicle revenue miles, unlinked passenger trips and operating expenses by mode from 1984 to 1993.

Performance Indicators

Performance indicators use two data elements and have been calculated only for those reports that include both data elements, such as revenue miles and hours for calculating average speed. The performance indicators displayed herein will not always coincide perfectly with performance indicators calculated from displayed data. The number of agencies represented also may vary slightly from one graph to the next. The exceptions to the rule are in the National Transit Profile, where performance measures are calculated directly from the data in the table.

Performance measures are generally divided into three main categories: efficiency, effectiveness, and impact measures. Impact measure, such as achievement of social, environmental, and energy conservation objectives, are not an amenable evaluation within the framework of the National Transit Database.

Efficiency measures compare inputs, such as dollars or labor, to outputs produced, such as miles or hours of service. Cost effectiveness measures compare inputs (dollars of labor) to the end product, the service to the public, such as passenger trips or passenger miles. Service effectiveness measures compare the end product, such as passenger trips or passenger miles, to the service outputs, such as miles or hours of service.

Certain measures act as indicators of service and cost effectiveness and efficiency utilized for analysis. The efficiency of service is reviewed herein by an examination of operating expense per vehicle revenue mile. The effectiveness of service is considered through use of unlinked passenger trips per vehicle revenue mile. The cost effectiveness of service is reviewed in light of operating expense per unlinked passenger trip. **Exhibits 5, 6,** and **7** reflect each of these indicators, from 1984 to 1993 for each mode.

Ten Year Data Summary Tables 1984-1993

Exhibit 4

Vehicle Revenue Miles by Mode (Millions)

Year	Mode						Total
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
1984	1,419.8	426.6	155.6	16.3	78.5	25.7	2,122.5
1985	1,463.8	443.2	167.1	15.9	90.4	24.7	2,205.1
1986	1,476.1	462.6	170.2	16.7	104.8	24.9	2,255.3
1987	1,497.2	473.9	169.9	18.0	113.4	25.6	2,298.0
1988	1,508.5	503.0	183.5	20.1	132.8	27.1	2,375.0
1989	1,506.4	513.1	190.2	20.5	152.1	23.1	2,405.4
1990	1,534.5	520.8	193.1	23.0	171.2	24.3	2,466.9
1991	1,552.3	508.3	197.9	26.6	185.8	27.8	2,498.7
1992	1,555.9	509.7	199.9	27.8	208.5	32.2	2,534.0
1993	1,578.3	505.2	203.4	26.9	243.4	36.0	2,593.2

Unlinked Passenger Trips by Mode (Millions)

Year	Mode						Total
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
1984	5,826.8	2,231.4	266.7	152.7	21.6	215.0	8,714.2
1985	5,438.7	2,289.8	275.3	130.7	23.8	191.4	8,349.7
1986	4,959.8	2,332.7	305.8	128.4	27.3	176.3	7,930.3
1987	4,795.7	2,402.1	310.9	131.3	29.2	196.6	7,865.8
1988	4,794.0	2,307.7	324.9	152.6	34.1	199.2	7,812.5
1989	4,838.1	2,541.9	329.6	161.1	36.7	190.6	8,098.0
1990	4,887.1	2,346.3	328.4	174.0	39.7	190.1	7,965.6
1991	4,825.5	2,167.0	323.8	183.6	42.4	192.6	7,734.9
1992	4,748.0	2,207.2	313.6	187.4	45.3	194.2	7,695.7
1993	4,638.5	2,045.6	320.8	187.5	52.0	188.3	7,432.7

Operating Expense by Mode (Millions)

Year	Mode						Total
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
1984	$5,652.5	$2,594.2	$566.4	$127.3	$126.7	$279.2	$9,346.3
1985	6,017.2	2,847.5	731.7	140.1	154.4	306.1	10,197.0
1986	6,336.0	3,101.6	1,640.3	158.2	176.2	309.0	11,721.3
1987	6,737.0	3,234.7	1,748.4	171.6	211.2	254.0	12,356.9
1988	6,994.8	3,524.0	1,889.2	197.2	251.6	261.3	13,118.1
1989	7,295.0	3,703.5	2,068.1	209.4	322.5	284.1	13,882.6
1990	7,778.6	3,825.0	2,156.8	236.0	385.5	322.8	14,704.7
1991	8,329.6	3,841.2	2,175.4	289.7	442.6	325.2	15,403.7
1992	8,625.1	3,555.1	2,169.7	307.2	499.8	341.6	15,498.5
1993	8,514.0	3,669.0	2,080.0	314.0	540.0	355.7	15,472.7

Exhibit 5 shows that operating expense per vehicle revenue mile has decreased from 1992 to 1993 for all major modes except light rail and heavy rail. Operating expense per vehicle revenue mile for light rail increased 5.5 percent from 1992 to 1993 and heavy rail increased 4.2 percent, whereas bus decreased by 2.7 percent and demand response decreased by 7.5 percent.

Exhibit 5

Operating Expense Per Vehicle Revenue Mile by Mode
1984-1993

Year	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
1984	$3.98	$6.08	$3.64	$7.81	$1.61
1985	4.11	6.42	4.38	8.81	1.71
1986	4.29	6.70	9.64	9.47	1.68
1987	4.50	6.83	10.29	9.53	1.86
1988	4.64	7.01	10.39	9.81	1.89
1989	4.84	7.22	10.87	10.21	2.12
1990	5.07	7.34	11.17	10.26	2.25
1991	5.37	7.56	10.99	10.89	2.38
1992	5.54	6.97	10.85	11.05	2.40
1993	5.39	7.26	10.22	11.66	2.22

Previous to 1993, each of the major modes had shown increases each year since 1984 in operating expense per vehicle revenue mile. The exceptions to this are heavy rail, which showed a decrease from 1991 to 1992 due to a reporting change by a major heavy rail operator, and commuter rail, which has exhibited declining operating expense per vehicle revenue mile since 1990.

Commuter rail had shown slight decreases in operating expense per vehicle revenue mile for 1991 and 1992 (1.6 percent and 1.2 percent, respectively). However, operating expense per vehicle revenue mile for commuter rail in 1993 is 5.8 percent less than in 1992. The 1993 cost per mile of $10.22 is very comparable to the 1987 cost per mile of $10.29.

Unlinked passenger trips per vehicle revenue mile is a measure of service effectiveness. As reflected in **Exhibit 6**, unlinked passenger trips per vehicle revenue mile have remained relatively stable though in recent years there have been slight decreases in all modes. However, for 1993, the indicator actually increased slightly over 1992 for commuter rail. The indicator for commuter rail had decreased annually on average of 2.7 percent in each of the previous five years. More striking is the increase in unlinked passenger trips per vehicle revenue mile for light rail. From 1992 to 1993, this indicator increased by 3.3 percent. Light rail had declined 2.3 percent from 1991 to 1992, after an unusually larger drop of 8.9 percent from 1990 and 1991. Demand response and bus have not changed significantly. Unlinked passenger trips per vehicle revenue mile for demand response declined 4.8 percent from 1992 to 1993 after having remained stable for the two years prior to this. For bus, the indicator has decreased 2.9 percent from 1992 to 1993.

Exhibit 6 shows the seemingly higher service effectiveness of heavy rail and light rail compared with the other modes. However, the nature of the service itself for each mode must be considered. Heavy and light rail systems are designed to operate within corridors containing high population densities as well as to be served by feeder bus services and park-and-ride facilities to increase capture areas of potential riders. These two modes would carry more ridership per vehicle revenue mile based on their design as higher-capacity modes. Commuter rail differs from the other rail modes because it experiences far fewer stops and has a higher tendency to have its ridership concentrated during peak

Unlinked Passenger Trips Per Vehicle Revenue Mile by Mode 1984-1993 **Exhibit 6**

Year	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
1984	4.10	5.23	1.71	9.37	0.28
1985	3.72	5.17	1.65	8.22	0.26
1986	3.36	5.04	1.80	7.69	0.26
1987	3.20	5.07	1.83	7.29	0.26
1988	3.18	4.59	1.77	7.59	0.26
1989	3.21	4.95	1.73	7.86	0.24
1990	3.18	4.51	1.70	7.57	0.23
1991	3.11	4.26	1.64	6.90	0.23
1992	3.05	4.33	1.57	6.74	0.22
1993	2.94	4.05	1.58	6.96	0.21

periods. Bus reflects a more moderate utilization, because along with routes that travel through highly dense areas of transit-dependent markets and operate during peak hours of ridership, services are also provided during off-peak hours in much less densely populated areas. Thus, vehicle revenue miles remain high while ridership varies by route, day of the week, and time of day. Demand response is designed to have much lower capacity and a greater flexibility and convenience for the user. Thus, it displays lower ridership along with significant miles of operation. Demand response has shown a trend of consistent increases in ridership over the ten year period. Revenue miles also show an increasing trend, but at a much higher rate. This has resulted in decreased service effectiveness. For demand response, which has poor cost and service effectiveness when compared with other higher capacity modes, an increase in demand for service would require more financial resources since an agency's operating deficit would increase. This could adversely impact other modes as resources are allocated to address demand response growth.

Operating Expense Per Unlinked Passenger Trip by Mode 1984-1993 **Exhibit 7**

Year	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
1984	$0.97	$1.16	$2.12	$0.83	$5.87
1985	1.11	1.24	2.66	1.07	6.49
1986	1.28	1.33	5.36	1.23	6.45
1987	1.40	1.35	5.62	1.31	7.23
1988	1.46	1.53	5.81	1.29	7.38
1989	1.51	1.46	6.27	1.30	8.79
1990	1.59	1.63	6.57	1.36	9.71
1991	1.73	1.77	6.72	1.58	10.44
1992	1.82	1.61	6.92	1.64	11.03
1993	1.84	1.79	6.48	1.68	10.38

Operating expense per unlinked passenger trip is a measure of cost effectiveness made by assessing the relationship of the cost of providing a service to its utilization. As seen in **Exhibit 7**, commuter rail and demand response operating expense per unlinked passenger trip decreased while increasing for other modes in 1993. It decreased by 6.4 percent from 1992 to 1993 for commuter rail and by 5.9 percent for demand response.

Operating expense per unlinked passenger trip for bus has increased an average of 8.2 percent annually from 1984 to 1993. It has increased an average of 5.3 percent per year for heavy rail and an average of 8.5 percent annually for light rail on average from 1984 to 1993.

Ratio of Passenger Fare Revenue to Operating Expense and Passenger Fare Revenue Per Unlinked Trip

The ratios of passenger fare revenue to operating expense and passenger fare revenue per unlinked trip are presented in **Exhibits 8** and **9**, respectively, aggregated for all modes from 1984 to 1993. These indicators are representative of cost efficiency. The ratio of passenger fare revenue to operating expenses has remained relatively stable since 1985, ranging between 36.3 percent and 40 percent. The ratio for 1993 is 39.5 percent. During the 1985-1993 period, passenger fare revenue per unlinked passenger trip has increased an average of 8.1 percent annually, with fare revenues per passenger trip increasing 10.8 percent from 1992 to 1993.

Exhibit 8

Ratio of Passenger Fare Revenue to Operating Expense 1984-1993

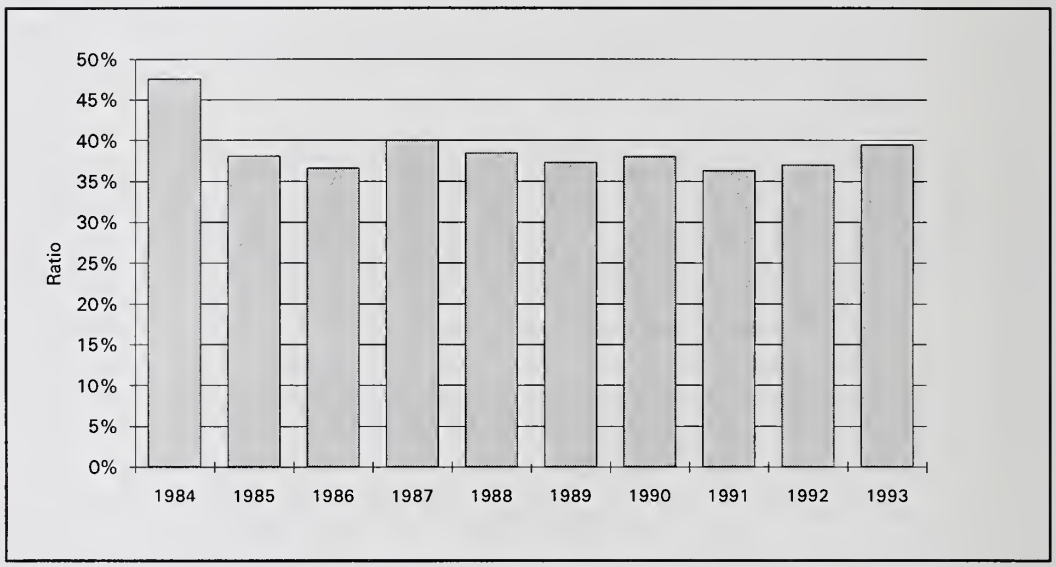
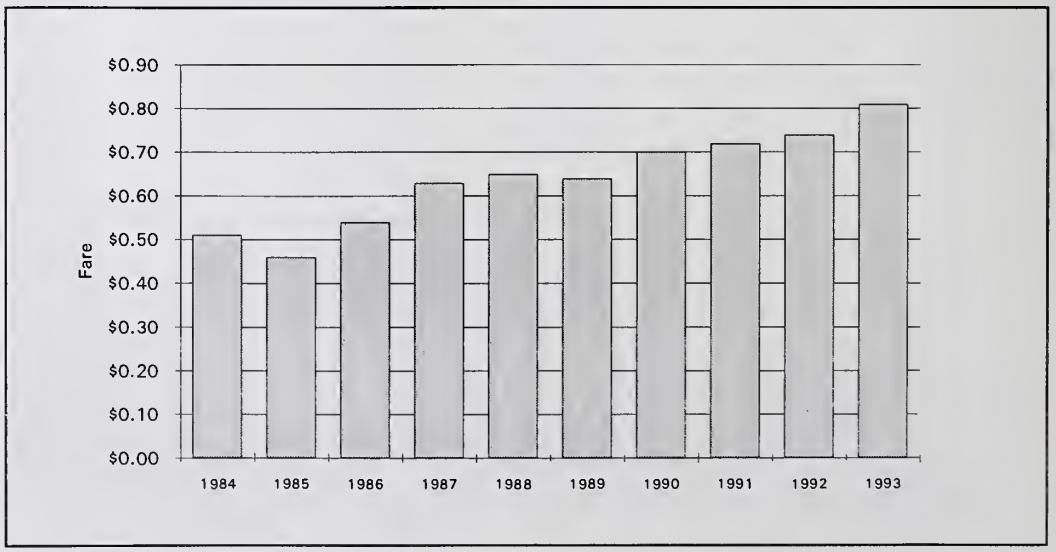


Exhibit 9

Passenger Fare Revenue Per Unlinked Passenger Trip 1984-1993



Chapter 2
Key Modal Characteristics of Individual Transit Agencies

Introduction

The exhibits and discussion found in this chapter provide data regarding operations, performance, and other significant characteristics of the fifteen largest transit agencies for bus and demand response and for all transit agencies operating heavy rail, commuter rail, light rail, trolleybus, ferryboat, and automated guideway.

Chapter Organization

Three exhibits are presented for each of the following modes: bus, heavy rail, commuter rail, light rail and demand response. Information concerning trolleybus, ferryboat, and automated guideway systems is also presented to demonstrate that these modes are the predominant ones in the category of Other and to reflect the dominance of certain agencies in these three modes. **Exhibits 10 through 33** provide data concerning service, performance indicators, and infrastructure for each mode.

For each of the modes, three exhibits are presented with discussion preceding them so as to provide the reader with a two-page synopsis that is easily reproducible. The first exhibit for each mode reflects basic information concerning each system's operations, such as operating expense, vehicle miles, vehicle hours, unlinked passenger trips, and passenger miles. The second exhibit offers measures of cost and service effectiveness and efficiency. The third exhibit offers infrastructure characteristics such as directional route miles, miles of track, and stations.

Bus Agencies

The 15 bus agencies addressed in **Exhibits 10**, **11**, and **12** are those with the greatest number of vehicles operated in maximum service. These 15 agencies dominate the service categories presented in **Exhibit 10**. Particularly noteworthy is that these 15 agencies account for more than 52.2 percent of the unlinked bus passenger trips made in the U.S. in 1993, as well as nearly 39 percent of bus revenue miles and over 43 percent of bus revenue hours. Also, these bus agencies account for nearly 47 percent of bus passenger miles.

Exhibit 10

Key Bus Operating Characteristics of Individual Agencies 1993

ST	Agency Name	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	592,220.7	80,832	6,718	375,848	1,169.8	1,428,283
CA	Oakland-AC Transit	129,998.5	23,650	1,858	61,195	198.3	219,981
CO	Denver-RTD	123,987.9	26,317	1,577	60,180	202.6	235,436
DC	Washington-WMATA	291,259.8	37,175	3,329	161,850	555.4	517,350
FL	Miami-MDTA	144,871.0	26,965	2,224	70,002	224.1	262,866
IL	Chicago RTA-CTA	472,839.6	69,970	6,720	326,656	1,059.6	835,171
MA	Boston-MBTA	196,247.2	24,772	2,436	94,376	313.9	253,267
MD	Baltimore-MDOT	127,469.8	20,306	1,756	86,063	298.0	302,285
MN	Minneapolis St. Paul-MTC	120,608.5	24,219	1,636	66,598	223.7	286,812
NJ	New Jersey Transit	392,572.5	68,029	4,412	120,655	414.6	740,373
NY	NY-MTA-NYCTA	991,250.6	88,593	11,091	620,556	2,052.5	1,250,340
PA	Philadelphia-SEPTA	287,131.8	34,909	3,389	166,640	541.6	441,869
PA	Pittsburgh-PAT	147,188.7	26,707	1,918	67,331	228.6	325,783
TX	Houston-Metro	175,299.9	35,312	2,397	87,328	299.8	480,657
WA	Seattle-Metro	178,747.5	27,052	1,606	58,243	198.8	380,671
	Individual Agencies Total	$4,371,694.0	614,808.1	53,066	2,423,521	7,981.3	7,961,144
	Percent of Total Bus Mode	51.3%	39.0%	43.2%	52.2%	51.4%	45.8%

The service effectiveness of these agencies on average is higher than that of many bus agencies in total in terms of unlinked passenger trips per vehicle revenue mile and unlinked passenger trips per vehicle revenue hour.

Exhibit 11 demonstrates that 3.94 unlinked passenger trips per vehicle revenue mile are realized on average by the combination of these agencies, as compared to 2.94 for all bus agencies. However, it should be noted that of the 15 agencies, only seven demonstrate

Exhibit 11

Key Bus Performance Indicators of Individual Agencies 1993

		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	$7.33	$88.16	$1.58	$0.41	4.65	55.95	212.62	12.03
CA	Oakland-AC Transit	5.50	69.96	2.12	0.59	2.59	32.93	118.38	12.73
CO	Denver-RTD	4.71	78.63	2.06	0.53	2.29	38.17	149.31	16.69
DC	Washington-WMATA	7.83	87.49	1.80	0.56	4.35	48.62	155.40	11.17
FL	Miami-MDTA	5.37	65.13	2.07	0.55	2.60	31.47	118.18	12.12
IL	Chicago-RTA-CTA	6.76	70.36	1.45	0.57	4.67	48.61	124.28	10.41
MA	Boston-MBTA	7.92	80.55	2.08	0.77	3.81	38.74	103.96	10.17
MD	Baltimore-Maryland-MTA	6.28	72.61	1.48	0.42	4.24	49.02	172.18	11.57
MN	Minneapolis-St. Paul-MTC	4.98	73.74	1.81	0.42	2.75	40.72	175.36	14.81
NJ	New Jersey Transit	5.77	88.97	3.25	0.53	1.77	27.35	167.80	15.42
NY	NY-MTA-NYCTA	11.19	89.38	1.60	0.79	7.00	55.95	112.74	7.99
PA	Philadelphia-SEPTA	8.23	84.73	1.72	0.65	4.77	49.17	130.38	10.30
PA	Pittsburgh-PAT	5.51	76.76	2.19	0.45	2.52	35.11	169.90	13.93
TX	Houston-Metro	4.96	73.13	2.01	0.36	2.47	36.43	200.52	14.73
WA	Seattle-Metro	6.61	111.27	3.07	0.47	2.15	36.26	236.97	16.84
	Average of Individual Agencies	$7.11	$82.38	$1.80	$0.55	3.94	45.67	150.02	11.59
	Average for Bus Mode	$5.39	$69.39	$1.84	$0.49	2.94	37.80	141.50	12.86

greater unlinked passenger trips per vehicle revenue mile than the 2.94 for all bus agencies. Also, 45.67 unlinked passenger trips per vehicle revenue hour are realized on average by these 15 bus agencies as compared to 37.80 for all bus agencies. Again, only nine of the 15 actually exceeded 37.80 unlinked passenger trips per vehicle revenue hour.

Exhibit 11 also reflects the relatively low service efficiency of these 15 bus agencies. In terms of operating expense per vehicle revenue mile and per vehicle revenue hour, these agencies attained figures of $7.11 and $82.38, respectively, as compared with $5.39 per vehicle revenue mile and $69.39 per vehicle revenue hour for all bus agencies. Only one of the 15 posted such figures that were less than the national averages. In terms of operating expense per unlinked passenger trip and operating expense per passenger mile, these 15 systems averaged $1.80 and $0.55, respectively. Nationally, the average figures for bus are $1.84 and $0.49. Thus, in terms of cost effectiveness, these 15 agencies are more in line with the national average for bus.

Exhibit 12 indicates that the majority of the 15 have at least some exclusive or shared rights-of-way for their bus operations, with eight of the systems having more than 20 directional route miles of such rights-of-way. Data in this exhibit reflect fixed guideway operated by each bus transit agency. In many larger metropolitan areas, several bus agencies operate on the same fixed guideway segments. **Exhibit 56** provides data on the actual segments operated regardless of the number of providers using an individual segment. These 15 agencies also account for 17,802 of the 44,041 buses operated in maximum service, over 40 percent of all buses in operation.

Key Bus Infrastructure Characteristics of Individual Agencies 1993 **Exhibit 12**

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	24.5	24.5	-	1,912	2,294	7.3
CA	Oakland-AC Transit	4.6	0.1	4.5	614	752	6.7
CO	Denver-RTD	14.4	1.9	12.5	663	769	7.6
DC	Washington-WMATA	45.9	-	45.9	1,339	1,506	12.2
FL	Miami-MDTA	22.3	0.0	22.3	617	783	6.8
IL	Chicago-RTA-CTA	5.4	5.4	0.0	1,731	2,081	7.7
MA	Boston-MBTA	1.5	1.5	-	841	1,153	10.3
MD	Baltimore-Maryland-MTA	11.8	-	11.8	722	937	7.3
MN	Minneapolis-St. Paul-MTC	54.4	19.0	35.4	855	970	5.8
NJ	New Jersey Transit	6.7	0.0	6.7	1,656	2,007	9.2
NY	NY-MTA-NYCTA	38.8	2.6	36.2	3,064	3,662	9.1
PA	Philadelphia-SEPTA	3.6	2.5	1.1	1,131	1,441	8.9
PA	Pittsburgh-PAT	41.3	41.3	0.0	735	889	7.5
TX	Houston-Metro	112.5	108.5	4.0	1,016	1,332	6.3
WA	Seattle-Metro	87.4	82.0	5.4	906	1,073	10.0
	Individual Agencies Total	475.1	289.3	185.8	17,802	21,649	8.2
	Total Bus Mode	484.4	58.9	625.5	44,041	54,191	8.4

Heavy Rail Agencies

The heavy rail agencies noted here are the total number of heavy rail operators in the U.S. providing a combined total of 8,187 vehicles in maximum service. The dominance of three New York City area agencies is demonstrated by the data presented. **Exhibit 13** shows that over 58 percent of the heavy rail operating expenses realized in the U.S. in 1993 are accounted for by the New York City agencies, which also provided 58 percent of the heavy rail vehicle revenue miles operated, 66 percent of the heavy rail vehicle revenue hours operated, realized 55 percent of heavy rail passenger miles, and carried 58 percent of all heavy rail riders.

Exhibit 13

Key Heavy Rail Operating Characteristics of Individual Agencies 1993

ST	Agency Name	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-LACMTA	$9,239.0	285	17.5	1,983	12.5	3,142.5
CA	San Francisco-8ART	203,828.0	41,893	1,189.5	78,302	263.6	931,234.9
DC	Washington-WMATA	313,297.9	36,650	1,459.4	191,428	660.9	930,027.3
FL	Miami-MDTA	42,746.0	5,351	176.4	14,818	49.5	117,329.0
GA	Atlanta-MARTA	65,513.0	16,938	684.7	65,005	209.4	336,388.1
IL	Chicago-RTA-CTA	282,691.4	45,575	1,990.9	135,370	464.1	823,357.3
MA	Boston-M8TA	256,188.4	23,573	1,172.0	190,330	579.1	578,601.8
MD	8altimore-MDOT	31,656.6	3,557	138.6	11,114	39.3	60,194.7
NY	NY-MTA-NYCTA	2,132,926.0	295,239	16,205.4	1,178,121	3,937.3	5,571,179.8
NY	NY-MTA-SIRTOA	17,836.3	1,819	86.0	5,141	19.2	37,684.2
NY	NY-Port Authority-PATH	155,136.0	12,838	637.0	61,815	214.3	270,393.2
OH	Cleveland-RTA	19,903.2	1,908	73.4	6,563	22.9	50,181.5
PA	Philadelphia-PATCO	27,784.8	4,264	147.0	11,232	39.9	98,479.5
PA	Philadelphia-SEPTA	109,817.5	15,339	732.6	94,332	323.1	422,610.6
	Total	$3,668,564.0	505,229	24,710.3	2,045,554	6,835.0	10,230,804.5

Exhibit 14 demonstrates that five of the reporting transit agencies exceed the average of 4.05 unlinked passenger trips per vehicle revenue mile and seven exceed the average of 82.78 unlinked passenger trips per vehicle revenue hour. This is reflective of a high level of service effectiveness for these operators.

Exhibit 14

Key Heavy Rail Performance Indicators of Individual Agencies 1993

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	$32.4	$528.9	$4.7	$2.9	6.96	113.51	179.90	16.32
CA	San Francisco-8ART	4.9	171.4	2.6	0.2	1.87	65.83	782.90	35.22
DC	Washington-WMATA	8.5	214.7	1.6	0.3	5.22	131.17	637.25	25.11
FL	Miami-MDTA	8.0	242.4	2.9	0.4	2.77	84.02	665.29	30.34
GA	Atlanta-MARTA	3.9	95.7	1.0	0.2	3.84	94.95	491.32	24.74
IL	Chicago-RTA-CTA	6.2	142.0	2.1	0.3	2.97	67.99	413.56	22.89
MA	8oston-MBTA	10.9	218.6	1.3	0.4	8.07	162.39	493.68	20.11
MD	8altimore-Maryland-MTA	8.9	228.4	2.8	0.5	3.12	80.20	434.36	25.67
NY	NY-MTA-NYCTA	7.2	131.6	1.8	0.4	3.99	72.70	343.79	18.22
NY	NY-MTA-Staten Island	9.8	207.5	3.5	0.5	2.83	59.80	438.34	21.16
NY	Port Authority-PATH	12.1	243.6	2.5	0.6	4.82	97.05	424.50	20.15
OH	Cleveland-RTA	10.4	271.0	3.0	0.4	3.44	89.37	683.30	25.97
PA	Philadelphia-PATCO	6.5	189.0	2.5	0.3	2.63	76.39	669.79	29.00
PA	Philadelphia-SEPTA	7.2	149.9	1.2	0.3	6.15	128.76	576.83	20.94
	Average	$7.3	$148.5	$1.8	$0.4	4.05	82.78	414.03	20.45

Exhibit 14 also offers insight into the relative service efficiency and cost effectiveness of these agencies. Six agencies realized operating expense per vehicle revenue mile less than the $7.26 national average, and three realized operating expense per vehicle revenue hour less than the $148.46 national average. Four agencies also posted operating expense per unlinked passenger trip that was lower than the national average of $1.79. Seven agencies were equal to or less than the $0.36 national average for operating expense per passenger mile.

Exhibit 15 again reflects the dominance of the New York City agencies. Approximately 35 percent of heavy rail route miles are accounted for by the New York City area and nearly 42 percent of heavy rail track miles are located there. Nearly 48 percent of all heavy rail stations are served by the New York City agencies. Approximately 61 percent of heavy rail vehicles operated in maximum service and 57 percent of heavy rail vehicles available for service are accounted for by the New York City agencies.

Key Heavy Rail Infrastructure Characteristics of Individual Agencies 1993 **Exhibit 15**

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	6.0	8.8	5	5	16	30	1.0
CA	San Francisco-BART	142.0	196.5	34	34	406	589	15.7
DC	Washington-WMATA	162.1	175.9	70	70	534	746	10.4
FL	Miami-MDTA	42.2	53.2	21	0	76	136	11.0
GA	Atlanta-MARTA	80.8	99.2	33	33	160	240	9.9
IL	Chicago-RTA-CTA	220.3	241.9	145	0	856	1,236	9.6
MA	Boston-MBTA	75.8	107.7	53	27	378	402	17.2
MD	Baltimore-MDOT	26.6	31.6	12	12	48	100	8.4
NY	NY-MTA-NYCTA	492.9	834.2	469	22	4,954	5,840	20.6
NY	NY-MTA-Staten Island	28.6	32.5	22	1	36	64	22.0
NY	NY-Port Authority-PATH	28.6	43.1	13	6	282	342	20.8
OH	Cleveland-RTA	38.2	41.9	18	1	35	60	10.0
PA	Philadelphia-PATCO	31.5	38.4	13	2	102	121	20.8
PA	Philadelphia-SEPTA	76.1	102.3	76	4	304	376	25.9
	Total	1,451.7	1,998.4	979	212	8,171	10,252	14.5

Commuter Rail Agencies

Exhibits 16, **17**, and **18** present all 18 commuter rail agencies. Once again, this mode is dominated by three agencies primarily serving the New York City area. **Exhibit 16** reveals that 48 percent of total operating expenses were realized by these agencies, as were 45 percent of the vehicle revenue miles of service, 44 percent of the vehicle revenue hours of service, 47 percent of the unlinked passenger trips, and 48 percent of the passenger miles.

Exhibit 16

Key Commuter Rail Operating Characteristics of Individual Agencies 1993

ST	Agency Name	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-OCTA	$2,278.0	116.9	3.0	169.7	0.7	9,162
CA	LA-SCRRA	18,954.0	743.5	19.5	939.5	5.4	26,432
CA	SF-CALTRANS	34,573.6	3,445.4	111.0	5,745.7	20.2	132,115
CT	Hartford-Conn DOT	5,073.1	407.8	9.8	274.0	1.1	5,555
FL	Ft. Lauderdale-TCRA	19,700.8	2,295.1	57.0	2,697.5	9.1	88,616
IL	Chicago-RTA-Metra	298,192.9	31,248.0	960.3	64,074.6	250.5	1,354,034
IN	NW IN-NICTD	22,243.5	2,011.1	57.2	2,531.2	9.1	70,811
MA	Boston-MBTA	106,384.8	15,730.2	533.2	21,595.9	78.2	402,376
MD	Baltimore-Maryland-MTA	32,188.0	4,711.6	110.9	4,747.4	18.6	142,896
NJ	New Jersey Transit	334,161.0	38,757.9	1,032.4	45,806.2	158.9	1,009,100
NY	NY-MTA-Long Island RR	620,916.5	54,320.0	1,662.8	92,462.0	325.0	1,960,886
NY	NY-MTA-Metro North RR	430,943.9	37,273.6	992.7	59,119.4	205.2	1,379,836
PA	Philadelphia-Penn DOT	2,766.5	638.5	12.2	189.6	0.5	16,205
PA	Philadelphia-SEPTA	139,786.3	10,788.7	414.0	19,018.7	67.3	275,920
VA	VA-VRE	11,773.0	933.6	26.5	1,394.4	5.6	38,021
	Total	$2,079,936.1	203,422.0	6,002.6	320,765.7	1,155.3	6,911,964

Exhibit 17 demonstrates that the majority of commuter rail agencies are operating more effectively than the average. In many categories of service supply, most of the reporters reflect an operating expense per vehicle revenue mile, vehicle revenue hour, and passenger mile that is better than average. The same is true with service consumption, as the large majority of reporters are experiencing better than average service effectiveness.

Exhibit 17

Key Commuter Rail Performance Indicators of Individual Agencies 1993

		Operating Expense				Passenger		Passenger	Vehicle
CA	LA-SCRRA	25.49	970.76	20.18	0.72	1.3	48.1	1,353.7	38.1
CA	LA-OCTA	19.48	765.97	13.42	0.25	1.5	57.1	3,080.6	39.3
CA	SF-CALTRANS	$10.03	$311.52	$6.02	$0.26	1.7	51.8	1,190.4	31.0
CT	Hartford-Conn DOT	12.44	518.56	18.51	0.91	0.7	28.0	567.8	41.7
FL	Ft. Lauderdale-TCRA	8.58	345.43	7.30	0.22	1.2	47.3	1,553.8	40.2
IL	Chicago-RTA-Metra	9.54	310.54	4.65	0.22	2.0	66.7	1,410.0	32.5
IN	NW IN-NICTD	11.06	388.63	8.79	0.31	1.3	44.2	1,237.2	35.1
MA	Boston-MBTA	6.76	199.50	4.93	0.26	1.4	40.5	754.6	29.5
MD	Baltimore-Maryland-MTA	6.83	290.35	6.78	0.23	1.0	42.8	1,289.0	42.5
NJ	New Jersey Transit	8.62	323.68	7.30	0.33	1.2	44.4	977.5	37.5
NY	NY-MTA-Long Island RR	11.43	373.41	6.72	0.32	1.7	55.6	1,179.3	32.7
NY	NY-MTA-Metro North RR	11.56	434.09	7.29	0.31	1.6	59.6	1,389.9	37.5
PA	Philadelphia-SEPTA	12.96	337.69	7.35	0.51	1.8	45.9	666.5	26.1
PA	Philadelphia-Penn DOT	4.33	226.19	14.59	0.17	0.3	15.5	1,324.9	52.2
VA	VA-VRE	12.61	443.95	8.44	0.31	1.5	52.6	1,433.7	35.2
	Average	$10.22	$346.51	$6.48	$0.03	1.6	53.4	1,151.5	33.9

Exhibit 18 also demonstrates the dominance of the New York City agencies relative to infrastructure. For example, New York City agencies account for 39 percent of the vehicles operating in maximum service, 29 percent of fixed guideway directional route miles, 23 percent of track miles, and 22 percent of commuter rail stations.

Also significant is the commuter rail infrastructure of Northeastern Illinois Regional Commuter Railroad Corporation (Metra) and its purchased transportation providers: Burlington Northern Railroad and Chicago & Northwestern Transportation Company; Southeastern Pennsylvania Transportation Authority; and the Massachusetts Bay Transportation Authority. These agencies combined account for another 52 percent of fixed guideway directional route miles and the vast majority of remaining trackage, stations, and vehicles.

Key Commuter Rail Infrastructure Characteristics of Individual Agencies 1993 **Exhibit 18**

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	176.4	262.9	21	21	67	99	1.0
CA	LA-OCTA	58.0	58.0	6	6	5	5	6.6
CA	SF-CALTRANS	153.6	153.6	34	0	84	93	7.8
CT	Hartford-Conn DOT	65.6	68.3	7	7	13	25	2.0
FL	Ft. Lauderdale-TCRA	132.8	136.1	15	15	25	31	5.3
IL	Chicago-RTA-Metra	864.4	1,104.6	133	20	955	1,034	18.0
IN	NW IN-NICTD	138.4	89.0	18	7	45	56	7.7
MA	Boston-MBTA	529.8	460.3	101	49	291	337	5.3
MD	Baltimore-Maryland-MTA	373.4	455.1	39	0	103	135	21.7
NJ	New Jersey Transit	928.2	1,177.3	163	27	628	748	16.9
NY	NY-MTA-Long Island RR	638.2	701.1	134	15	967	1,184	22.3
NY	NY-MTA-Metro North RR	535.4	756.2	108	5	696	792	17.9
PA	Philadelphia-SEPTA	442.8	694.8	181	25	263	329	18.2
PA	Philadelphia-Penn DOT	144.0	144.0	14	4	23	44	41.1
VA	VA-VRE	154.1	179.8	16	16	49	69	13.9
	Total	5,335.1	6,441	1,079	242	4,214	4,981	12.1

Light Rail Agencies

Exhibits 19, 20, and **21** provide data for all 17 reporting light rail operators. It should be noted that one new agencies was added (in Memphis) for 1993. Several other agencies that reported capital investment information (which is discussed in Chapter 4) will commence operation after 1993. These are Denver, St. Louis, and Dallas. Two agencies did not report in 1993, McKinney Avenue Trolley in Dallas and Tandy Trolley in Fort Worth.

Exhibit 19 demonstrates that five 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 accounted for over 70 percent of the unlinked passenger trips made via light rail, and realized 64 percent of the passenger miles accumulated.

In terms of service supplied, these five agencies also accounted for a majority of vehicle revenue miles and hours. Combined, they accounted for over 57 percent of vehicle revenue miles and 60 percent of vehicle revenue hours.

Exhibit 19

Key Light Rail Operating Characteristics of Individual Agencies 1993

ST	Agency Name	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-LACMTA/SCRTD	$43,732.1	2,864.3	149.9	11,809.2	36.6	106,353
CA	Sacramento-RT	15,550.6	1,670.6	80.6	6,571.4	22.3	31,508
CA	San Diego-The Trolley	19,911.4	4,432.9	233.8	16,504.5	47.1	111,735
CA	San Francisco-Muni	63,043.3	3,874.6	371.6	39,331.9	131.1	106,630
CA	San Jose-SCCTD	19,602.4	1,724.0	120.6	6,245.4	20.2	42,620
LA	New Orleans-RTA	5,527.1	693.9	87.3	6,440.1	18.8	15,128
MA	8oston-M8TA	26,109.2	1,449.1	95.8	26,703.7	82.0	37,385
MD	Baltimore-Maryland-MTA	12,462.9	1,223.7	76.0	3,457.4	11.5	24,562
NJ	New Jersey Transit	4,791.6	643.9	41.7	2,986.8	10.2	9,234
NY	8uffalo-NFTA	12,846.1	904.5	75.3	8,209.1	28.1	19,468
OH	Cleveland-RTA	10,837.8	970.7	43.8	4,113.7	14.3	26,512
OR	Portland-Tri-Met	11,675.8	1,503.3	100.3	7,770.7	23.7	43,143
PA	Philadelphia-SEPTA	38,599.1	2,877.6	310.1	38,065.8	124.0	88,804
PA	Pittsburgh-PAT	27,444.8	2,042.5	135.7	8,837.1	30.4	40,164
TN	Memphis-MATA	361.1	N/R	N/R	180.0	N/R	N/R
TX	Galveston-Island Transit	283.8	19.5	4.2	107.0	0.3	241
WA	Seattle-Metro	1,352.8	48.2	11.4	182.8	0.4	193
	Total	$314,132.1	26,943.2	1,938.2	187,516.5	600.8	703,679.7

N/R - Not Reported

Exhibit 20 shows that in terms of service consumed, the majority of light rail agencies operated more effectively than the average for light rail, in terms of passenger trips per vehicle revenue mile and vehicle revenue hour.

Key Light Rail Performance Indicators of Individual Agencies 1993

Exhibit 20

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/SCRTD	$15.3	$291.8	$3.7	$0.4	4.1	78.8	709.6	19.1
CA	Sacramento-RT	9.3	192.9	2.4	0.5	3.9	81.5	390.8	20.7
CA	San Diego- The Trolley	4.5	85.2	1.2	0.2	3.7	70.6	478.0	19.0
CA	San Francisco-Muni	16.3	169.6	1.6	0.6	10.2	105.8	286.9	10.4
CA	San Jose-SCCTD	11.4	162.5	3.1	0.5	3.6	51.8	353.3	14.3
LA	New Orleans-RTA	8.0	63.3	0.9	0.4	9.3	73.8	173.3	7.9
MA	Boston-M8TA	18.0	272.5	1.0	0.7	18.4	278.7	390.1	15.1
MD	8altimore-Maryland-MTA	10.2	164.1	3.6	0.5	2.8	45.5	323.3	16.1
NJ	New Jersey Transit	7.4	114.9	1.6	0.5	4.6	71.6	221.5	15.4
NY	8uffalo-NFTA	14.2	170.5	1.6	0.7	9.1	109.0	258.4	12.0
OH	Cleveland-RTA	11.2	247.3	2.6	0.4	4.2	93.9	605.0	22.2
OR	Portland-Tri-Met	7.8	116.4	1.5	0.3	5.2	77.4	430.0	15.0
PA	Philadelphia-SEPTA	13.4	124.5	1.0	0.4	13.2	122.8	286.4	9.3
PA	Pittsburgh-PAT	13.4	202.2	3.1	0.7	4.3	65.1	295.9	15.0
TN	Memphis-MATA	N/R	N/R	2.0	N/R	N/R	N/R	N/R	N/R
TX	Galveston-Island Transit	14.6	67.7	2.7	1.2	5.5	25.5	57.5	4.6
WA	Seattle-Metro	28.1	118.8	7.4	7.0	3.8	16.1	16.9	4.2
	Average	$11.7	$162.1	$1.7	$0.4	7.0	96.7	363.1	13.9

N/R - Not Reported

Exhibit 21 shows that the same five agencies mentioned earlier accounted for 64 percent of vehicles operated in maximum service, over 53 percent of light rail stations, and nearly 52 percent of directional route miles.

Key Light Rail Infrastructure Characteristics of Individual Agencies 1993

Exhibit 21

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/SCRTD	43.2	46.7	22	22	36	54	4.0
CA	Sacramento-RT	36.2	32.6	28	0	32	35	4.9
CA	San Diego- The Trolley	41.5	41.5	35	35	59	71	7.1
CA	San Francisco-Muni	49.7	54.2	9	9	101	128	19.6
CA	San Jose-SCCTD	39.0	41.1	33	0	38	54	13.6
LA	New Orleans-RTA	16.0	12.7	N/R	N/R	21	44	68.9
MA	8oston-M8TA	55.9	77.5	77	0	194	229	12.5
MD	8altimore-Maryland-MTA	32.8	35.2	24	24	30	34	1.0
NJ	New Jersey Transit	8.3	8.3	11	0	16	22	46.5
NY	Buffalo-NFTA	12.4	14.1	14	N/R	23	27	9.0
OH	Cleveland-RTA	26.7	28.9	29	0	24	46	12.0
OR	Portland-Tri-Met	30.2	29.1	27	2	23	26	8.1
PA	Philadelphia-SEPTA	81.3	171.0	64	N/R	107	147	13.9
PA	Pittsburgh-PAT	45.3	55.8	14	0	59	71	15.5
TN	Memphis-MATA	0.7	4.0	N/R	N/R	4	4	0.0
TX	Galveston-Island Transit	4.7	4.7	N/R	N/R	3	4	5.0
WA	Seattle-Metro	4.2	2.1	N/R	N/R	3	5	65.2
	Total	528.1	659.5	387	92	773	1,001	19.2

N/R = Not Reported

Demand Response Agencies

The 15 demand response agencies listed in **Exhibits 22**, **23**, and **24** are those reporting the most vehicles operating in maximum service. As **Exhibit 22** demonstrates, these agencies accounted for over 32 percent of the total demand response service operated in the U.S. in terms of vehicle revenue miles. These agencies carried over 27 percent of the nation's demand response riders, and realized over 26 percent of demand response passenger miles.

Exhibit 22

Key Demand Response Operating Characteristics of Individual Agencies 1993

ST	Agency Name	Vehicle Revenue Miles (000s)	Vehicle Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
CA	LA-OCTA	4,024.4	322.6	1,808.8	6.9	9,604.5
FL	Ft. Lauderdale-Bct	2,365.8	197.2	574.1	1.9	5,477.6
FL	Miami-MDTA/Comprehensive	7,364.8	589.2	1,326.3	4.4	8,461.5
HI	Honolulu-HDOT-Mayflower	2,624.5	190.6	462.0	2.3	5,723.5
IL	Chicago-RTA-CTA	6,278.0	N/R	1,167.9	3.8	9,356.6
IL	Chicago-RTA-Pace	6,848.4	420.1	1,524.3	5.9	7,895.9
MA	Fitchburg-MART	1,896.9	112.2	583.7	2.3	4,786.4
PA	Philadelphia-SEPTA	6,099.4	476.3	896.4	3.2	6,391.7
PA	Pittsburgh-PAT/ACCESS	11,789.0	830.5	1,904.8	6.5	10,501.6
TX	Dallas-DART	8,117.1	553.9	925.2	3.1	9,687.1
TX	Houston-Metro	6,038.3	334.6	711.8	2.3	7,045.5
TX	San Antonio-VIA	7,568.8	434.1	885.7	3.0	9,734.9
WA	Seattle-Metro	2,058.4	154.4	480.8	1.8	3,625.1
WI	Milwaukee-Paratransit	4,709.7	401.1	731.6	2.4	3,760.4
WI	Madison-MMT	1,224.9	80.0	217.2	0.7	1,260.7
	Individual Agencies Total	79,008.4	5,096.8	14,200.6	50.6	103,312.8
	Percent of Total Demand Response	32.5%	30.3%	27.4%	16.7%	26.6%

N/R - Not Reported

Exhibit 23 demonstrates that six of these 15 demand response agencies operated more efficiently than the national average in terms of service supplied based on cost per vehicle revenue mile, though nine were more efficient than the national average in terms of cost per vehicle revenue hour. In terms of cost effectiveness of the service consumed, a majority of these agencies were not as effective as the national average based on cost per unlinked passenger trip and per passenger mile. As for the service effectiveness of these agencies, approximately one-half were more effective in terms of unlinked passenger trips per vehicle revenue mile or hour than the national average.

Key Demand Response Performance Indicators of Individual Agencies 1993

Exhibit 23

ST	Agency Name	Operating Expense: Per Vehicle Revenue Mile (VRM)	Operating Expense: Per Vehicle Revenue Hour (VRH)	Operating Expense: Per Unlinked Passenger Trip (UPT)	Operating Expense: Per Passenger Mile (PM)	Passenger Trips: Per Vehicle Revenue Mile (VRM)	Passenger Trips: Per Vehicle Revenue Hour (VRH)	Passenger Miles: Per Vehicle Revenue Hour (VRH)	Vehicle Revenue Miles: Per Vehicle Revenue Hour (MPH)
CA	LA-OCTA	$3.19	$39.80	$7.10	$1.34	0.45	5.61	29.78	12.48
FL	Ft. Lauderdale-Bct	2.51	30.08	10.33	1.08	0.24	2.91	27.78	12.00
FL	Miami-MDTA/Comprehensive	2.28	28.51	12.66	1.98	0.18	2.25	14.36	12.50
HI	Honolulu-HDOT-Mayflower	2.11	29.12	12.01	0.97	0.18	2.42	30.03	13.77
IL	Chicago-RTA-CTA	3.11	N/R	16.70	2.08	0.19	N/R	N/R	N/R
IL	Chicago-RTA-Pace	1.84	29.95	8.25	1.59	0.22	3.63	18.79	16.30
MA	Fitchburg-MART	2.25	37.95	7.30	0.89	0.31	5.20	42.64	16.90
PA	Philadelphia-SEPTA	2.53	32.38	17.20	2.41	0.15	1.88	13.42	12.81
PA	Pittsburgh-PAT/ACCESS	1.68	23.84	10.40	1.89	0.16	2.29	12.65	14.20
TX	Dallas-DART	1.64	24.04	14.39	1.37	0.11	1.67	17.49	14.65
TX	Houston-Metro	1.44	25.97	12.21	1.23	0.12	2.13	21.05	18.04
TX	San Antonio-VIA	1.64	28.55	13.99	1.27	0.12	2.04	22.43	17.44
WA	Seattle-Metro	2.69	35.84	11.51	1.53	0.23	3.11	23.48	13.34
WI	Madison-MMT	2.12	32.51	11.98	2.06	0.18	2.71	15.75	15.30
WI	Milwaukee-Paratransit	1.58	18.61	10.20	1.98	0.16	1.82	9.38	11.74
	Average of Individual Agencies	$2.06	$31.92	$11.46	$1.57	0.18	2.79	20.27	15.50
	Average for Demand Response Mode	$2.22	$32.06	$10.38	$1.39	$0.21	$3.09	23.18	14.48

N/R - Not Reported

Exhibit 24 shows that 3,968 demand response vehicles are operated in maximum service by the 15 agencies presented. This represents 35 percent of all demand response vehicles operated nationally in maximum service.

Key Demand Response Infrastructure Characteristics of Individual Agencies 1993

Exhibit 24

ST	Agency Name	Operating Expense (000s)	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	LA-OCTA	$12,838.0	213	238	4.2
FL	Ft. Lauderdale-Bct	5,929.7	192	197	2.6
FL	Miami-MDTA/Comprehensive	16,795.2	283	283	4.7
HI	Honolulu-HDOT-Mayflower	5,550.4	135	221	2.1
IL	Chicago-RTA-CTA	19,506.4	695	708	2.4
IL	Chicago-RTA-Pace	12,581.4	313	332	3.7
MA	Fitchburg-MART	4,259.5	158	180	5.8
PA	Philadelphia-SEPTA	15,422.6	246	256	1.9
PA	Pittsburgh-PAT/ACCESS	19,801.0	418	476	3.5
TX	Dallas-DART	13,315.6	312	377	2.0
TX	Houston-Metro	8,689.3	208	N/A	N/A
TX	San Antonio-VIA	12,392.9	168	177	3.4
WA	Seattle-Metro	5,531.6	174	408	3.1
WI	Madison-MMT	2,602.2	158	197	3.3
WI	Milwaukee-Paratransit	7,464.1	295	428	6.1
	Individual Agencies Total	$162,679.9	3,968	4,478	3.4
	Total Demand Response Mode	$540,000.0	11,262	15,226	3.8

N/A - Not Applicable

Trolleybus Agencies

Exhibits 25, **26**, and **27** provide data regarding the five trolleybus agencies included in the National Transit Database. This mode consists of rubber tired vehicles supplied with electric power from overhead lines. The mode has remained relatively stable since 1989 in both service supplied and consumed. As seen in **Exhibit 25**, the San Francisco Muni transit agency accounted for nearly 54 percent of vehicle revenue miles operated, over 60 percent of vehicle revenue hours, 68 percent of the trolleybus riders carried, and nearly 62 percent of passenger miles realized.

Exhibit 25

Key Trolleybus Operating Characteristics of Individual Agencies 1993

ST	Agency Name	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	$71,151.0	6,969.7	967.9	81,807.9	258.6	116,138.5
MA	Boston-MBTA	$7,812.2	746.9	66.1	3,123.1	10.7	7,258.2
OH	Dayton-RTA	$7,785.6	1,091.7	105.0	2,430.5	8.4	6,574.4
PA	Philadelphia-SEPTA	$11,585.5	910.6	112.9	11,051.5	37.1	16,246.6
WA	Seattle-Metro	$33,586.8	3,315.5	350.1	22,644.4	74.0	41,607.2
	Total	$131,921.1	13,034.4	1,602.1	121,057.5	388.8	187,824.8

As demonstrated in **Exhibit 26**, San Francisco-Muni is generally the most cost efficient and cost effective of the trolleybus systems, though Dayton also demonstrates a high level of efficiency. Philadelphia attained the highest level of service effectiveness.

Exhibit 26

Key Trolleybus Performance Indicators of Individual Agencies 1993

ST	Agency Name	Operating Expense				Passenger		Passenger	Vehicle
		Per Vehicle Revenue Mile	Per Vehicle Revenue Hour	Per Unlinked Passenger Trip	Per Passenger Mile	Per Vehicle Revenue Mile	Per Vehicle Revenue Hour	Per Vehicle Revenue Hour	Per Vehicle Revenue Hour
CA	San Francisco-Muni	$10.21	$73.51	$0.87	$0.61	11.74	84.52	119.99	7.20
MA	Boston-MBTA	10.46	118.11	2.50	1.08	4.18	47.22	109.73	11.29
OH	Dayton-RTA	7.13	74.13	3.20	1.18	2.23	23.14	62.60	10.39
PA	Philadelphia-SEPTA	12.72	102.59	1.05	0.71	12.14	97.86	143.87	8.06
WA	Seattle-Metro	10.13	95.93	1.48	0.81	6.83	64.68	118.84	9.47
	Average	$10.12	$82.34	$1.09	$0.70	9.29	75.56	117.23	8.14

Exhibit 27 shows that the San Francisco-Muni transit agency operates 54 percent of the trolleybus vehicles operated in maximum service. Seattle-Metro, however, also provides 26 percent of trolleybuses operating in maximum service, and accounts for 28 percent of trolleybus directional route miles, compared to 30 percent for San Francisco-Muni and 26 percent for Dayton.

Key Trolleybus Infrastructure Characteristics of Individual Agencies 1993 **Exhibit 27**

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	119.8	265	343.0	17.0
MA	Boston-MBTA	21.6	23	43.0	18.0
OH	Dayton-RTA	104.5	26	32.0	16.0
PA	Philadelphia-SEPTA	42.5	52	52.0	14.0
WA	Seattle-Metro	112.6	116	165.0	11.1
	Total	401.0	482	635.0	15.2

Ferryboat Agencies

Exhibits 28, **29**, and **30** offer information on the nation's 14 ferryboat agencies included in the National Transit Database. **Exhibit 28** shows that the Washington State Department of Transportation operating in Seattle accounts for over 48 percent of the vehicle revenue miles operated, nearly 44 percent of the vehicle revenue hours operated, realized 30 percent of the unlinked passenger trips made, and realized 43 percent of passenger miles.

Exhibit 28

Key Ferryboat Operating Characteristics of Individual Agencies 1993

ST	Agency Name	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	$1,832.2	79.9	6.3	350.3	1.1	2,387.7
CA	Oakland-Vallejo Transit	2,088.9	71.9	3.4	221.2	0.6	6,857.9
CA	SF-Golden Gate	8,779.0	134.5	11.2	1,466.1	4.7	15,794.2
CT	Hartford-Conn DOT	510.1	9.3	4.9	213.1	0.8	46.8
LA	New Orleans-Cresent City	3,848.6	45.3	22.6	3,908.3	11.2	1,954.1
MA	Boston-MBTA	3,798.9	92.2	7.1	407.3	1.5	5,479.8
ME	Portland-CBL	1,593.9	61.7	12.6	655.5	2.0	2,294.3
NY	New York City DOT	32,430.0	169.5	16.4	17,987.9	61.4	93,536.9
NY	Port Authority-PATH	4,930.0	83.7	9.6	2,325.3	8.9	3,953.0
PR	San Juan-Port Authority	7,346.2	259.0	47.0	1,689.4	4.4	4,093.2
VA	Norfolk-TRT	543.0	12.1	6.1	498.1	1.1	249.0
WA	Bremerton-Kitsap Transit	136.2	15.4	4.6	94.7	0.3	87.3
WA	Seattle-Washington DOT	107,020.0	967.3	120.6	13,008.0	34.7	102,763.6
WA	Tacoma-Pierce Ferry	667.0	31.1	4.9	134.3	0.3	982.4
	Total	$175,524.0	2,032.9	277.1	42,959.6	132.9	240,480.2

Exhibit 29 reflects the high cost of ferryboat service, but also demonstrates its high service effectiveness. The Staten Island Ferry operated by the New York City Department of Transportation realized approximately 106 unlinked passenger trips per mile and over 1,100 unlinked passenger trips per hour.

Exhibit 29

Key Ferryboat Performance Indicators of Individual Agencies 1993

ST	Agency Name	Operating Expense				Passenger		Passenger	Vehicle
		Revenue	Revenue	Passenger	Passenger	Revenue	Revenue	Revenue	Revenue
CA	Oakland-AOFS	22.94	288.81	5.23	0.77	4.39	55.22	376.38	12.59
CA	Oakland-Vallejo Transit	29.07	621.70	9.44	0.30	3.08	65.84	2,041.04	21.39
CA	SF-Golden Gate	$65.25	$784.12	$5.99	$0.56	10.90	130.94	1,410.70	12.02
CT	Hartford-Conn DOT	55.01	105.10	2.39	10.91	22.99	43.92	9.63	1.91
LA	New Orleans-Cresent City	84.97	170.14	0.98	1.97	86.29	172.78	86.39	2.00
MA	Boston-MBTA	41.19	535.36	9.33	0.69	4.42	57.39	772.24	13.00
ME	Portland-CBL	25.83	126.21	2.43	0.69	10.62	51.91	181.67	4.89
NY	New York City DOT	191.31	1,983.36	1.80	0.35	106.11	1,100.11	5,720.56	10.37
NY	Port Authority-PATH	58.87	515.91	2.12	1.25	27.77	243.33	413.67	8.76
PR	San Juan-Port Authority	28.36	156.30	4.35	1.79	6.52	35.94	87.09	5.51
VA	Norfolk-TRT	44.74	89.48	1.09	2.18	41.04	82.09	41.04	2.00
WA	Bremerton-Kitsap Transit	8.85	29.85	1.44	1.56	6.16	20.76	19.13	3.37
WA	Seattle-Washington DOT	110.64	887.46	8.23	1.04	13.45	107.87	852.16	8.02
WA	Tacoma-Pierce Ferry	21.43	136.45	4.97	0.68	4.32	27.48	200.98	6.37
	Average	$86.34	$633.40	$4.09	$0.73	21.13	155.02	867.80	7.34

Exhibit 30 again demonstrates the significance of the Washington State Department of Transportation's ferryboat service in terms of infrastructure. Approximately 35 percent of the vehicles operated in maximum service are accounted for by this agency.

Key Ferryboat Infrastructure Characteristics of Individual Agencies 1993 **Exhibit 30**

ST	Agency Name	Fixed Guideway Directional Route Miles	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
CA	Oakland-AOFS	30.5	3	4	11.8
CA	Oakland-Vallejo Transit	79.6	1	1	8.0
CA	SF-Golden Gate	38.7	4	4	19.8
CT	Hartford-Conn DOT	0.9	2	2	41.0
LA	New Orleans-Cresent City	3.0	5	6	28.2
MA	Boston-MBTA	11.7	7	8	17.0
ME	Portland-CBL	20.0	3	4	20.3
NY	New York City DOT	10.4	4	7	17.4
NY	Port Authority-PATH	3.4	4	5	3.4
PR	San Juan-Port Authority	16.0	6	8	7.0
VA	Norfolk-TRT	1.0	2	3	7.0
WA	Bremerton-Kitsap Transit	3.5	4	5	38.4
WA	Seattle-Washington DOT	245.8	25	25	33.8
WA	Tacoma-Pierce Ferry	11.1	1	2	63.0
	Total	491.6	77	92	22.1

Automated Guideway Agencies

Exhibits 31, **32**, and **33** offer information concerning the three automated guideway agencies operating in Jacksonville, Miami, and Detroit. **Exhibit 31** reflects the fact that Miami and Detroit are comparably sized agencies, though Detroit carried 49 percent of automated guideway passenger trips, accounting for 57 percent of automated guideway passenger miles. Detroit also provided nearly 54 percent of automated guideway vehicle revenue miles and 53 percent of automated guideway vehicle revenue hours.

Exhibit 31

Key Automated Guideway Operating Characteristics of Individual Agencies 1993

ST	Agency Name	Operating Expense (000s)	Vehicle Revenue Miles (000s)	Vehicle Revenue Hours (000s)	Unlinked Passenger Trips (000s)	Average Weekday Unlinked Passenger Trips (000s)	Passenger Miles (000s)
FL	Jacksonville-JTA	$681.3	74.4	5.2	301.5	1.1	175.1
FL	Miami-MDTA	7,639.2	355.7	32.5	2,343.6	8.0	2,522.1
MI	Detroit-DTC	7,485.7	495.6	42.7	2,518.9	7.0	3,579.5
	Total	$15,806.2	925.7	80.4	5,164.0	16.1	6,276.7

Exhibit 32 demonstrates that Jacksonville's automated guideway attained a higher level of service efficiency as evidenced by operating expense per vehicle revenue mile and vehicle revenue hour. In terms of service effectiveness, Miami's automated guideway reflects higher measures of passenger trips per vehicle revenue mile and vehicle revenue hour.

Exhibit 32

Key Automated Guideway Performance Indicators of Individual Agencies 1993

ST	Agency Name	Operating Expense				Passenger		Passenger	Vehicle
		Revenue	Revenue	Passenger	Passenger	Revenue	Revenue	Revenue	Revenue
FL	Jacksonville-JTA	$9.16	$130.39	$2.26	$3.89	4.06	57.70	33.51	14.23
FL	Miami-MDTA	21.48	235.02	3.26	3.03	6.59	72.10	77.60	10.95
MI	Detroit-DTC	15.10	175.23	2.97	2.09	5.08	58.96	83.83	11.61
	Average	$17.07	$196.59	$3.06	$2.52	5.58	64.23	78.07	11.51

Exhibit 33 shows that Miami and Detroit operate similarly with eight vehicles operated in maximum service. Miami, however, operates one more directional route mile of automated guideway than Detroit's system.

Key Automated Guideway Infrastructure Characteristics of Individual Agencies 1993

Exhibit 33

ST	Agency Name	Fixed Guideway Directional Route Miles	Vehicles Operated in Maximum Service	Vehicles Available for Maximum Service	Average Fleet Age
FL	Jacksonville-JTA	1.2	2	2	4.0
FL	Miami-MDTA	3.9	8	16	6.1
MI	Detroit-DTC	2.9	8	8	7.0
	Total	8.0	18.0	26.0	17.1

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Chapter 3
Key Characteristics by Urbanized Areas

Introduction

The previous chapter presented Key Individual Characteristics of several transit modes coupled with their largest transit agencies. Another way of examining the National Transit Database is to consider Urbanized Areas (UZAs). The Federal Transit Administration apportions transit operating assistance to eligible UZAs. In this chapter, which is new to the National Transit Summaries and Trends, data is presented regarding Key Characteristics of Urbanized Areas. This information will be helpful in understanding the data presented in subsequent chapters of the 1993 NTST, which will present various data based on UZA size as well.

Chapter Organization

This chapter provides information about the amount of transit service that exists as it applies to the number of Urbanized Areas, their various sizes and the number of transit agencies that provide some form of transit service. The key characteristics of the various sizes of urbanized areas, the types and number of modes operated and the number of transit agencies reporting transit services are discussed.

Urbanized Area

An Urbanized Area is a unique geographical area with a population of 50,000 or more, as designated by the Department of Commerce's Bureau of the Census. Boundaries are fixed by the Bureau of the Census. UZAs are determined every ten years with each national census. An urbanized area generally consists of one or more cities and surrounding population areas and may include areas in more than one State.

For purposes of the *National Transit Summaries and Trends*, Urbanized Areas are classified into three groups: 50,000 to 199,999 Population; 200,000 to One Million Population; and Over One Million Population.

The profiles by UZA size found in **Exhibits 34, 35,** and **36** depict the U.S. transit industry aggregated from the perspective of small, medium and large UZAs. The information presented herein is designed to show the differing characteristics of transit agencies grouped by UZA size.

Exhibit 34
National Transit Profile for Urbanized Areas With Less Than 200,000 Population 1993

General Information (System Wide)

Service Consumption*	
Annual Passenger Miles	913.9
Annual Unlinked Trips	235.1
Average Weekday Unlinked Trips	0.9
Average Saturday Unlinked Trips	0.4
Average Sunday Unlinked Trips	0.1
Service Supplied	
Annual Vehicle Revenue Miles*	175.1
Annual Vehicle Revenue Hours*	12.7
Total Fleet	7,745
Vehicles Operated in Maximum Service	6,115
Base Period Requirement	2,460

Vehicles Operated in Maximum Service

Directly Operated

	Vehicles	Agencies **
Bus	3,076	163
Light Rail	3	1
Demand Response	932	95
Other	167	7
Total	**4,178**	**266**

Purchased Transportation

	Vehicles	Agencies **
Bus	401	34
Light Rail	0	0
Demand Response	1,527	112
Other	9	2
Total	**1,937**	**148**

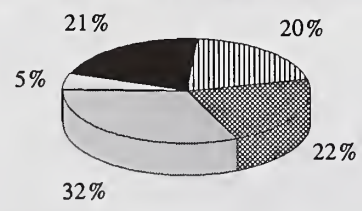
Financial Information (System Wide)

Sources of Operating Funds Expended*	
Passenger Fares	$111.7
Local Funds	168.3
State Funds	114.6
Federal Assistance	102.5
Other Funds	23.4
Total Operating Funds Expended	**$520.5**
Summary of Operating Expenses*	
Salaries/Wages/Benefits	$300.8
Materials & Supplies	56.3
Purchased Transportation	81.6
Other Operating Expenses	65.4
Total Operating Expenses	**$504.2**
Reconciling Cash Expenditures	$9.3
Sources of Capital Funds Expended*	
Local Funds	$17.4
State Funds	18.0
Federal Assistance	54.0
Total Capital Funds Expended	**$89.4**

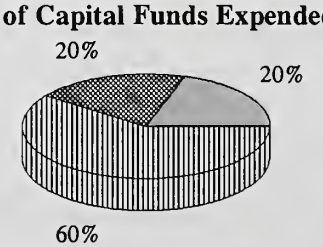
Uses of Capital Funds*

	Rolling Stock	Facilities and Other	Total
Bus	$51.6	$24.5	$76.0
Light Rail	0.1	0.1	0.1
Demand Response	8.4	2.6	11.1
Other	1.5	0.2	1.7
Total	**$61.5**	**$27.5**	**$89.0**

Sources of Operating Funds Expended



Sources of Capital Funds Expended



* Millions

** Number of Transit Agencies reporting this Mode

Exhibit 35
National Transit Profile for Urbanized Areas from 200,000 to 1 Million Population
1993

General Information (System Wide)

Service Consumption*	
Annual Passenger Miles	2,720.8
Annual Unlinked Trips	685.8
Average Weekday Unlinked Trips	2.4
Average Saturday Unlinked Trips	1.2
Average Sunday Unlinked Trips	0.4
Service Supplied	
Annual Vehicle Revenue Miles*	362.5
Annual Vehicle Revenue Hours*	26.0
Total Fleet	14,583
Vehicles Operated in Maximum Service	11,284
Base Period Requirement	5,140

Vehicles Operated in Maximum Service

Directly Operated

	Vehicles	Agencies **
Bus	7,644	97
Heavy Rail	0	0
Commuter Rail	0	0
Light Rail	27	2
Demand Response	875	44
Other	174	10
Total	**8,720**	**153**

Purchased Transportation

	Vehicles	Agencies **
Bus	582	29
Heavy Rail	0	0
Commuter Rail	13	1
Light Rail	0	0
Demand Response	1,868	74
Other	101	5
Total	**2,564**	**109**

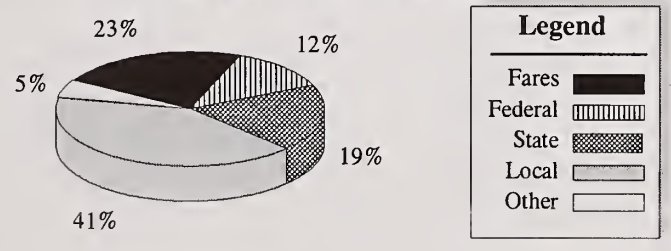
Financial Information (System Wide)

Sources of Operating Funds Expended*	
Passenger Fares	$320.0
Local Funds	588.7
State Funds	273.8
Federal Assistance	168.7
Other Funds	70.0
Total Operating Funds Expended	**$1,421.2**
Summary of Operating Expenses*	
Salaries/Wages/Benefits	$882.5
Materials & Supplies	152.8
Purchased Transportation	111.7
Other Operating Expenses	160.4
Total Operating Expenses	**$1,307.4**
Reconciling Cash Expenditures	$41.7
Sources of Capital Funds Expended*	
Local Funds	$57.4
State Funds	58.4
Federal Assistance	242.9
Total Capital Funds Expended	**$358.8**

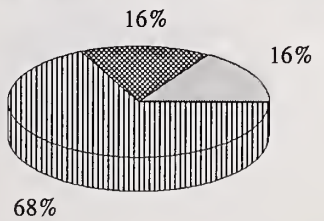
Uses of Capital Funds

	Rolling Stock	Facilities and Other	Total
Bus	$127.8	$95.5	$223.3
Heavy Rail	0.0	19.5	19.5
Commuter Rail	0.0	64.3	64.3
Light Rail	0.0	10.4	10.4
Demand Response	15.3	7.9	23.2
Other	5.0	0.0	17.9
Total	**$143.1**	**$197.7**	**$340.8**

Sources of Operating Funds Expended



Sources of Capital Funds Expended



* Millions

** Number of Transit Agencies reporting this Mode

Exhibit 36
National Transit Profile for Urbanized Areas With Over 1 Million Population
1993

General Information (System Wide)

Service Consumption*

Annual Passenger Miles	32,590.1
Annual Unlinked Trips	6,511.9
Average Weekday Unlinked Trips	21.7
Average Saturday Unlinked Trips	11.0
Average Sunday Unlinked Trips	7.2

Service Supplied

Annual Vehicle Revenue Miles*	2,055.7
Annual Vehicle Revenue Hours*	136.3
Total Fleet	65,964
Vehicles Operated in Maximum Service	52,908
Base Period Requirement	24,565

Vehicles Operated in Maximum Service

Directly Operated

	Vehicles	Agencies **
Bus	29,863	92
Heavy Rail	8,187	14
Commuter Rail	3,755	9
Light Rail	743	14
Demand Response	810	46
Other	1,275	19
Total	**44,633**	**194**

Purchased Transportation

	Vehicles	Agencies **
Bus	2,475	55
Heavy Rail	0	0
Commuter Rail	446	9
Light Rail	0	0
Demand Response	5,250	67
Other	104	12
Total	**8,275**	**143**

Financial Information (System Wide)

Sources of Operating Funds Expended*

Passenger Fares	$5,685.3
Local Funds	4,408.5
State Funds	3,086.7
Federal Assistance	641.9
Other Funds	993.8
Total Operating Funds Expended	**$14,816.2**

Summary of Operating Expenses*

Salaries/Wages/Benefits	$10,418.4
Materials & Supplies	1,214.7
Purchased Transportation	674.3
Other Operating Expenses	1,353.6
Total Operating Expenses	**$13,661.1**
Reconciling Cash Expenditures	$904.5

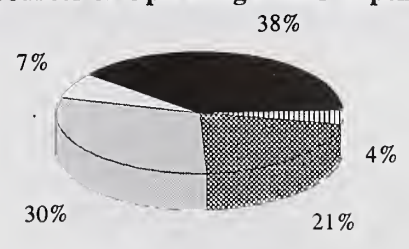
Sources of Capital Funds Expended*

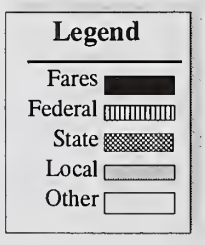
Local Funds	$1,958.6
State Funds	1,240.3
Federal Assistance	2,086.6
Total Capital Funds Expended	**$5,285.5**

Uses of Capital Funds*

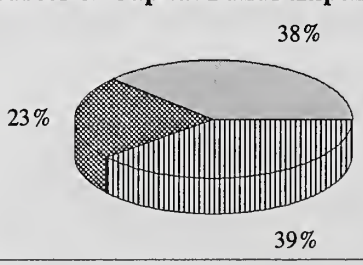
	Rolling Stock	Facilities and Other	Total
Bus	$563.3	$639.0	$1,202.3
Heavy Rail	409.1	1,476.6	1,885.7
Commuter Rail	266.1	1,314.7	1,580.7
Light Rail	46.4	407.3	453.7
Demand Response	24.4	10.0	34.5
Other	35.7	90.8	126.5
Total	**$1,309.3**	**$3,847.6**	**$5,156.9**

Sources of Operating Funds Expended





Sources of Capital Funds Expended



* Millions

** Number of Transit Agencies reporting this Mode

It is clear from the information presented that large UZAs (those with over one million population) by far dominate the transit industry in service supplied and consumed as well as capital investment and operating expenses. This is certainly not surprising given that the very nature of transit service in these UZAs is to transport large numbers of people. Agencies in large UZAs provide 80 percent of vehicle revenue miles of service operated, account for 88 percent of all unlinked passenger trips made, realize 90 percent of all passenger miles accumulated, receive 84 percent of all Federal financial assistance made available to transit for operating expenses and capital investment, and account for one-third of the agencies reporting. What does become apparent in these exhibits is the shift away from capital investment in bus expenditures (as a percentage of capital funding) to greater investment in fixed guideway by agencies in large UZAs. Again, this is not unexpected, as the greater population densities found in large UZAs justify the substantial capital expenditures made to build and maintain fixed guideway systems.

The Bureau of the Census has designated 405 Urbanized Areas within the United States, District of Columbia, and Puerto Rico (396 and 9, respectively), as reflected in **Exhibit 37**. Of these, 334 or 82.3 percent have reported some form of transit service being provided. Depending on the size of the Urbanized Area, the number of UZAs reporting declines as UZAs become smaller. The largest UZAs all have transit service provided. The 90 UZAs with populations ranging between 200,000 and one million population have transit service in all but one UZA (McAllen-Edinburg-Mission, Texas). Three others (Trenton, NJ-PA; Ogden, UT; and Provo, UT) are reported served by transit agencies that primarily operate within other UZAs. The smallest UZAs have 211 or 74.8 percent out of a possible 281 UZAs reporting. In addition, the number of transit providers in a UZA tend to be more numerous in the largest UZAs and less numerous in the smaller UZAs. The vast majority of UZAs are reported by only one transit agency.

Number of Urbanized Areas Reporting Per Urbanized Area Size **Exhibit 37**
1993

Urbanized Area Size	Number of UZAs per 1990 Census	Number of UZAs Reporting	Number of Agencies* Reporting
Under 200,000 Population	281	211	374
200,000 to 1 Million Population	90	89	262
Over 1 Million Population	34	34	336
Total	405	334	636
50 States and District of Columbia	396	333	969
Puerto Rico	9	1	3

* Number of Transit Agencies reporting by individual mode.

The geographic boundaries of Urbanized Areas may extend beyond any one State. Some of the largest Urbanized Areas cover multi-state jurisdictions, such as Northeastern New Jersey and New York for the metropolitan New York City Area. Similarly, Chicago's Urbanized Area extends into Indiana while Philadelphia's extends into New Jersey and Delaware. **Exhibit 38** provides a summary of the three classifications of Urbanized Areas by the number of States that they comprise. The exhibit indicates that 86.9 percent

Exhibit 38

Multiple State Urbanized Areas
1993

Urbanized Areas	UZAs	50,000 to 199,999	200,000 to 1 Million	Over 1 Million
Within One State	352	253	73	26
Within Two States	46	24	15	7
Within Three States	6	4	1	1
Within Four States	1	-	1	-
Total	405	281	90	34

of the UZAs do not extend beyond a state line. The Wilmington, Delaware UZA is unique in that it extends to three other States beyond Delaware. These States are Maryland, New Jersey and Pennsylvania.

Exhibit 39 indicates that transit agencies with the largest infrastructures intended primarily to support rail systems are almost all located in the largest UZAs. This is because of several factors, not the least of which is a large population base that can support these modes. Along with a large population are high density development and well-defined transportation corridors, which can make rail modes extremely attractive. Of the three rail modes specifically identified in this exhibit, only four transit agencies provide some form of rail service that operate in UZAs of less than one million population. Most UZAs are served by a combination of bus and demand response transit agencies as they tend to be less capital intensive and are more flexible in serving areas of lower population density.

Exhibit 39

Number of Urbanized Areas Reporting by Mode and Type of Service
1993

UZA Size		Modes Reported and Type of Service					
		MB	HR	CR	LR	DR	Other
Under 200,000 Population	DO	163	0	0	1	95	7
	PT	34	0	0	0	112	2
Total		197	0	0	1	207	9
200,000 to 1 Million Population	DO	97	0	0	2	44	10
	PT	29	0	1	0	74	5
Total		126	0	1	2	118	15
Over 1 Million Population	DO	92	14	9	14	46	19
	PT	55	0	9	0	67	12
Total		147	14	18	14	113	31
	DO	352	14	9	17	185	36
	PT	118	0	10	0	253	19
Total		470	14	19	17	438	55

The number of UZAs reporting has continued to increase due to the 1990 Census when the number of UZAs increased by 10.4 percent from 367 to 405. **Exhibit 40** documents this growth.

Number of Urbanized Areas Reporting
1989-1993

Exhibit 40

	1989*	1990	1991	1992	1993
Under 200,000 Population	189	194	194	197	211
200,000 to 1 Million Population	86	89	89	89	89
Over 1 Million Population	30	34	34	34	34
UZAs Reporting	275	283	283	286	300
UZAs Not Reporting	62	88	88	85	71
Total UZAs	337	371	371	371	371

* 1989 Data based on 1980 Census

Exhibits 41 through 43 indicate the modes of services provided by transit agencies since 1989 in each of the three UZA size classifications. The growth in the number of modes of service in each category of Urbanized Area size reflects in part the continuation of the Federal Transit Administration's capital participation and the number of new starts that have occurred.

Number of Urbanized Areas Reporting by Mode
(Less Than 200,000 Population)
1993

Exhibit 41

Mode	1989*	1990	1991	1992	1993
Bus	173	172	174	180	187
Heavy Rail	0	0	0	0	0
Commuter Rail	0	0	0	0	0
Light Rail	1	1	1	1	1
Demand Response	139	149	157	166	183

* 1989 Data based on 1980 Census

Number of Urbanized Areas Reporting by Mode
(200,000 to One Million Population)
1993

Exhibit 42

Mode	1989*	1990	1991	1992	1993
Bus	84	89	89	89	89
Heavy Rail	0	0	0	0	0
Commuter Rail	6	7	7	7	8
Light Rail	1	1	1	1	2
Demand Response	76	82	83	85	85

* 1989 Data based on 1980 Census

Exhibit 43

Number of Urbanized Areas Reporting by Mode
(Over One Million Population)
1993

Mode	1989*	1990	1991	1992	1993
Bus	30	34	34	34	34
Heavy Rail	10	10	10	11	11
Commuter Rail	13	12	11	12	12
Light Rail	12	12	14	15	15
Demand Response	25	30	30	32	33

* 1989 Data based on 1980 Census

Chapter 4
Capital Funding

Introduction

Capital investment in the transit industry has continued to increase each year since 1989. Such investment grew by over eight percent on average each year between 1989 and 1993, with capital investment between 1992 and 1993 showing a comparable increase of approximately 8.5 percent. The significant transit infrastructure in place in the U.S., along with that under development, continued to require commitments of funds for rehabilitation and construction of fixed guideway systems and facilities, as well as the purchase and restoration of vehicles.

Chapter Organization

This chapter begins with a review of the sources of capital funding. It then discusses the uses of capital funds by mode and category of use. Finally, information concerning uses of capital funds for individual systems is presented for each mode.

Sources of Capital Funds

Federal capital assistance continues to be the single largest source of funds for capital investment in transit infrastructure. Of the over $5.7 billion used in 1993 for capital investment in transit infrastructure expansion and rehabilitation, Federal assistance accounts for nearly 42 percent. Local funds represent 35 percent and State funding contributes 23 percent of the available capital assistance. **Exhibit 44** shows that while capital investment has increased since 1989, Federal assistance remained relatively stable in the amount of dollars contributed to transit infrastructure, though from 1992 to 1993, Federal capital assistance decreased by 22 percent. In 1989, Federal assistance accounted for 60 percent of capital funding, while local funds represented 24 percent and state funding provided 16 percent. Local funding for capital investment increased by almost seven percent from 1992 to 1993. State funding increased by 69 percent from 1992 to 1993.

Distribution of Capital Funds by UZA Size and Source

Urbanized areas (UZAs) with more than one million population account for nearly $5.3 billion, or over 92 percent, of the capital investment made in the transit infrastructure in 1993. This is because of the substantial fixed guideway systems in place or being developed in the nation's large metropolitan areas, as well as the large fleets of vehicles required to maintain such significant capital assets and accommodate the needs of passengers as well as providing sophisticated signaling and control systems and maintenance facilities.

Exhibit 44

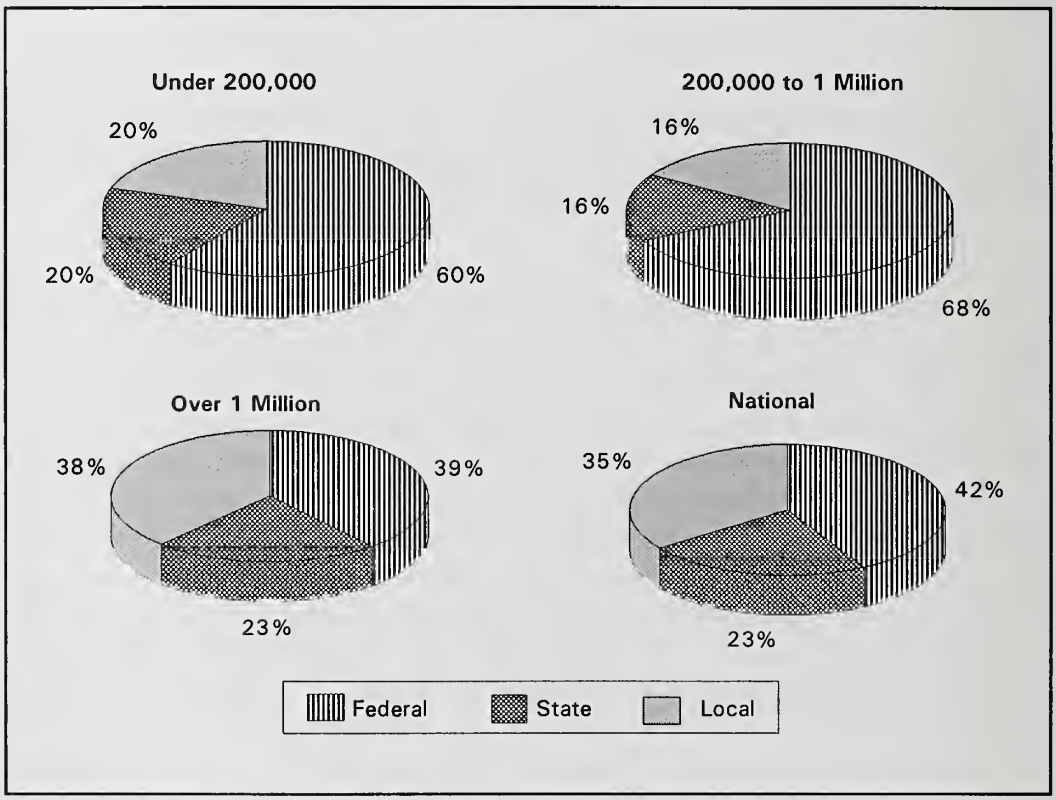
Sources of Capital Funds
(Millions)
1989-1993

	1989	1990	1991	1992	1993
Federal	$2,248.1	$2,636.3	$2,545.0	$2,598.7	$2,383.5
State	623.2	644.6	638.1	777.7	1,316.7
Local	896.0	1,254.6	1,914.2	1,906.2	2,033.4
Total	$3,767.3	$4,535.5	$5,097.3	$5,282.6	$5,733.6

As presented in **Exhibit 45**, large UZAs rely more heavily than mid-size and small UZAs on local funding sources to meet capital needs. Because of the substantial investment needed to maintain their transit infrastructures, large UZAs must commit more monies from local resources than do mid-sized and small UZAs, which have far less transit infrastructure.

Exhibit 45

Distribution of Capital Funds by UZA Size and Source
1993



Uses of Capital Funds

For the 1993 Report Year, transit agencies identified uses of capital funds by mode and category of use. The two categories of use are rolling stock, and facilities and other capital expenditures.

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

Facilities and other capital expenditures include everything not related to rolling stock. It includes items such as construction and rehabilitation of maintenance facilities; crime prevention and security equipment; track; line equipment and structures; signals and communications; power equipment and substations; transit malls; transfer facilities; intermodal terminals; shelters; passenger stations; depots; terminals; high-occupancy vehicle (HOV) facilities; transit ways; park-and-ride facilities; bus diagnostic equipment; real-time data acquisition systems; computer hardware and software; and, fare collection equipment.

Exhibit 46 outlines the uses of capital funds by mode and category of use. Nearly 73 percent of transit's capital investment is in the form of facilities and other capital expenditures, whereas only 27 percent is expended for rolling stock. Nearly 50 percent of capital investment in the bus mode is dedicated to rolling stock. Demand response demonstrates 70 percent of capital investment in rolling stock, and a substantially smaller investment of 30 percent in facilities and other capital expenditures. Bus relies heavily on its revenue vehicles remaining operable, serving riders in a variety of climate and traffic conditions. Buses operate over relatively large geographic areas with many dispersed sites where passengers board and alight. Thus, bus agencies are not necessarily required to provide extensive passenger facilities. Rolling stock is a fundamental element of bus service while the facilities required beyond vehicle maintenance facilities, such as passenger shelters, park-and-rides, and transfer facilities do not demand equally substantial investments. In addition, investments in equipment related to vehicle movement control and other real-time data acquisition systems do not represent a large percentage of the capital invested in buses. For demand response systems, revenue vehicles are also the fundamental capital element with facilities and other capital expenditures playing a minor role in the utilization of capital funds.

The emphasis on investment in facilities and other capital expenditures is most evident upon review of the rail modes. Seventy-eight percent of the capital investment by heavy rail systems is in facilities and other capital expenditures, while these account for 84 percent of commuter rail capital investment and 90 percent of light rail investment. Again, the nature of rail systems drives the categories of use for which capital investment is required. Passenger facilities in the form of stations, depots, intermodal transfer facilities, and parking facilities require an investment far more substantial for rail modes because of the collection of large groups of riders at selected boarding/alighting sites, typically during finite periods of demand for rail service. The need for a specially equipped right-of-way with tracks and wayside equipment requires even greater investment in facilities by the rail modes. Also, the high level of technology involved in the safe and efficient movement of trains, and the necessary physical structures required to power the trains, also demand substantial and continuing investment.

Uses of Capital Funds by Mode
(Millions)
1993

Exhibit 46

	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	Total
Rolling Stock	$742.6	$409.1	$266.1	$46.5	$48.1	$42.1	$1,554.5
Facilities	554.7	762.6	1,161.1	243.6	9.3	72.4	$2,803.7
Other Capital	204.1	733.5	217.9	174.2	11.4	31.6	$1,372.8
Total	$1,501.5	$1,905.2	$1,645.1	$464.3	$68.7	$146.1	$5,731.0

Exhibit 47 demonstrates the largest 20 users of capital funds and reflects the substantial investment in facilities and other capital expenditures for rail modes. These 20 transit agencies accounted for 76 percent of capital spending in 1993.

Exhibit 47

Twenty Largest Users of Capital Funds
(Thousands)
1993

ST	Agency Name	Rolling Stock	Facilities and Other	Total
CA	LA-LACMTA	$160,353	$63,486	$223,839
CA	LA-OCTA	2,839	124,097	$126,936
CA	LA-SCRRA	45,817	184,499	$230,316
CA	San Diego-NCTD	9,913	82,346	$92,259
CA	San Francisco-BART	28,702	189,918	$218,620
CA	SF-CALTRANS	0	210,855	$210,855
CO	Denver-RTD	12,217	106,727	$118,943
DC	Washington-WMATA	105,740	155,814	$261,555
GA	Atlanta-MARTA	7,172	82,480	$89,653
IL	Chicago-RTA-CTA	100,206	129,596	$229,802
IL	Chicago-RTA-Metra	75,369	135,416	$210,784
MA	Boston-MBTA	42,777	192,657	$235,434
MD	Baltimore-Maryland-MTA	19,632	101,488	$121,121
MO	St. Louis-Bi-State	28,710	128,459	$157,169
NJ	New Jersey Transit	87,071	120,273	$207,344
NY	NY-MTA-Long Island RR	4,666	175,876	$180,542
NY	NY-MTA-Metro North RR	12,509	95,524	$108,033
NY	NY-MTA-NYCTA	144,807	764,580	$909,387
PA	Philadelphia-SEPTA	58,002	195,625	$253,627
TX	Houston-Metro	73,379	115,894	$189,272
	Total	$1,019,881	$3,355,611	$4,375,492

Exhibit 48

Uses of Bus Capital Funds by Individual Agencies
(Thousands)
1993

ST	Agency Name	Rolling Stock	Facilities and Other	Total
CA	LA-LACMTA	$73,342.9	$37,532.3	$110,875.2
CA	Oakland-AC Transit	12,525.8	$1,104.7	$13,630.5
CO	Denver-RTD	9,572.2	$48,883.7	$58,455.8
DC	Washington-WMATA	17,228.4	$17,546.9	$34,775.3
FL	Miami-MDTA	16,051.7	$8,512.8	$24,564.5
IL	Chicago-RTA-CTA	6,081.9	$48,805.3	$54,887.2
MA	Boston-MBTA	29,910.4	$44.9	$29,955.3
MD	Baltimore-Maryland-MTA	1,649.2	$7,074.9	$8,724.2
MN	Minneapolis-St. Paul-MTC	1,321.4	$11,714.0	$13,035.4
NJ	New Jersey Transit	3,401.8	$36,799.3	$40,201.1
NY	NY-MTA-NYCTA	58,798.3	$64,281.5	$123,079.8
PA	Philadelphia-SEPTA	25,494.4	$7,474.2	$32,968.5
PA	Pittsburgh-PAT	21,824.7	$23,481.6	$45,306.2
TX	Houston-Metro	73,378.8	$112,371.9	$185,750.7
WA	Seattle-Metro	8,766.4	$21,838.0	$30,604.4
	Total	$359,348.0	$447,466.1	$806,814.1
	Percent of National Bus Total	48.4%	59.0%	53.7%

Exhibits 48 through **54** provide capital investment information for individual transit modes by category of use except for demand response. The 15 largest bus systems found in **Exhibit 48** reflect a significant investment of their capital funds in facilities and other expenditures, accounting for nearly 59 percent of the total national capital investment for this capital expenditure category.

Exhibit 49

Uses of Heavy Rail Capital Funds by Individual Agencies
1993

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000's)	Total (000s)
CA	LA-LACMTA	$87,010.1	$25,528.6	$112,538.7
CA	San Francisco-BART	28,701.9	189,917.8	$218,619.7
DC	Washington-WMATA	88,512.0	138,267.4	$226,779.4
FL	Miami-MDTA	0.0	5,510.3	$5,510.3
GA	Atlanta-MARTA	175.0	70,838.3	$71,013.2
HI	Honolulu-DTS	0.0	19,547.2	$19,547.2
IL	Chicago-RTA-CTA	94,124.3	80,790.9	$174,915.1
MA	Boston-MBTA	6,725.5	72,824.0	$79,549.4
MD	Baltimore-Maryland-MTA	532.4	56,132.3	$56,664.8
NY	NY-MTA-NYCTA	86,008.6	700,298.3	$786,306.9
NY	NY-MTA-Staten Island	0.0	4,807.2	$4,807.2
NY	Port Authority-PATH	0.0	44,718.0	$44,718.0
NY	NY-Hauppage-Suffolk Transit	0.0	3,790.8	$3,790.8
OH	Cleveland-RTA	23.0	11,709.0	$11,731.9
PA	Philadelphia-SEPTA	16,388.5	68,535.3	$84,923.8
PA	Philadelphia-PATCO	927.8	2,902.5	$3,830.2
	Total	$409,128.9	$1,496,117.7	$1,905,246.6

Exhibit 50

Uses of Commuter Rail Capital Funds by Individual Agencies
1993

ST	Agency Name	Rolling Stock* (000s)	Facilities and Other (000s)	Total (000s)
CA	LA-OCTA	$0.0	$113,110.0	$113,110.0
CA	LA-SCRRA	45,817.2	184,498.8	$230,316.0
CA	San Diego-NCTD	4,198.9	79,842.6	$84,041.5
CA	San Jose-SCCTD	0.0	16,685.2	$16,685.2
CA	SF-CALTRANS	0.0	210,854.7	$210,854.7
CT	Hartford-Conn DOT	0.0	64,302.0	$64,302.0
FL	Ft. Lauderdale-TCRA	1,167.0	677.0	$1,844.0
IL	Chicago-RTA-Metra	75,368.5	135,415.9	$210,784.5
IN	NW IN-NICTD	1,771.8	2,394.8	$4,166.6
MA	Boston-MBTA	4,500.2	84,256.0	$88,756.1
MD	Baltimore-Maryland-MTA	7,802.2	13,185.8	$20,988.0
NJ	New Jersey Transit	81,677.0	83,474.1	$165,151.1
NY	NY-MTA-Long Island RR	4,666.0	175,876.3	$180,542.3
NY	NY-MTA-Metro North RR	12,509.1	95,524.1	$108,033.1
PA	Philadelphia-Penn DOT	0.0	0.0	$0.0
PA	Philadelphia-SEPTA	11,941.7	114,374.4	$126,316.1
TX	Houston-Metro	0.0	1,410.0	$1,410.0
VA	VA-VRE	14,651.4	3,071.5	$17,722.9
	Total	$266,071.1	$1,378,953.2	$1,645,024.3

* Rolling stock has been adjusted by $29.0

Exhibit 51

Uses of Light Rail Capital Funds by Individual Agencies 1993

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	LA-LACMTA	$0.0	$0.0	$0.0
CA	Sacramento-RT	$9.3	$5,719.1	5,728.4
CA	San Diego- The Trolley	0.0	0.0	0.0
CA	San Francisco-Muni	4,558.9	25,591.0	30,609.9
CA	San Jose-SCCTD	0.0	17,691.6	17,691.6
CO	Denver-RTD	2,220.2	57,834.9	60,055.1
DE	Wilmington-WTA	0.0	3.1	3.1
LA	New Orleans-RTA	4,185.3	0.0	4,185.3
MA	Boston-MBTA	1,641.0	31,316.6	32,957.7
MD	Baltimore-Maryland-MTA	9,648.3	25,095.4	34,743.8
MO	St. Louis-Bi-State	17,231.1	125,753.4	142,984.5
NC	Charlotte-CTS	0.0	162.4	162.4
NJ	New Jersey Transit	1,992.0	0.0	1,992.0
NY	Buffalo-NFTA	0.0	114.1	114.1
OH	Cleveland-RTA	15.5	2,486.5	2,501.9
OR	Portland-Tri-Met	694.6	43,561.3	44,255.9
PA	Philadelphia-SEPTA	4,177.7	5,171.8	9,349.5
PA	Pittsburgh-PAT	0.0	8,833.4	8,833.4
TN	Memphis-MATA	0.0	9,971.2	9,971.2
TX	Austin-Capital Metro	0.0	164.1	164.1
TX	Dallas-DART	0.0	49,686.7	49,686.7
TX	Galveston-Island Transit	53.3	92.3	145.7
WA	Seattle-Metro	32.1	8,119.6	8,151.7
	Total	$46,459.4	$417,828.4	$464,287.9

Exhibit 52

Uses of Trolleybus Capital Funds by Individual Agencies 1993

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	San Francisco-Muni	$5,151.0	$5,387.3	$10,538.2
MA	Boston-MBTA	0.0	$0.0	$0.0
OH	Dayton-RTA	635.3	$3,926.6	$4,561.9
PA	Philadelphia-SEPTA	0.0	$69.4	$69.4
WA	Seattle-Metro	579.2	$3,080.3	$3,659.5
	Total	$6,365.5	$12,463.6	$18,829.1

Uses of Ferryboat Capital Funds by Individual Agencies
1993

Exhibit 53

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	Oakland-AOFS	$439.8	$67.8	$507.6
CA	Oakland-Vallejo Transit	0.0	$0.0	$0.0
CA	SF-Golden Gate	0.0	$684.8	$684.8
CT	Hartford-Conn DOT	0.0	$0.0	$0.0
LA	New Orleans-Cresent City	74.4	$270.8	$345.2
MA	Boston-MBTA	0.0	$0.0	$0.0
MA	Bremerton-Kitsap Transit	0.0	$0.0	$0.0
NY	New York City DOT	9.5	$15,101.5	$15,111.1
NY	Port Authority-PATH	0.0	$0.0	$0.0
OR	Portland-CBL	533.0	$47.1	$580.1
PR	San Juan-Port Authority	0.0	$3,683.5	$3,683.5
VA	Norfolk-TRT	0.0	$0.0	$0.0
WA	Seattle-Washington DOT	23,422.0	$35,724.3	$59,146.3
WA	Tacoma-Pierce Ferry	3,184.6	$2.8	$3,187.4
	Total	$27,663.3	$55,582.7	$83,246.0

Uses of Automated Guideway Capital Funds by Individual Agencies
1993

Exhibit 54

ST	Agency Name	Rolling Stock (000s)	Facilities and Other (000s)	Total (000s)
CA	LA-LACMTA	$0.0	$425.5	$425.5
FL	Jacksonville-JTA	3.8	$7,315.7	$7,319.5
FL	Miami-MDTA	1,875.8	$21,755.0	$23,630.8
MI	Detroit-DTC	0.0	$0.0	$0.0
	Total	$1,879.6	$22,862.8	$31,375.8

Current Infrastructure: Fixed Guideway Characteristics

Exhibit 55 reflects the amount of fixed guideway segment miles by mode and demonstrates the continuing investment in the development and operation of fixed guideway systems. For the bus mode, 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 30 percent since 1991. Bus fixed guideway segment miles reported are for the actual segments being operated. Many bus fixed guideway segments are utilized by more than one transit agency. Each transit agency is required to report their operation on each segment. However, the exhibit only includes the actual segments as measured in miles. Prior to 1991, this data was reported in a manner that did not avoid double counting. Therefore, this exhibit includes the period 1991 through 1993 and it will be continued in subsequent editions of *NTST* from 1991.

For the rail modes, increases were reported for heavy rail and commuter rail. These increases reflect new starts and the expansion of existing systems with the opening of new segments. Heavy rail indicates an increase of less than one percent even though new system starts and expansions were occurring during the period. The increase in commuter rail is more noticeable as it increased by 16.2 percent with new system starts in California and Virginia. Light rail on the other hand reported a reduction even with several new system starts taking place during the period. The decrease was 3.3 percent. Some light rail lines in Philadelphia were discontinued, which offset increases from new system starts.

Exhibit 55

Fixed Guideway Miles by Mode
(Actual Segments)
1991-1993

Mode	1991	1992	1993
Bus*	712.2	790.2	925.6
Heavy Rail	1,368.7	1,403.2	1,451.7
Commuter Rail	5,056.3	5,306.7	5,875.1
Light Rail	556.0	562.9	537.4
Demand Response	-	-	-
Other - Ferryboat	454.1	459.0	475.6
- Trolleybus	375.9	394.5	405.2
- All other	24.1	20.7	21.7
Total	8,547.3	8,937.2	9,692.3

* Exclusive plus Controlled Access Rights-of-Way.

Exhibit 56

Miles of Fixed Guideway Segments Utilized by Selected Bus Systems*
1993

ST	System Name	Exclusive Directional Route Miles	Controlled Access Directional Route Miles	Total Fixed Directional Route Miles	Segments or Portions Thereof Utilized by other Transit Agencies
AZ	Phoenix-Phoenix TS/ATC	76.9	-	76.9	
CA	LA-LACMTA/SCRTD	24.5	-	24.5	X
CA	San Jose-SCCTD	-	106.4	106.4	
CA	SF-Golden Gate	-	20.5	20.5	
CT	Hartford-CT Transit	27.4	-	27.4	X
DC	Washington-WMATA	-	45.9	45.9	X
FL	Miami-MDTA	-	22.3	22.3	X
HI	Honolulu-DTS	1.2	20.0	21.2	
MN	Minneapolis-St. Paul-MTC	19.0	35.4	54.4	
NY	NY-MTA-NYCTA	2.6	36.2	38.8	X
PA	Pittsburgh-PAT	41.3	-	41.3	X
PR	San Juan-MBA	17.1	-	17.1	X
TX	Houston-Metro	108.5	4.0	112.5	X
VA	Norfolk-TRT	-	27.1	27.1	
WA	Seattle-Metro	82.0	5.4	87.4	X
	Subtotal	400.5	323.2	723.7	
	All Other Systems	50.6	151.3	201.9	
	Total	451.1	474.5	925.6	

* Transit agencies with the greatest amount of total fixed guideway directional route miles.

The 15 bus systems with the greatest amount of fixed guideway segment miles are displayed in **Exhibit 56** above and account for almost 78.2 percent of fixed guideway segment miles. One reason for the growth in bus fixed guideway segments is the inclusion of high occupancy vehicle lanes in urban freeway designs and construction. Also, some fixed guideway applications such as controlled access rights-of-way can be implemented with minimal capital investment.

Vehicle Availability

Exhibit 57 shows the number of vehicles available in maximum service by mode and type of service. In addition, the number of vehicles that meet the Americans with Disabilities Act (ADA) accessibility requirements are provided by mode and type of service. The use of purchased transportation is evident in bus and especially in demand response, where over 78 percent of the vehicles available in maximum service are operated by purchased transportation providers.

Vehicles Available for Maximum Service and ADA Accessible by Mode and Type of Service 1993

Exhibit 57

Modes/Type of Service	Vehicles	ADA Accessible Vehicles	Percent Available
Buses			
Directly Operated	49,880	25,505	54.1
Purchased Transportation	4,311	1,959	45.4
Total	54,191	27,464	50.7
Heavy Rail			
Directly Operated	10,282	8,072	78.5
Purchased Transportation	-	-	-
Total	10,282	8,072	78.5
Commuter Rail			
Directly Operated	4,349	804	18.5
Purchased Transportation	632	176	27.8
Total	4,981	980	19.7
Light Rail			
Directly Operated	1,001	517	51.6
Purchased Transportation	-	-	-
Total	1,001	517	51.6
Demand Response			
Directly Operated	3,307	2,371	71.7
Purchased Transportation	11,919	5,952	49.9
Total	15,226	8,323	54.7
Other			
Directly Operated	2,306	342	14.8
Purchased Transportation	305	34	11.1
Total	2,611	376	14.4

Spare Ratio

Exhibit 58 reflects the relative stability of spare ratios for each mode since 1989. Demand response displays the highest spare ratio of the modes at 35.1 percent, while commuter rail has the lowest at 18.2 percent. Bus, heavy rail, and light rail are at 23.0 percent, 25.6 percent, and 28.8 percent, respectively.

Spare Ratio by Mode for Directly Operated Service 1989-1993

Exhibit 58

Mode	1989	1990	1991	1992	1993
Bus	22.1%	23.0%	24.1%	22.5%	23.0%
Heavy Rail	26.4	23.6	25.5	25.1	25.6
Commuter Rail	19.6	16.7	16.9	17.6	18.2
Light Rail	31.5	35.6	25.3	32.4	28.8
Demand Response	37.4	24.7	25.4	25.5	35.1

Average Fleet Age

Exhibit 59 indicates that since 1989, the average fleet age for four of the five major transit modes has declined significantly. For bus, commuter rail, light rail, and demand response average fleet age has declined by 1.7, 1.2, 2.7 and 1.3 years, respectively. Bus, which has the largest number of vehicles, experienced a decline from an average of 10 years in 1989 to 8.3 years in 1993. Demand response, which has the second highest number of vehicles among the major modes, experienced a decline from five years in 1989 to 3.7 years in 1993. Commuter rail indicated a decline from 20 years to 18.8 years during this period. Light rail's average fleet age declined from 17 years in 1989 to 14.3 in 1993. The other major mode, heavy rail, experienced a slight increase from 17 years in 1989 to 17.8 in 1993.

Exhibit 59

Average Fleet Age by Mode for Directly Operated Service
1993

Mode	1989	1990	1991	1992	1993
Bus	10.0	9.0	8.0	8.3	8.3
Heavy Rail	17.0	17.0	17.0	17.8	17.8
Commuter Rail	20.0	18.0	17.0	18.5	18.8
Light Rail	17.0	16.0	16.0	17.1	14.3
Demand Response	5.0	4.0	4.0	3.4	3.7

Non-Fixed Guideway Vehicles

Exhibit 60 indicates that over 88 percent of vehicles operated in bus service are high-capacity coaches seating more than 35 passengers. In contrast, about 44 percent of demand response vehicles are vans, while over 35 percent are automobiles. Also, more than 93 percent of bus mode vehicles are directly operated, while over 78 percent of demand response vehicles are operated by purchased transportation providers.

Exhibit 60

Non-Fixed Guideway Vehicles by Vehicle Type, Mode, and Type of Service
1993

Vehicle Type	Bus		Demand Response	
	Directly Operated	Purchased Transportation	Directly Operated	Purchased Transportation
Class A Bus (>35 Seats)	46,153	2,545	91	21
Class B Bus (25-35 Seats)	3,204	416	109	53
Class C Bus (<25 Seats)	1,010	444	1,334	1,482
Articulated Bus	1,872	3	4	0
School Bus	0	87	37	76
Van	71	92	1,652	4,990
Automobile	0	19	74	5,229
Total	52,310	3,606	3,301	11,851

Exhibit 61 demonstrates that, while other forms of propulsion are growing in acceptance, diesel fuel-powered vehicles and gasoline-powered vehicles still account for 83 percent and 14 percent, respectively, of 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 three percent.

Non-Fixed Guideway Vehicles by Vehicle Type and Propulsion
1993

Exhibit 61

Vehicle Type	Diesel Fuel	Gasoline	Other Fuels	Total
Class A Bus (>35 Seats)	47,691	26	1,089	48,806
Class B Bus (25-35 Seats)	3,604	58	120	3,782
Class C Bus (<25 Seats)	2,898	1,177	195	4,270
Articulated Bus	1,825	0	54	1,879
School Bus	148	27	25	200
Van	1,574	4,847	372	6,793
Automobile	0	3,653	0	3,653
Total	57,740	9,788	1,855	69,383

New Vehicles Acquired

Exhibit 62 provides a summary of new vehicle acquisitions by mode and type of service. Data for 1993 in this exhibit reflects only the number of new vehicles acquired within the report year. Since transit agencies' report years are based on their fiscal year, data for 1993 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 the fiscal year. This means that a vehicle manufacturer in a given year, but accepted after the fiscal year will not be reported until the subsequent report year for the transit agency. One half of all transit agencies conclude their fiscal year on June 30. As a result, current year data will understate the number of new vehicles for 1993.

New Vehicles Acquired by Mode and Type of Service
1993

Exhibit 62

Modes/Type of Service	1989	1990	1991	1992	1993
Buses					
Directly Operated	3,759	3,836	2,396	2,647	1,254
Purchased Transportation	124	239	455	379	84
Total	3,883	4,075	2,851	3,026	1,338
Heavy Rail					
Directly Operated	63	14	-	215	191
Purchased Transportation	-	-	-	-	-
Total	63	14	0	215	191
Commuter Rail					
Directly Operated	111	46	71	35	13
Purchased Transportation	-	-	39	59	10
Total	111	46	110	94	23
Light Rail					
Directly Operated	19	32	14	34	4
Purchased Transportation	-	-	-	-	-
Total	19	32	14	34	4
Demand Response					
Directly Operated	579	495	512	353	287
Purchased Transportation	564	802	857	781	581
Total	1,143	1,297	1,369	1,134	868
Other					
Directly Operated	64	403	284	575	209
Purchased Transportation	5	30	30	99	40
Total	69	433	314	674	249
Total					
Directly Operated	4,595	4,826	3,277	3,859	1,958
Purchased Transportation	693	1,071	1,381	1,318	715
Total	5,288	5,897	4,658	5,177	2,673

Bus accounts for most of the new vehicle acquisitions ranging from 73.4 percent in 1989 to slightly more than 50 percent for 1993. The three rail modes combined account for a low of 1.6 percent in 1990 to a high of 8.1 percent in 1993 for all new vehicle acquisitions during the five year period. Within the rail modes, heavy rail accounts for most of the acquisitions. Demand response new vehicle acquisitions during the period range from a low of 21.6 percent in 1989 to a high of 32.5 percent in 1993. Other modes represent less than 10 percent of new vehicle acquisitions during the period except for 1992 when they account for 13 percent.

Exhibit 63 provides yet another perspective on fleet age. Comparisons with the previous exhibit should be avoided as this exhibit provides data by fleet type while the previous exhibit provided information by mode. In addition, new vehicles in computing fleet age will be included with vehicle age from zero to five years, a period of six years. Each of the vehicle types enjoy a different useful life 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 five 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 that are more than 15 years old.

Exhibit 63

Vehicles by Age and Vehicle Type
(Directly Operated Service)
1993

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	
Buses							
Class A Bus (>35 Seats)	14,518	17,299	9,384	3,085	1,027	599	45,912
Class B Bus (25-35 Seats)	1,583	924	590	147	28	2	3,274
Class C Bus (<25 Seats)	1,606	665	26	8	1	4	2,310
Articulated Bus	219	1,252	405	0	0	0	1,876
School Bus	30	1	0	0	0	0	31
Heavy Rail	863	3,108	417	1,536	1,516	2,830	10,270
Commuter Rail	451	803	304	841	1,458	784	4,641
Light Rail	198	228	358	62	0	272	1,118
Van/Auto	2,822	466	11	0	0	0	3,299
Total	22,290	24,746	11,495	5,679	4,030	4,491	72,731

Chapter 5
Operating Funding and Expenses

Introduction

This chapter discusses patterns and trends of funding and expenditures for transit operations. Sources and levels of such funding are outlined, as are general trends in the nature of operating funding and expenses. Operating expenses are presented and discussed by mode and object class. Performance measures regarding the cost effectiveness of operations are also provided.

Chapter Organization

The chapter opens with a review of the various funding sources (Federal, State, and local assistance, as well as passenger fare revenues). Operating expenses are then presented by mode and object class. Finally, performance indicators are offered to measure cost effectiveness of transit services. Current year and five-year data are presented.

Operating Funding

Operating funds include Federal, State, and local financial assistance utilized for subsidizing the cost of operating transit services, as well as all categories of passenger fare revenues. Federal funds include general grants of operating assistance funds under 49 USC 5307 (formerly Section 9, of the Federal Transit Act, as amended) as well as other grants that have an operating assistance component. State funds include direct operating grants and assistance to transit agencies to encourage reduced fares for the elderly and physically challenged. Local assistance incorporates funds available from dedicated taxes (property, sales, income or other), tolls and fees, and other non-fare-based revenue sources such as concessions and advertising.

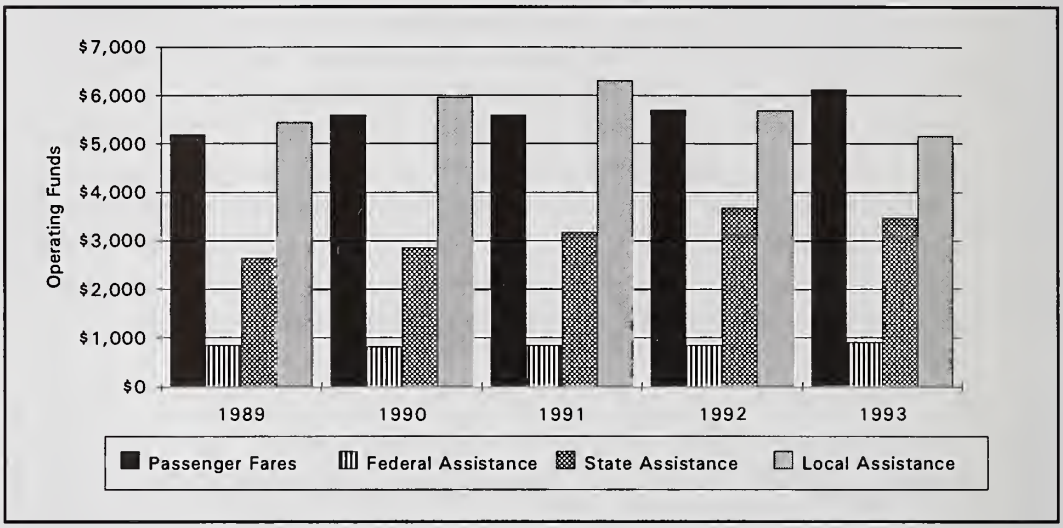
Sources of Operating Funding

As shown in **Exhibit 64**, passenger fares and local funds compose the bulk of operations funding. The basis of reporting operating funds expended changed in 1993 to account for only the funds applied to the operation rather than total funds received. In 1993, fares contributed slightly more than 36 percent of the available funds for transit operations, while local assistance contributed nearly 31 percent. State operating assistance accounted for approximately 21 percent, while Federal funds supplied slightly over five percent. While actual dollars have increased each year by source except Federal since 1989, the proportion of funding from each source has remained fairly stable, though State assistance has grown larger in proportion.

Since 1989, the proportion of operating funds realized through passenger fares has declined only very slightly from 36.7 percent to 36.5 percent. Local assistance has declined slightly as well as a proportion of operating funds, from 32.7 percent in 1989 to 30.8 percent in 1993. The proportion of operating funds realized from Federal sources has declined slightly as well, from six percent in 1989 to 5.4 percent in 1993. In contrast, the proportion of operating funds accounted for by State assistance has increased from 18.8 percent in 1989 to 20.7 percent in 1993. Other sources accounted for 6.5 percent in 1993 as compared to 5.8 percent in 1989.

Exhibit 64

Sources of Operating Funds
(Millions)
1989-1993



Sources of Operating Funds by UZA Size

Exhibit 65 outlines the distribution of transit operations funding from the various sources available by size of urbanized area. While the general trend in transit operations funding has been toward a decreased role for Federal funding and increases from other sources, there is a variation among the different sizes of urbanized areas. For urbanized areas under 200,000 population, Federal assistance was five percent greater in 1993 than in 1989. However, the other sources of operating funds increased at more dramatic rates. State assistance increased by 34 percent from 1989 to 1993 and local funds increased by nearly 13 percent. Thus, Federal assistance still accounted for about 20 percent of operating funds for small urbanized areas in 1993, as it did in 1989.

The same trend is seen with urbanized areas of 200,000 to one million population, but the increases in State and local assistance are more significant. Federal assistance is nearly six percent greater in 1993 than in 1989, but State assistance is approximately 90 percent greater and local assistance 14 percent greater. Federal assistance accounted for 12 percent of operating funds in 1993 as compared to nearly 15 percent in 1989.

Exhibit 65

Sources of Operating Funds by UZA Size
(Millions)
1993

UZA Size	Year	Passenger Fares	Federal Assistance	State Assistance	Local Assistance	Other	Total
Under 200,000	1989	$89.6	$97.5	$85.3	$142.8	$18.6	$433.8
	1990	86.9	88.3	92.2	132.6	17.9	$417.9
	1991	93.3	91.7	107.2	140.5	19.8	$452.5
	1992	96.7	97.0	113.2	152.2	24.6	$483.7
	1993	111.7	102.5	114.6	168.3	23.4	$520.5
200,000 to 1 Million	1989	280.8	160.8	144.5	461.1	47.8	$1,095.0
	1990	288.7	159.5	172.7	472.7	43.4	$1,137.0
	1991	305.6	168.6	270.3	509.6	46.2	$1,300.3
	1992	303.6	165.4	232.5	579.5	49.7	$1,330.7
	1993	320.0	168.7	273.8	588.7	70.0	$1,421.2
Over 1 Million	1989	4,814.0	588.1	2,418.6	4,011.5	756.3	$12,588.5
	1990	5,216.7	573.7	2,593.4	4,462.5	833.5	$13,679.8
	1991	5,200.6	589.7	2,796.0	4,741.5	863.1	$14,190.9
	1992	5,297.0	586.7	3,335.0	4,100.9	773.9	$14,093.5
	1993	5,685.3	641.9	3,086.7	4,408.5	993.8	$14,816.2
Total	1989	$5,184.5	$846.3	$2,648.5	$4,615.3	$822.7	$14,117.2
	1990	$5,592.5	$821.5	$2,858.2	$5,067.7	$894.8	$15,234.6
	1991	$5,599.4	$850.0	$3,173.5	$5,391.7	$929.1	$15,943.7
	1992	$5,697.3	$849.1	$3,680.6	$4,832.6	$848.2	$15,907.8
	1993	$6,117.1	$913.0	$3,475.1	$5,165.5	$1,087.2	$16,757.9

With the large urbanized areas of over one million population, Federal operating assistance is nearly nine percent greater in 1993 than in 1989. State assistance was almost 28 percent greater in 1993 than in 1989, while local assistance was nearly 12 percent greater. Federal assistance has, however, represented a relatively consistent portion of overall operating funding, accounting for slightly more than four percent of operating funds in 1993, and slightly less than five percent in 1989.

Passenger fares increased at various rates between 1989 and 1993 across all urbanized areas. For small urbanized areas, the increase was approximately 24.7 percent, while for mid-size urbanized areas it was 14 percent. For large urbanized areas, passenger fares increased by 18.1 percent. For small and large urbanized areas, the portion of operating funds realized via passenger fares has remained relatively stable between 1989 and 1993. For small urbanized areas, it represents about 21 percent of operating funds, while for large urbanized areas, passenger fares represent slightly more than 38 percent of operating funds. For mid-size urbanized areas, however, passenger fares as a portion of operating funds was 22.5 percent in 1993 compared to 25.6 percent in 1989.

Operating expenses totalled nearly $15.5 billion in 1993. This is less than the $16.8 billion in operating funds reported, because of reconciling items that are reported but vary in treatment as a result of local ordinances and conditions. These items are used to reconcile National Transit Database expenses with public financial reports. Included are such items as depreciation, amortization, interest expense, and base payments. Also, purchased transportation expenses incurred by transit providers operating in excess of 100 vehicles are excluded. This was presented earlier in the Introduction.

Total operating expense increased 11.5 percent from 1989 to 1993. The Consumer Price Index (CPI), however, increased 16.5 percent during the same period indicating that total transit expenses have been maintained below the level of inflation. Changes in the operating expenses of individual modes show much greater variation. These are displayed in **Exhibit 66**. This exhibit also provides the reconciling cash expenditures since 1989. Reconciling cash expenditures consist of interest expenses; leases and rentals; purchased lease agreements; related parties lease agreements; and other reconciling items. The cash expenditures are not reported nor are they allocated by mode, function and/or object class.

Exhibit 66

Operating Expense by Mode and Reconciling Cash Expenditures
(Millions)
1989-1993

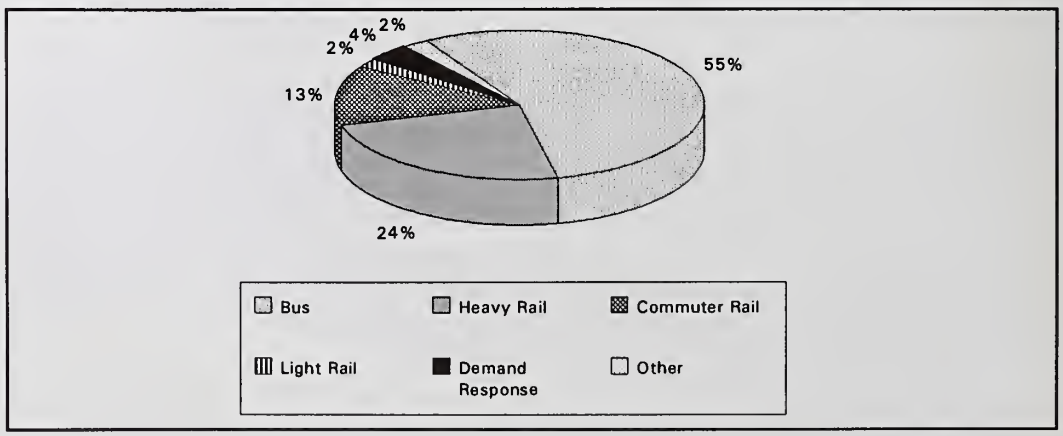
Mode	1989	1990	1991	1992	1993	Difference 1989-1993
Bus	$7,295	$7,789	$8,330	$8,625	$8,514	16.7%
Heavy Rail	3,704	3,825	3,841	3,555	3,669	-1.0%
Commuter Rail	2,068	2,157	2,175	2,170	2,080	0.6%
Light Rail	209	236	290	307	314	50.3%
Demand Response	323	386	443	500	540	67.2%
Other	284	323	325	342	356	25.4%
Operating Expenses	$13,883	$14,716	$15,404	$15,499	$15,473	11.5%
Reconciling Cash Expenditures	$655	$726	$908	$1,064	$914	39.5%

Demand response and light rail experienced the greatest increase in expense between 1989 and 1993, increasing 67.2 percent and 50.3 percent, respectively. These substantial increases were due in part to the dramatic growth in services for both modes. Vehicle revenue miles increased 60 percent for demand response and 31.4 percent for light rail during the same period. Bus also experienced a cost increase of 16.7 percent that was greater than the rate of inflation. Here again, vehicle revenue miles of service increased, but at a more modest increase of almost five percent. Further discussion of service supplied and consumed can be found in the next chapter.

Exhibit 67 reflects the dominance of bus services, which accounted for 55 percent of 1993 total operating expense. Heavy rail consumed over 23 percent and commuter rail represents almost 14 percent. Demand response and light rail, while increasing in the amount of service supplied and in operating expense, represent less than four percent and two percent, respectively, of total operating expenses for 1993.

Exhibit 67

Distribution of Total Operating Expense by Mode
1993



Object Classes and Functions

Operating expense is delineated by object class and function. An object class is a grouping of expenses based on goods or services purchased. The ten object classes used for reporting are:

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

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

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

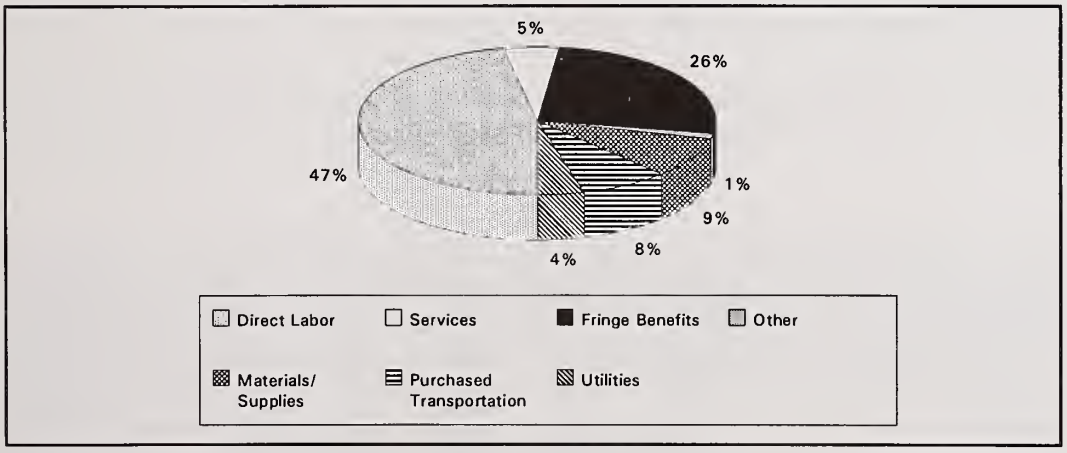
For the *NTST*, casualty and liability costs, taxes, miscellaneous expense, and expense transfers are grouped together as Other when operating expense by object class is discussed. Operating expense by object class and function are compared by mode.

Operating Expense by Object Class

Labor and fringe benefits are the two largest classes of operating expense. As seen in **Exhibit 68**, the two classes total nearly 75 percent of operating expense, indicative of the labor-intensive nature of the transit industry and underscoring the industry's sensitivity to labor cost increases.

Exhibit 68

Distribution of Total Operating Expense by Object Class 1993



Materials and supplies incorporate fuel and lubricants, tires and tubes, and other miscellaneous materials and supplies. This object class consumed 9.2 percent of operating expense.

Purchased transportation includes payments or accruals to providers operating transit service under contract to transit agencies, fare revenues the providers retain, and any other contract related costs incurred by the purchasing transit agency such as contract administration, customer information services, advertising, fuel, or vehicle maintenance. Purchased transportation absorbed 5.6 percent of operating expenses. This is exclusive of those transit agencies that have contractual relationships with providers in excess of 100 vehicles. A discussion of this contractual relationship is found in the Introduction.

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 5.4 percent of operating expense. Utilities represent 3.9 percent of operating expense. These are costs associated with electricity (used to propel transit vehicles), as well as general building and station utilities. Other expenses comprise all remaining object classes accounting for less than one percent combined.

Operating Expense by Mode and Object Class

Exhibit 69 shows how operating expense is distributed by object class, for each mode. Reconciling cash expenditures are not reported by mode. Direct labor and fringe benefits represent the largest classes of expense for all modes except demand response. With demand response, the significant role of purchased transportation is demonstrated by the 68.6 percent of demand response operating expense attributable to this object class. As directly operated service is a much smaller portion of demand response operations, direct labor and fringe benefits account for much smaller portions of operating expense than with other modes. Combined, direct labor and fringe benefits account for only 23.1 percent of demand response operating expenses.

Materials and supplies account for 11.2 percent of bus operating expense, significantly more than materials and supplies expense for the other modes. Fuel costs, tires, and other general vehicle maintenance items that bus service demands explain why bus accounted for almost 69 percent of materials and supplies expense for all modes combined. A negative amount appears for Other expenses for heavy rail due to expense transfers by a major heavy rail operator from operating to capital, as noted earlier.

Exhibit 69

Operating Expense by Mode and Object Class and Reconciling Cash Expenditures (Millions) 1993

Object Class	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	Total
Direct Labor	$4,177.9	$2,049.8	$793.2	$140.1	$89.4	$181.2	$7,431.6
Fringe Benefits	2,218.9	1,172.1	588.5	81.4	35.8	73.6	4,170.2
Materials and Supplies	956.4	233.2	163.5	21.1	19.0	30.7	1,423.8
Purchased Transportation	340.9	0.0	140.0	0.0	369.3	17.4	867.6
Utilities	115.0	320.2	136.9	24.9	2.9	7.1	607.0
Services	410.6	162.9	193.4	36.9	11.7	23.0	838.5
Other	293.8	(269.6)	64.5	9.9	12.0	23.4	134.0
Operating Expenses	$8,513.6	$3,668.6	$2,079.9	$314.1	$540.1	$356.4	$15,472.7
Reconciling Cash Expenditures							$914.3

Operating Expense by Function and Object Class

Exhibit 70 presents operating expense by function and object class, demonstrating how operating expense is spread over the various functions and how the allocations to object classes vary by function. Reconciling cash expenditures are included. However, they are not allocated by function and object class.

Exhibit 70

Operating Expense by Function and Object Class and Reconciling Cash Expenditures (Millions) 1993

Object Class	Vehicle Operation	Vehicle Maintenance	Non-Vehicle Maintenance	General Administration	Total
Direct Labor	$4,211.8	$1,391.8	$928.9	$899.1	$7,431.6
Fringe Benefits	2,255.6	768.6	537.9	608.1	4,170.2
Materials and Supplies	501.1	634.8	195.2	92.7	1,423.8
Purchased Transportation	496.1	31.0	11.6	328.9	867.6
Utilities	190.9	14.2	247.1	154.8	607.0
Services	145.3	116.2	163.9	413.1	838.5
Other	184.5	(37.1)	(374.8)	361.4	134.0
Operating Expenses	$7,985.3	$2,919.5	$1,709.8	$2,858.1	$15,472.7
Reconciling Cash Expenditures					$914.3

The labor-intensive nature of vehicle operations and maintenance functions as compared to general administration is reflected by the significant portions of cost for these functions attributed to direct labor and fringe benefits. Slightly more than 80 percent of vehicle operations expense is consumed by direct labor and fringe benefits, while over 74 percent of vehicle maintenance and over 85 percent of non-vehicle maintenance expense are so consumed. In contrast, 53.4 percent of general administration expense is absorbed by direct labor and fringe benefit costs. This is not only due to the difference in the labor intensiveness between the general administration function and the other functions, but is also indicative of the higher wages commanded by technicians, mechanics and operators (typically negotiated through collective bargaining agreements) versus those wages realized by clerical employees. In addition, some labor functions typically associated with general administration, such as those accomplished by professional staff, may be acquired through contracting.

General administration reflects much greater proportions of costs attributed to the services and other object classes than is found with the other functions. This is not unusual given that the level of services needed to support such administrative activities 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. Thus, 27.5 percent of general administration expense is accounted for by services and other items, whereas these object classes account for very little operations and maintenance expense.

Purchased transportation accounts for 6.9 percent of vehicle operations expense and slightly more than 10.3 percent of general administration cost, while accounting for approximately less than one percent of vehicle and non-vehicle maintenance costs. This is the result of purchased transportation providers supplying service under contract typically with their own vehicles and personnel. Vehicle and facilities maintenance are part of the contract cost for operational service and are the responsibility of the purchased transportation providers. Thus, the bulk of the contract cost is allocated to vehicle operations. The proportion of general administrative costs attributable to purchased transportation accounts for the expense realized by transit agencies in procuring the transportation services, administering contracts, and providing planning, marketing, customer services, and advertising in support of such services.

Negative amounts appear in the other object classes for the maintenance functions due to expense transfers created by the adjustment and reclassification of previously recorded expenses to other functions. Also, expense transfers that resulted when non-operating costs temporarily credited to functions were ultimately capitalized are also incorporated into the other object class for purposes of the *NTST*. The vehicle and non-vehicle maintenance functions are more capital-intensive and thus more likely to experience capitalization of non-operating costs resulting in expense transfers.

Operating Expense by Function and Mode

As **Exhibit 71** shows, demand response has a much higher percentage of operating expense consumed by general administration than the other modes. This is because of the significant amount of service operated under contract. Also, the needs for customer service, scheduling, and data processing are very substantial and add to greater administrative expense. Thirty-five percent of operating expense for demand response is consumed by general administration.

The rail modes, particularly heavy rail, demonstrate substantial levels of facilities and wayside maintenance required as compared to other modes. Approximately 24 percent of heavy rail operating expense is attributable to non-vehicle maintenance while only 15.9 percent is accounted for by vehicle maintenance. In contrast, nearly 20 percent of bus operating expense is consumed by vehicle maintenance while four percent is expended for non-vehicle maintenance. Reconciling cash expenditures are reported for the entire transit agency and are not allocated by mode. The National Transit Database uses operating expenses as the basis for all analysis and calculations.

Exhibit 71

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

Mode	Vehicle Operation	Vehicle Maintenance	Non-Vehicle Maintenance	General Administration	Total
Bus	$4,853.3	$1,752.7	$356.3	$1,551.2	$8,513.6
Heavy Rail	1,619.6	551.8	886.9	610.3	$3,668.6
Commuter Rail	854.6	460.6	374.1	390.7	$2,079.9
Light Rail	133.7	69.3	60.2	50.9	$314.1
Demand Response	309.0	30.9	3.5	196.8	$540.1
Other	215.2	54.2	28.8	58.2	$356.4
Operating Expenses	$7,985.3	$2,919.5	$1,709.8	$2,858.1	$15,472.7
Reconciling Cash Expenditures					$914.3

Chapter 6
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. The amount of service supplied is expressed in terms of annual vehicle revenue miles and hours operated, as well as total vehicles operated in maximum passenger service. These measures offer an overview of the quantity and capacity of transit services. The efficiency of service provided is measured by operating expense per vehicle revenue mile. Service consumption is measured with annual unlinked passenger trips and annual passenger miles. Service effectiveness is measured with the ratio of unlinked passenger trips to vehicle revenue miles. The cost effectiveness of service is measured with the ratios of operating expenses to unlinked passenger trips and passenger miles.

Refer to Exhibit 2 of the Introduction for further explanation of Purchased Transportation Reported as Directly Operated

Chapter Organization

The chapter begins with discussions of service supplied and consumed by mode and type of service from 1989 through 1993. Performance measures are then presented to measure 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 UZA size.

Vehicle Revenue Miles by Mode and Type of Service

Almost 2.6 billion vehicle revenue miles of transit service were supplied in 1993. As shown in **Exhibit 72**, 12 percent of these miles were provided through purchased transportation contracts. More than 57 percent of these purchased miles were provided via demand response. This mode, in turn, supplied slightly more than 73 percent of all of its service via purchased transportation contracts. All remaining modes provided significantly less purchased service. Bus and commuter rail each logged more than seven percent of their revenue miles via purchased transportation. Heavy rail and light rail did not report any purchased services for 1993.

Bus dominates total service supplied with almost 61 percent of all revenue vehicle miles reported. Heavy rail accounts for 19.5 percent of the vehicle revenue miles operated, followed by demand response (9.4 percent) and commuter rail (7.8 percent). Light rail accounts for only one percent.

Exhibit 73 displays the tremendous growth in demand response and light rail services over the past five years. Annual vehicle revenue miles for demand response rose 60 percent between 1989 and 1993. Light rail service increased 31.2 percent during the same time-frame. Commuter rail and bus experienced less substantial growth, with 6.9

percent and 4.8 percent, respectively. Heavy rail is the only mode to show a loss during this time period; it declined by 1.5 percent.

Exhibit 72

Vehicle Revenue Miles by Mode and Type of Service
(Millions)
1993

Mode	Directly Operated	Purchased Transportation	Total
Bus	1,465.4	112.9	1,578.3
Heavy Rail	505.2	0.0	505.2
Commuter Rail	188.2	15.2	203.4
Light Rail	26.9	0.0	26.9
Demand Response	65.5	177.9	243.4
Other	31.3	4.6	35.9
Total	2,282.5	310.6	2,593.1

Exhibit 73

Vehicle Revenue Miles by Mode
(Millions)
1989-1993

Mode	1989	1990	1991	1992	1993
Bus	1,506.3	1,534.5	1,552.4	1,555.9	1,578.3
Heavy Rail	513.1	520.8	508.3	509.7	505.2
Commuter Rail	190.2	193.0	197.9	199.9	203.4
Light Rail	20.5	22.9	26.6	27.8	26.9
Demand Response	152.1	171.2	185.8	208.5	243.4
Other	23.0	24.2	27.8	32.2	35.9
Total	2,405.2	2,466.6	2,498.8	2,534.0	2,593.1

Vehicle Revenue Hours by Mode and Type of Service

Exhibit 74 displays the vehicle revenue hours operated in 1993. More than 11 percent of these hours were provided through purchased transportation contracts. As with vehicle revenue miles, demand response provides the largest share of purchased transportation service (72.2 percent) based on hours. Bus and commuter rail each provide approximately six percent of their services through purchased hours (6.6 percent for commuter rail, 5.9 percent for bus). Of the almost 175 million vehicle revenue hours operated by all modes, 70.1 percent were provided via bus, followed by 14.1 percent for heavy rail and 9.7 percent for demand response. The remaining modes combined account for six percent of the total vehicle revenue hours reported.

Exhibit 74

Vehicle Revenue Hours by Mode and Type of Service
(Millions)
1993

Mode	Directly Operated	Purchased Transportation	Total
Bus	115.5	7.2	122.7
Heavy Rail	24.7	0.0	24.7
Commuter Rail	5.6	0.4	6.0
Light Rail	1.9	0.0	1.9
Demand Response	4.7	12.2	16.9
Other	2.5	0.2	2.7
Total	154.9	20.0	174.9

The change in vehicle revenue hours over the past five years is displayed in **Exhibit 75**. As with miles of service, the largest increase has occurred in demand response (55.6 percent) which has grown steadily each year. Light rail and bus have also increased, but to a much smaller degree, 11.8 percent and 5.2 percent, respectively. Commuter rail has experienced a minor decrease (minus 1.7 percent) when compared to 1989, but shows a modest increase (3.4 percent) when compared to 1992. Similarly, heavy rail vehicle revenue hours show a decrease (minus 5.7 percent) when compared to 1989 figures. Since 1991, these hours have increased annually.

Exhibit 75

Vehicle Revenue Hours by Mode
(Millions)
1989-1993

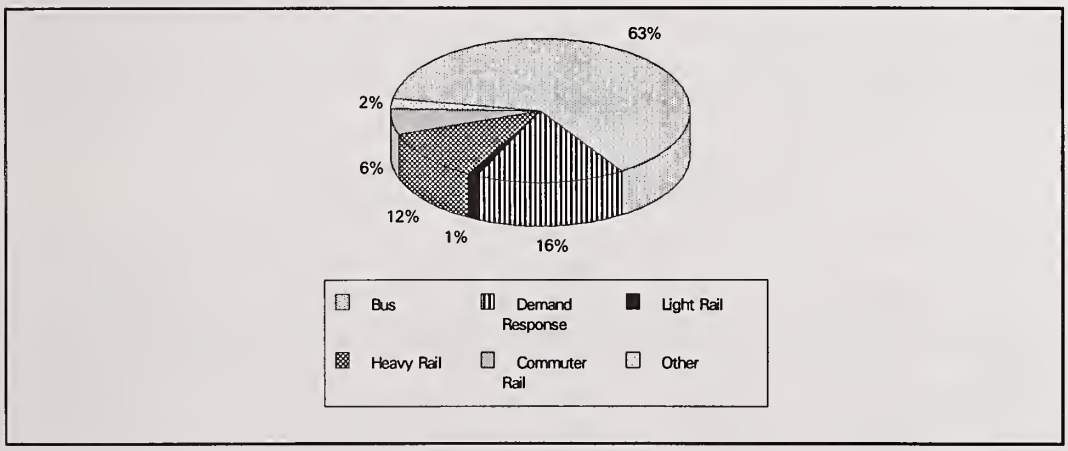
Mode	1989	1990	1991	1992	1993
Bus	116.6	120.1	120.9	122.0	122.7
Heavy Rail	26.2	26.3	21.7	23.3	24.7
Commuter Rail	6.1	6.1	5.9	5.8	6.0
Light Rail	1.7	1.9	2.1	2.1	1.9
Demand Response	10.8	12.3	13.4	14.9	16.9
Other	2.3	2.3	2.5	2.6	2.7
Total	163.7	169.0	166.5	170.7	174.9

Vehicles Operated in Maximum Service by Mode

Another measure of service supplied is the number of vehicles operated in maximum service. As can be seen in **Exhibit 76**, bus is the dominant mode. Bus provides the largest number of vehicles operated in maximum service with 62.6 percent. The next largest number of vehicles was operated in demand response service (16 percent) followed by heavy rail service (11.6 percent).

Exhibit 76

Distribution of Vehicles Operated in Maximum Service by Mode
1993



Changes over time in the number of vehicles operated reflect the pattern of change found in both vehicle revenue miles and vehicle revenue hours. Specifically, the significant growth in demand response and light rail service highlight this change. As can be seen in **Exhibit 77**, the number of vehicles operated in maximum service increased 58.3 percent for demand response and 44.5 percent for light rail between 1989 and 1993. The changes in the other modes were modest. The number of buses increased only 3.2 percent. Com-

muter rail increased 2.4 percent. A large increase (6.7 percent) in commuter rail vehicles operated occurred between 1992 and 1993 when a new commuter rail operator (the Virginia Railway Express) began service. Heavy rail experienced the only loss (minus 1.4 percent) between 1989 and 1993. The greatest change occurred between 1990 and 1991, when 2.9 percent fewer heavy rail vehicles were operated in maximum service. Modest recovery has occurred since then.

Exhibit 77

Vehicles Operated in Maximum Service by Mode
1989-1993

Mode	1989	1990	1991	1992	1993
Bus	42,688	42,869	42,959	43,861	44,041
Heavy Rail	8,306	8,347	8,106	8,180	8,187
Commuter Rail	4,114	4,163	3,989	3,949	4,214
Light Rail	535	665	811	798	773
Demand Response	7,115	7,903	8,435	9,274	11,262
Other	1,080	1,195	1,524	1,633	1,830
Total	63,838	65,142	65,824	67,695	70,307

Service Supplied: Modal Comparison

Exhibit 78 compares the modal shares of each of the service supplied measures examined in this chapter. Evident is the dominance of bus service, accounting for 60 to 70 percent of vehicle revenue miles, revenue hours, and the number of vehicles operated in maximum service. These large shares reflect the lower operating speeds in large urbanized areas, and relatively low passenger capacity of buses. Other patterns include the heavy rail and commuter rail shares, which reflect the higher operating speeds and the greater passenger capacity of these rail modes and vehicles. In contrast, demand response shows a speed slightly better than bus, but a greater use of vehicles. This reflects the difference between bus and demand response service. The bus mode is designed with fixed routes, numerous stops, and operation in large urbanized areas. In comparison demand response is operated with variable routing, smaller vehicles, and fewer stops on less congested roadways in small and mid-sized urbanized areas.

Exhibit 78

Modal Comparison of Service Supplied
1993

Mode	Percentage of Vehicle Revenue Miles	Percentage of Vehicle Revenue Hours	Percentage of Vehicles in Maximum Service
Bus	60.9%	70.1%	62.6%
Heavy Rail	19.5	14.1	11.6
Commuter Rail	7.8	3.4	6.0
Light Rail	1.0	1.1	1.1
Demand Response	9.4	9.6	16.0
Other	1.4	1.6	2.6
Total	100.0%	100.0%	100.0%

Service Consumed: Unlinked Passenger Trips by Mode

Over 7.4 billion passenger trips were reported in 1993. As shown in **Exhibit 79**, slightly more than 97 percent of these trips were made on directly operated service. The remaining trips (2.8 percent) were made via purchased transportation services. Of these trips, the vast majority were taken on bus (62.4 percent), followed by heavy rail (27.5 percent). The remaining modes carried less than eight percent combined: 4.3 percent on commuter rail, 2.5 percent on light rail, and 0.7 percent on demand response. Within each mode, however, only demand response shows a significant share of trips taken on purchased transportation services. Seventy-one percent of all demand response trips were made on purchased transportation services during 1993. In contrast, the remaining modes show only three to six percent of their trips were taken via purchased transportation services.

Exhibit 79

Unlinked Passenger Trips by Mode and Type of Service
(Millions)
1993

Mode	Directly Operated	Purchased Transportation	Total
Bus	4,490	148	4,638
Heavy Rail	2,046	0	2,046
Commuter Rail	303	18	321
Light Rail	188	0	188
Demand Response	15	37	52
Other	180	8	188
Total	7,222	211	7,433

Exhibit 80 displays the change in unlinked passenger trips over the past five years. Overall, ridership decreased 8.2 percent from 1989 to 1993. Heavy rail was the only mode to experience a significant loss (19.5 percent). Bus and commuter rail experienced modest losses (4.1 and 2.7 percent, respectively). Commuter rail, however, may be reversing this trend. Between 1992 and 1993, commuter rail ridership increased 2.2 percent. In contrast, ridership has grown annually for both light rail and demand response. The most dramatic growth occurred in demand response ridership (40.5 percent). Light rail ridership followed with a healthy 16.8 percent increase during the same period.

Exhibit 80

Unlinked Passenger Trips by Mode
(Millions)
1989-1993

Mode	1989	1990	1991	1992	1993
Bus	4,838	4,887	4,826	4,748	4,638
Heavy Rail	2,542	2,346	2,167	2,207	2,046
Commuter Rail	330	328	324	314	321
Light Rail	161	174	184	187	188
Demand Response	37	40	42	45	52
Other	190	190	192	194	188
Total	8,098	7,965	7,735	7,695	7,433

Passenger Miles by Mode

Passenger miles act as a measure of the total distance travelled by transit customers. Transit agencies either randomly sample statistically selected trips throughout the year and derive an average trip length which is multiplied by the number of unlinked passenger trips, or they conduct a 100 percent count of boardings and alightings from which passenger miles are calculated. Certain report years are mandatory reporting years in which reporters must take a new statistical sample or 100 percent count of unlinked passenger trips and passenger miles. This mandatory year may serve as the basis for future year reporting depending on the size of the urbanized area in which the reporter operates and the number of vehicles directly operated in maximum service. The 1993 Report Year was a mandatory sampling/count year for all transit agencies. As a result, the 1993 reported data are the most accurate available at this time.

As shown in **Exhibit 81**, more than 36 billion passenger miles were reported in 1993. Ninety-five percent of all these miles were logged in directly operated service. The remaining five percent were accounted for by purchased transportation service. Among these purchased miles, a little more than half (51.9 percent) were on bus, followed by 29.3 percent on commuter rail and 14.5 percent on demand response. Only on demand response, however, did the passenger miles reported and purchased transportation services account for a significant share of the mode's total passenger miles (67.4 percent).

Exhibit 81

Passenger Miles by Mode and Type of Service
(Millions)
1993

Mode	Directly Operated	Purchased Transportation	Total
Bus	16,429	935	17,364
Heavy Rail	10,231	0	10,231
Commuter Rail	6,383	529	6,912
Light Rail	704	0	704
Demand Response	127	262	389
Other	549	76	625
Total	34,423	1,802	36,225

The dominance of bus is again evident when examining passenger miles by mode. Bus accounts for 47.9 percent of all passenger miles, followed by 28.2 percent for heavy rail and 19.1 percent for commuter rail. Light rail and demand response each account for less than two percent of the total (1.9 percent and 1.1 percent, respectively).

As seen in **Exhibit 82**, the change in passenger miles between 1989 and 1993 reflects the same pattern of change in ridership during this period. Specifically, a modest overall decrease was experienced (six percent). The largest decrease was experienced by heavy rail (15 percent), while bus and commuter rail experienced modest losses, 3.6 and 4.2 percent, respectively. The tremendous growth in demand response and light rail usage is also evident. Demand response passenger miles increased by 67 percent between 1989 and 1993. Light rail passenger miles increased 38.9 percent during the same period.

Exhibit 82

Passenger Miles by Mode
(Millions)
1989-1993

Mode	1989	1990	1991	1992	1993
Bus	18,010	18,070	18,104	17,494	17,364
Heavy Rail	12,030	11,475	10,488	10,737	10,231
Commuter Rail	7,212	7,083	7,383	7,320	6,912
Light Rail	507	570	661	700	704
Demand Response	233	259	274	317	389
Other	541	535	563	585	625
Total	38,533	37,992	37,473	37,153	36,225

Service Consumed: Modal Comparison

Exhibit 83 displays the modal shares of unlinked passenger trips and passenger miles, and average trip length. Evident is the dominance of bus in service consumed, accounting for more than 60 percent of the ridership and almost one-half of the passenger miles. All modes except commuter rail show relatively similar shares of transit trips and passenger miles. The proportionate shares of these modes account for their relatively short trip lengths, whereas the disproportionate shares of commuter rail reflect its long trip length.

Exhibit 83

Distribution of Unlinked Passenger Trips and Passenger Miles
With Average Trip Length by Mode
1993

Mode	Percentage of Total Unlinked Passenger Trips	Percentage of Total Passenger Miles	Average Trip Length in Miles
Bus	62.4%	47.9%	3.7
Heavy Rail	27.5	28.2	5.0
Commuter Rail	4.3	19.1	21.5
Light Rail	2.5	1.9	3.7
Demand Response	0.7	1.1	7.5
Other	2.5	1.7	-
Total	100.0%	100.0%	-

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 may be measured by examining unlinked passenger trips.

Service Efficiency: Operating Expense Per Vehicle Revenue Mile by Mode

Exhibit 84 displays the operating expense per vehicle revenue mile by mode for 1993. Demand response provides the most service efficiency at $2.22 per vehicle revenue mile, followed by bus at $5.39 per vehicle revenue mile. The rail modes are progressively higher in cost, ranging from $7.26 to $11.66 per vehicle revenue mile. The substantially lower cost per vehicle revenue mile for demand response may be explained in part by the utilization of purchased transportation. As was discussed earlier in this chapter, demand response utilizes purchased transportation services to a far greater degree than the other modes. As a result, direct labor and fringe benefits, which jointly comprise 63 to 88 percent of the total operating cost for bus and rail modes, account for less than one-quarter of demand response cost.

Exhibit 84

Operating Expense Per Vehicle Revenue Mile by Mode
1993

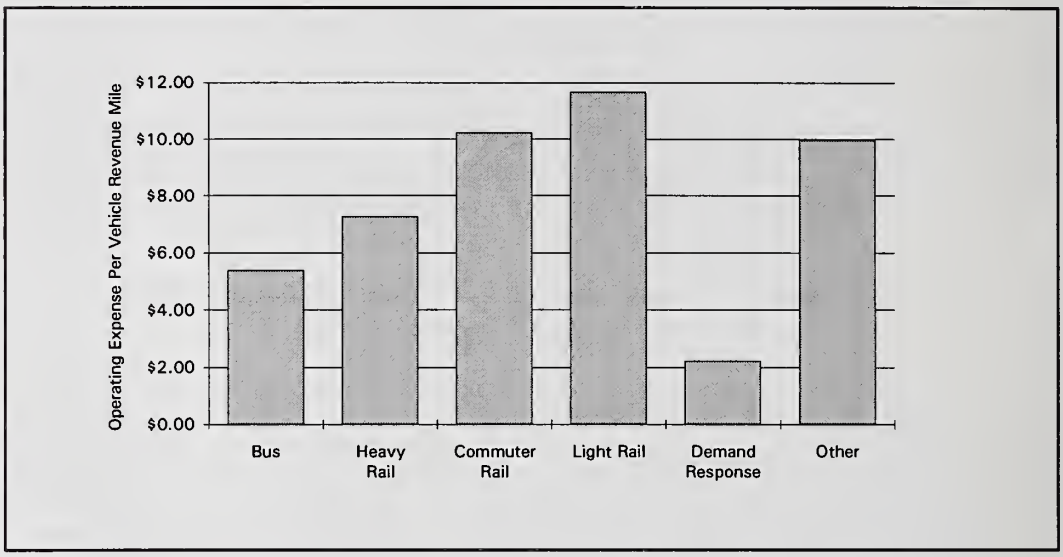


Exhibit 85 displays the changes in operating expenses per vehicle revenue mile by mode from 1989 to 1993. The cost per mile increased for all modes except commuter rail during this period. The largest increase occurred in bus (11.4 percent) and light rail (14.2 percent). Demand response followed with a moderate 4.7 percent increase. Heavy rail remained relatively consistent. However, commuter rail declined by 6.0 percent. Compared to 1992, decreases were experienced by bus, commuter rail and demand response. In part, the decline from 1992 to 1993 reflects a better accounting of purchased transportation expenses being excluded from transit agencies contracting with providers that operate more than 100 vehicles. Information concerning the effect of purchased transportation was provided earlier in the Introduction.

Exhibit 85

Operating Expense Per Vehicle Revenue Mile by Mode
1989-1993

Mode	1989	1990	1991	1992	1993
Bus	$4.84	$5.07	$5.37	$5.54	$5.39
Heavy Rail	7.22	7.34	7.56	6.97	7.26
Commuter Rail	10.87	11.17	10.99	10.85	10.22
Light Rail	10.21	10.26	10.89	11.05	11.66
Demand Response	2.12	2.25	2.38	2.40	2.22

Cost Effectiveness: Operating Expense Per Unlinked Passenger Trip by Mode

Exhibit 86 compares the cost effectiveness of each mode as measured by the operating expense per unlinked passenger trip for 1993. Light rail, heavy rail, and bus are the most cost-effective modes with their costs per trip ranging from $1.68 to $1.84. Commuter rail and demand response costs, however, are nearly four to six times greater. These differences are due in part to the fixed route services of bus, heavy rail and light rail, which provide relatively high capacity vehicles in densely populated areas.

Operating Expense Per Unlinked Passenger Trip by Mode 1993

Exhibit 86

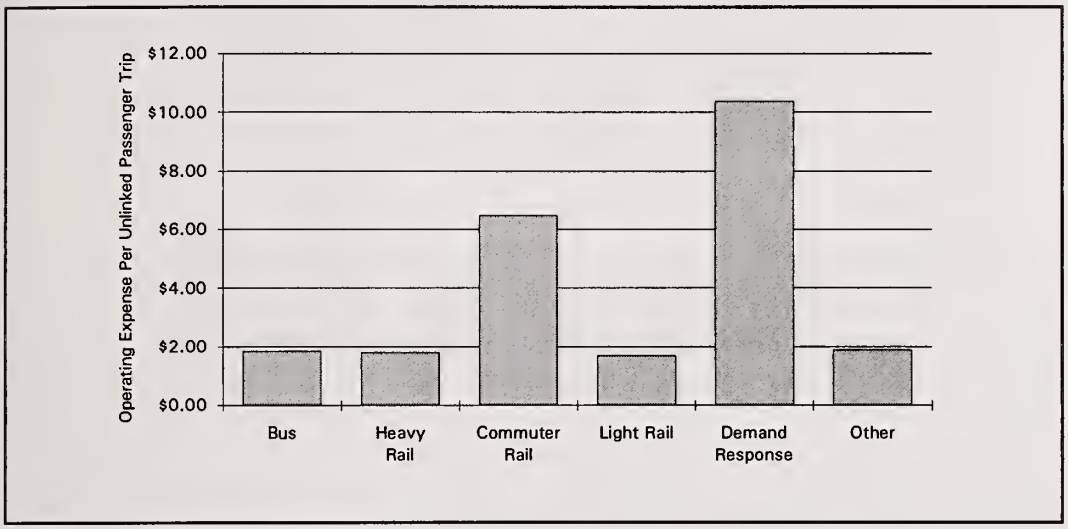


Exhibit 87 displays the changes in operating expense per unlinked passenger trip by mode from 1989 to 1993. Although bus, heavy rail and light rail remain cost effective modes, their costs per trip have increased 29.2 to 31.6 percent since 1989. Commuter rail cost, though significantly higher, has also increased about 17 percent. Demand response experienced the most dramatic change in the cost per trip with an increase of 37.8 percent. These and all other historical cost comparisons in this chapter should be considered relative to the change in the Consumer Price Index, which increased 16.5 percent between 1989 and 1993. In addition, comments regarding purchased transportation as indicated earlier affect differences between 1992 and 1993.

Operating Expense Per Unlinked Passenger Trip by Mode 1989-1993

Exhibit 87

Mode	1989	1990	1991	1992	1993
Bus	$1.47	$1.56	$1.65	$1.82	$1.84
Heavy Rail	1.46	1.63	1.77	1.61	1.79
Commuter Rail	5.54	5.87	6.01	6.92	6.48
Light Rail	1.30	1.36	1.58	1.64	1.68
Demand Response	7.53	8.53	9.47	11.03	10.38

Operating Expense Per Passenger Mile by Mode

Exhibit 88 offers another assessment of cost effectiveness through a comparison of operating expense per passenger mile by mode. Commuter rail and heavy rail are the most cost effective modes when cost per passenger mile is examined. This is due to the greater vehicle capacity and longer trips taken on these modes. Conversely, demand response has the highest cost per passenger mile due to its high trip length but low vehicle capacity.

Exhibit 88

Operating Expense Per Passenger Mile by Mode
1993

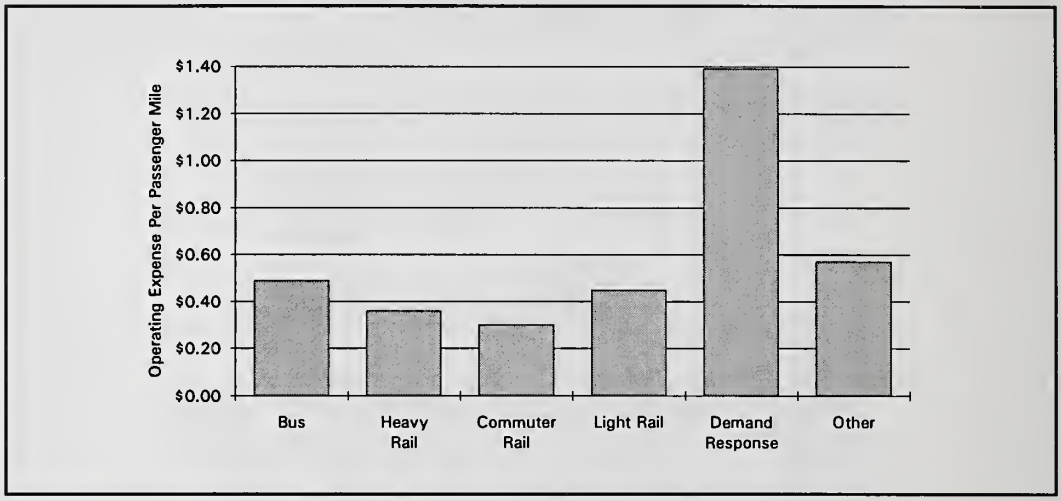


Exhibit 89 displays the change in operating cost per passenger mile by mode from 1989 to 1993. All modes experienced significant increases in cost per mile during this period. The largest increases occurred in commuter rail (20 percent), bus (22.5 percent), and demand response (17.8 percent). Heavy rail and light rail followed with increases of 15.7 percent and 8.9 percent, respectively. Again, changes from 1992 to 1993 reflect enhanced accounting for purchased transportation expenses.

Exhibit 89

Operating Expense Per Passenger Mile by Mode
1989-1993

Mode	1989	1990	1991	1992	1993
Bus	$0.40	$0.42	$0.44	$0.49	$0.49
Heavy Rail	0.31	0.33	0.37	0.33	0.36
Commuter Rail	0.25	0.27	0.26	0.30	0.30
Light Rail	0.41	0.41	0.44	0.44	0.45
Demand Response	1.18	1.32	1.48	1.58	1.39

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

The service effectiveness of each mode 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 90** shows, different combinations of vehicle capacity and trip length yield different results. The long trip length and low vehicle capacity of demand response results in a very low number of trips per mile. Similarly, the long trip length of commuter rail combined with the high capacity of rail vehicles also results in a low trip per mile ratio. Conversely, the shorter trip lengths and greater vehicle capacities of heavy rail and light rail result in a significantly higher number of trips per mile.

Unlinked Passenger Trips Per Vehicle Revenue Mile by Mode 1993 **Exhibit 90**

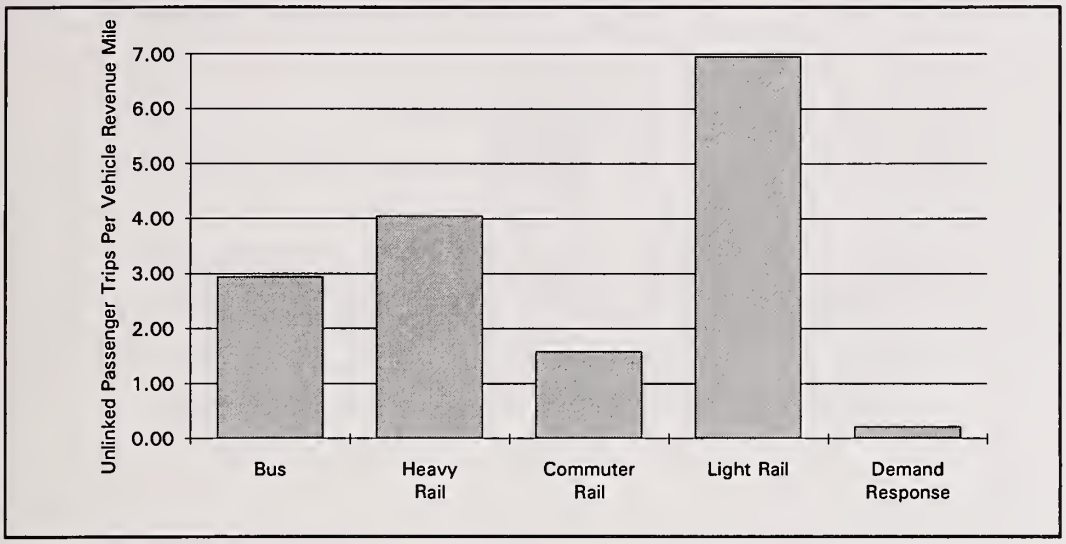


Exhibit 91 displays the change in unlinked passenger trips per vehicle revenue mile by mode from 1989 to 1993. All modes experienced moderate to high decreases during this period. Heavy rail shows the largest decrease (18.2 percent). Light rail and demand response followed, with decreases of 11.5 percent and 12.5 percent, respectively. Commuter rail and bus have the smallest decreases, 8.7 percent and 8.4 percent, respectively.

Unlinked Passenger Trips Per Vehicle Revenue Mile by Mode 1989-1993 **Exhibit 91**

Mode	1989	1990	1991	1992	1993
Bus	3.21	3.18	3.11	3.05	2.94
Heavy Rail	4.95	4.51	4.26	4.33	4.05
Commuter Rail	1.73	1.70	1.64	1.57	1.58
Light Rail	7.86	7.60	6.90	6.74	6.96
Demand Response	0.24	0.23	0.23	0.22	0.21

Average Operating Speed

Average operating speed varies greatly among the modes. As **Exhibit 92** shows, bus, light rail, and demand response services operate at a much slower speed than heavy rail or commuter rail. Bus service operates in mixed traffic with frequent stops for boarding and alighting. Light rail trains must also contend with mixed traffic while operating at-grade. The station/stop spacing of light rail also requires more frequent stopping for passenger boardings and alightings as compared to the other rail modes. Demand response service also operates in mixed traffic and must deal with significantly longer boarding and alighting times for frail, ill, or physically challenged patrons. Its longer trip length compensates for these delays, however. 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 92

Average Operating Speed by Mode
1993

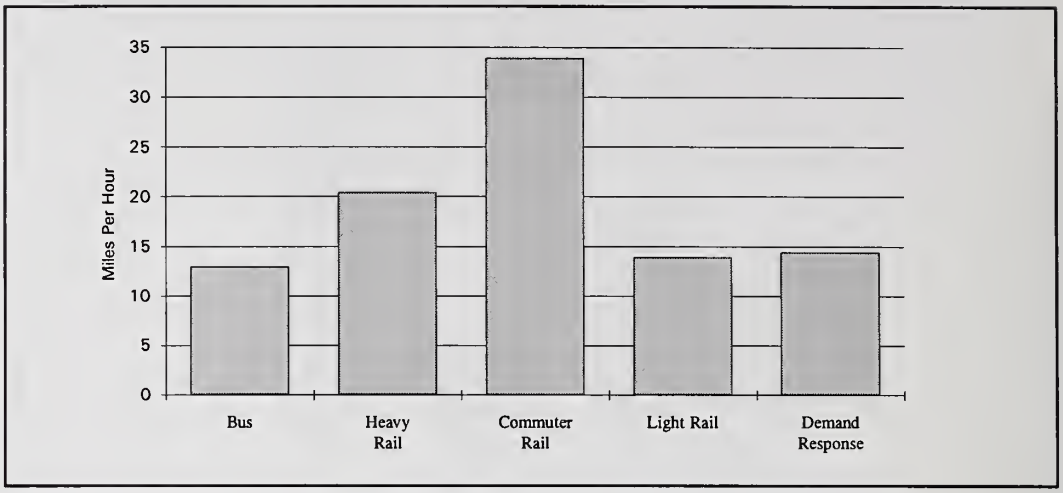


Exhibit 93 compares the operating speeds of directly operated and purchased transportation services. Across all modes, purchased transportation services are operated at higher speeds. Purchased bus service operates at an average speed nearly 24 percent higher than directly operated bus services. This may be as the result of transit agencies contracting out suburban flyer and express services. The difference between the two types of service is smaller for commuter rail, with an average speed 16.1 percent higher for purchased service. The difference is far less significant for demand response, where purchased services operated only 3.5 percent faster than directly operated service.

Exhibit 93

Operating Speed by Mode and Type of Service
1993

Mode/Type of Service	Speed
Bus	
Directly Operated	12.7
Purchased Transportation	15.7
Modal Average	12.9
Heavy Rail	
Directly Operated	20.4
Purchased Transportation	-
Modal Average	20.4
Commuter Rail	
Directly Operated	33.5
Purchased Transportation	38.9
Modal Average	33.9
Light Rail	
Directly Operated	13.9
Purchased Transportation	-
Modal Average	13.9
Demand Response	
Directly Operated	14.1
Purchased Transportation	14.6
Modal Average	14.4

Vehicle Revenue Miles by UZA Size and Mode

Exhibit 94 displays the significant share of vehicle revenue miles provided within urbanized areas with populations greater than one million individuals. In total, 79.2 percent of all vehicle revenue miles were operated in these larger areas, followed by 14.1 percent and 6.8 percent in medium and small urbanized areas, respectively. The amount and mode of service varies by UZA size. Most evident are the rail services, which operated almost exclusively in the large areas. The three rail modes combined account for almost 36 percent of all revenue miles in large areas. Bus accounts for more than 56 percent of vehicle revenue miles in these areas, followed by demand response with nearly seven percent. Service within the mid-sized areas is also dominated by bus (81.7 percent). Demand response service, however, accounts for a larger portion of service with a 17.2 percent share. The demand response share is the largest in the small urbanized areas, where it provides 26.1 percent of all service operated.

Exhibit 94

Vehicle Revenue Miles by UZA Size and Mode
(Millions)
1993

UZA Size	Mode						Total
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
Under 200,000	126.9	0.0	0.0	0.0	45.6	2.5	175.0
200,000 to 1 Million	296.1	0.0	0.4	0.9	62.4	2.7	362.5
Over 1 Million	1,155.3	505.2	203.0	26.0	135.3	29.6	2,055.7
Total	1,578.3	505.2	203.4	26.9	243.3	34.8	2,593.2

Vehicles Operated in Maximum Service by UZA Size and Mode

Exhibit 95 displays the number of vehicles operated in maximum service by urbanized area size. The patterns evident in vehicle revenue miles are also present with the number of vehicles. First, heavy rail, commuter rail and light rail are operated almost exclusively in the large urbanized areas. Combined, these modes account for 24.8 percent of the total vehicles operated during maximum service in these areas. Second, bus is the dominant mode in all urbanized areas, regardless of size. Finally, the share of demand response vehicles has an inverse relationship to urbanized area size. The greatest share occurs in the small urbanized areas (21.8 percent), and then decreases in the medium (24.3 percent) and large (53.8 percent) areas.

Exhibit 95

Vehicles Operated in Maximum Service by UZA Size and Mode
1993

	Mode						

Unlinked Passenger Trips by UZA Size and Mode

Exhibit 96 displays the change in transit ridership from 1989 to 1993 by urbanized area size and mode. Overall, there was a modest ridership growth in small and mid-sized urbanized areas (1.7 and 1.2 percent, respectively). The large urbanized areas experienced a 9.4 percent loss of ridership during this same period. As shown in this exhibit, transit ridership is concentrated in the large urbanized areas. In total, nearly 88 percent of all transit trips occurred in these areas. The mid-sized areas followed with approximately nine percent, and the small areas accounted for only three percent of the total transit ridership during this period.

Among the various modes, demand response experienced a ridership growth in all urbanized areas; 33.3 percent in small and mid-sized areas and 47.4 percent in the large urbanized areas. Bus, the only other mode operating in all three areas, maintained ridership in small and mid-sized areas, and experienced a modest loss of 5.4 percent in the large urbanized areas. Light rail also experienced a ridership growth in all areas it serves; 100 percent in mid-sized areas and 14 percent in the large areas. Commuter rail ridership decreased three percent in the large urbanized areas. Heavy rail, the only mode to operate solely in the large urbanized areas, posted a ridership loss of 19.5 percent during this period. Some of this loss appears attributable to a data reporting anomaly in 1989.

Exhibit 96

Unlinked Passenger Trips by UZA Size and Mode
(Millions)
1989-1993

UZA Size	Year	Mode						Total
		Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
Under 200,000	1989	221	-	-	0	9	1	231
	1990	211	-	-	0	8	2	221
	1991	217	-	-	0	9	2	228
	1992	223	-	-	0	10	2	235
	1993	221	-	-	0	12	2	235
200,000 to 1 Million	1989	662	-	-	4	9	8	683
	1990	647	-	0	8	10	5	670
	1991	657	-	0	8	10	4	679
	1992	666	-	0	9	11	4	690
	1993	666	-	0	8	12	5	686
Over 1 Million	1989	3,956	2,542	330	157	19	182	7,186
	1990	4,029	2,346	328	166	22	184	7,075
	1991	3,951	2,167	324	175	23	187	6,827
	1992	3,859	2,207	313	179	25	188	6,771
	1993	3,752	2,046	320	179	28	182	6,512
Total	1989	4,839	2,542	330	161	37	191	8,100
	1990	4,887	2,346	328	174	40	191	7,966
	1991	4,825	2,167	324	183	42	193	7,734
	1992	4,748	2,207	314	187	45	194	7,695
	1993	4,638	2,046	321	188	52	188	7,433

Passenger Miles by UZA Size and Mode

Exhibit 97 displays the change in passenger miles by urbanized area size and mode between 1989 and 1993. An examination of historical data before and after 1989 indicates that the 1989 passenger mile data for small urbanized areas may be artificially high skewing all comparisons. As a result, this analysis focuses on the comparison of data between 1990 and 1993 for the small urbanized areas. Overall, there was a 14 percent increase in passenger miles in small urbanized areas between 1990 and 1993. Passenger miles in mid-size areas increased 1.1 percent while miles in large urbanized areas decreased 6.2 percent between 1989 and 1993.

Exhibit 97

Passenger Miles by UZA Size and Mode
(Millions)
1989-1993

UZA Size	Year	Mode						Total
		Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response	Other	
Under 200,000	1989	1,053	-	-	0	52	11	1,116
	1990	748	-	-	0	47	7	802
	1991	780	-	-	0	53	13	846
	1992	815	-	-	0	63	10	888
	1993	810	-	-	0	77	27	914
200,000 to 1 Million	1989	2,592	-	-	22	67	37	2,718
	1990	2,535	-	-	20	74	29	2,658
	1991	2,553	-	0	20	73	38	2,684
	1992	2,552	-	5	19	91	46	2,713
	1993	2,540	-	6	19	104	52	2,721
Over 1 Million	1989	14,365	12,030	7,212	486	115	492	34,700
	1990	14,786	11,475	7,082	549	137	499	34,528
	1991	14,771	10,488	7,379	642	147	512	33,939
	1992	14,127	10,737	7,315	681	162	529	33,551
	1993	14,014	10,231	6,906	684	209	546	32,590
Total	1989	18,010	12,030	7,212	508	234	540	38,534
	1990	18,069	11,475	7,082	569	258	535	37,988
	1991	18,104	10,488	7,384	662	273	563	37,474
	1992	17,494	10,737	7,320	700	317	585	37,153
	1993	17,364	10,231	6,912	704	389	625	36,225

Passenger miles, like transit ridership, are concentrated in the large urbanized areas. Given the interaction between these two measures, it is not surprising to find that historically, approximately 90 percent of all passenger miles occurred in these larger areas. The remaining ten percent was split between the mid-sized areas (7.5 percent) and the small urbanized areas (two percent). Examination of the modal data indicates that demand response is the only mode to show growth among all urbanized areas over the five year period; 63.8 percent in small areas between 1990 and 1993, 55.2 percent in mid-sized areas and 81.7 percent in large areas between 1989 and 1993. The only other area of significant growth occurred in light rail passenger miles, which posted a 40.7 percent increase in the large areas. The remaining modes each recorded a decrease in passenger miles in the large areas. Heavy rail experienced the largest loss (15 percent), followed by commuter rail (4.2 percent). Bus, however, indicated declines in each urbanized area size by 23.1 percent for the smallest areas, two percent for the mid-size areas, and 2.4 percent for the largest areas.

Operating Expense Per Vehicle Revenue Mile by UZA Size and Mode

Exhibit 98 displays the difference in operating expense per vehicle revenue miles by urbanized areas size for each mode. A weighted average for this exhibit and the three exhibits which follow in this chapter have been computed for each mode. The cost per mile for bus and demand response service has a direct relationship to urbanized area size: cost increases with population size. The cost per bus vehicle revenue mile in mid-sized areas is 21.3 percent greater than in small urbanized areas, and 85.2 percent greater in large urbanized areas. The differences are not as great for demand response where the cost per mile in mid-sized areas is approximately 4.6 percent higher than in small areas, and almost 20.8 percent higher in large areas. The opposite is true for light rail and

Exhibit 98

Operating Expense Per Vehicle Revenue Mile by UZA Size and Mode
1993

UZA Size	Mode				
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
Under 200,000	$3.24	-	-	$4.55	$1.97
200,000 to 1 Million	3.92	-	$12.44	14.60	2.06
Over 1 Million	6.00	$7.26	10.22	11.55	2.38
Weighted Average	$5.39	$7.26	$10.22	$11.66	$2.22

commuter rail where the cost per mile in large urbanized areas is lower than in mid-sized areas: nearly 21 percent lower for light rail and 17.8 percent lower for commuter rail.

Operating Expense Per Unlinked Passenger Trip by UZA Size and Mode

Exhibit 99 displays the cost effectiveness of each mode by urbanized area size as measured by the cost per unlinked passenger trip. The cost effectiveness of bus service does not vary greatly by population size. Bus service is 6.5 percent less in mid-sized areas and 6.3 percent greater in large areas when compared to the cost per trip for 200,000 to one million population areas. More dramatic differences occur with demand response and light rail costs. With demand response, the cost per trip increases with population size. The cost is 40.7 percent greater in mid-sized areas, and 56.3 percent greater in large areas when compared to the cost per trip in small areas. Light rail shows a different pattern with the cost per trip being 40.8 percent less in mid-sized areas and 36.6 percent less in large areas, as compared to the cost in small areas.

Exhibit 99

Operating Expense Per Unlinked Passenger Trip by UZA Size and Mode
1993

UZA Size	Mode				
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
Under 200,000	$1.86	-	-	$2.65	$7.44
200,000 to 1 Million	1.74	-	$18.51	1.57	10.47
Over 1 Million	1.85	$1.79	6.47	1.68	11.63
Weighted Average	$1.84	$1.79	$6.48	$1.68	$10.38

Operating Expense Per Passenger Mile by UZA Size and Mode

Exhibit 100 displays the operating expense per passenger mile by urbanized area size and mode. This measure of cost effectiveness displays some of the same trends as those found in the cost per trip ratios. Specifically, the cost per passenger mile for bus is lower in mid-sized areas (minus 11.7 percent) and slightly lower in large areas (two percent), when compared to the small urbanized areas. In addition, the cost of demand response service increases with urbanized area size: 5.1 percent higher for mid-sized areas and 31.6 percent higher for large areas when compared to the cost in small areas. Light rail and commuter rail show the opposite pattern; their cost per mile decreases as the urbanized area size increases. Light rail costs decrease 42.4 percent when operations occur in mid-sized areas as opposed to small urbanized areas. In large urbanized areas, the cost decreases 62.7 percent. A similar decrease (67 percent) occurs for commuter rail when comparing the cost per passenger mile in mid-sized areas to large areas.

Operating Expense Per Passenger Mile by UZA Size and Mode
1993

Exhibit 100

UZA Size	Mode				
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
Under 200,000	$0.51	-	-	$1.18	$1.17
200,000 to 1 Million	0.45	-	$0.91	0.68	1.23
Over 1 Million	0.50	$0.36	0.30	0.44	1.54
Weighted Average	$0.49	$0.36	$0.30	$0.45	$1.39

Average Operating Speed by UZA Size and Mode

Exhibit 101 displays the average operating speed of each mode by urbanized area size. Bus service in large urbanized areas operates eight to 10 percent slower than in mid-sized and small areas. Demand response and light rail, however, show the opposite pattern. The average operating speed of demand response service in mid-sized and large areas is nearly 10 percent faster than the service operated in small areas. The operating speed of light rail, however, increases dramatically with urbanized area size.

Average Operating Speed by UZA Size and Mode
1993

Exhibit 101

UZA Size	Mode				
	Bus	Heavy Rail	Commuter Rail	Light Rail	Demand Response
Under 200,000	13.9	-	-	4.6	13.4
200,000 to 1 Million	13.7	-	40.8	12.0	14.8
Over 1 Million	12.6	20.4	33.8	14.0	14.7
Weighted Average	12.9	20.4	33.9	13.9	14.4

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Chapter 7
Safety

Introduction

This chapter will discuss an important measure of service quality: operations safety. Data regarding safety-related incidents is presented here for each of the five major modes.

Chapter Organization

The chapter discusses safety of transit operations as measured by collision and non-collision incidents, as well as by comparing injuries, fatalities and property damage.

Before proceeding through this chapter, some items need to be noted. Data is reported only for directly operated service. Safety-related data reporting changes have led to large variations in data for those years prior to 1990 as compared with data subsequently reported. Thus, unlike chapters discussing five-year trends from 1989 to 1993, safety issues will be presented for the period 1990 to 1993. Also, safety data is not required to be reported from smaller transit agencies. This results in aggregate data being lower than in previous chapters.

General Notes

Collision incidents are those that involve one or more transit agency vehicles colliding with any other vehicle, obstacle, or person. Non-collision incidents involve derailments; buses or other transit vehicles leaving the roadway; personal injuries received while inside the transit vehicle resulting from sudden braking or unexpected swerving; falls or other mishaps experienced while boarding or alighting; and 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 are all incidents involving fires.

Total Reported Incidents By Mode

Exhibit 102 provides total reportable incidents by mode from 1990 to 1993. As is apparent from this exhibit, the number of incidents has dropped each year for all of the major modes except heavy rail. However, heavy rail incidents were fewer in 1993 than in 1992 despite increases in each of the previous years. Still, heavy rail incidents were 15.4 percent greater in 1993 than in 1990, while incidents for bus, commuter rail, light rail and demand response combined were 36.7 percent less than in 1990.

Exhibit 102

Total Reported Incidents by Mode
1990-1993

Mode	1990	1991	1992	1993
Bus	71,636	66,036	52,381	45,545
Heavy Rail	13,070	14,917	15,512	15,082
Commuter Rail	3,500	3,236	3,235	2,111
Light Rail	1,606	1,700	1,520	1,182
Demand Response	1,961	1,457	1,147	973
Total	91,773	87,346	73,795	64,893

Total Fatalities by Mode

Exhibit 103 indicates that fatalities have declined for bus, heavy rail and commuter rail when comparing 1993 with 1990, though there were six more fatalities involving commuter rail in 1993 than in 1992. Light rail recorded 15 fatalities in 1993, as compared with five in 1990 and seven in 1992, but almost comparable to the 13 fatalities reported in 1991. Demand response noted two fatalities in 1993. Bus, heavy rail and commuter rail each had a comparable number of fatalities in 1993, and combined accounted for approximately 94 percent of all fatalities.

Exhibit 103

Total Fatalities by Mode
1990-1993

Mode	1990	1991	1992	1993
Bus	110	87	99	83
Heavy Rail	112	100	91	83
Commuter Rail	98	93	80	86
Light Rail	5	13	7	15
Demand Response	0	3	0	2
Total	325	296	277	269

Total Injuries by Mode

Exhibit 104 presents total injuries by mode. These figures not only include injuries experienced by passengers in both collision and non-collision incidents, but also those experienced by non-passengers such as auto passengers involved in an auto and bus incident. The number of injuries declined for all of the major modes but heavy rail from 1992 to 1993, though heavy rail actually realized a less than one percent increase in injuries since 1992. Bus accounts for 73.6 percent of injuries, while heavy rail accounts for 20.2 percent.

Exhibit 104

Total Injuries by Mode
1990-1993

Mode	1990	1991	1992	1993
Bus	39,301	38,164	39,552	38,300
Heavy Rail	10,178	9,282	10,446	10,532
Commuter Rail	2,328	2,308	2,546	1,560
Light Rail	1,260	1,251	1,269	982
Demand Response	777	620	705	649
Total	53,844	51,625	54,518	52,023

Total Property Damage by Mode

Exhibit 105 provides total property damage for each of the major modes. Each mode reported increased property damages from 1992 to 1993 except light rail and demand response. Light rail property damage decreased by 32.4 percent, while demand response decreased by 42.6 percent. Bus property damage increased by 22.9 percent, while heavy rail increased by 22.8 percent and commuter rail increased by 30.9 percent. Bus accounted for 68.1 percent of the property damage reported in 1993, while heavy rail accounted for 20.1 percent and commuter rail 8.7 percent. Light rail and demand response each accounted for less than two percent.

Exhibit 105

Total Property Damage by Mode
1990-1993

Mode	1990	1991	1992	1993
Bus	$27,316,045	$26,256,950	$24,793,067	$30,463,558
Heavy Rail	7,929,642	6,525,828	7,333,790	9,003,757
Commuter Rail	861,513	1,295,623	2,986,769	3,911,643
Light Rail	1,144,000	1,008,107	1,184,825	801,082
Demand Response	609,484	868,482	1,080,698	549,804
Total	$37,860,684	$35,954,990	$37,379,149	$44,729,844

Total Incidents Per 100 Million Passenger Miles by Mode

Exhibit 106 indicates the number of incidents per 100 million passenger miles. The relative safety of the major modes is reflected in terms of the occurrence of incidents in relation to the large number of passenger miles realized. The rail modes demonstrated the lowest rate of incidents per 100 million passenger miles, with commuter rail posting the lowest rate of 30.5 incidents per 100 million passenger miles. Bus and demand response posted the highest rates. This is indicative of the operation of vehicles for these modes in mixed traffic versus the operation of rail modes along exclusive fixed guideways. In fact, among the rail modes, light rail shows the highest rate of incidents per 100 million passenger miles, reflective of the greater incidence of cross and mixed traffic it experiences. The average number of incidents per 100 million passengers has been computed and reflects the relative frequency (weighted average) of each mode in the distribution of passenger miles. Similar weighted averages have been computed for the exhibits that follow.

Exhibit 106

Total Incidents Per 100 Million Passenger Miles by Mode
1990-1993

Mode	Incidents	Passenger Miles (Millions)	Incidents Per 100 Million Passenger Miles
Bus	45,545	17,364	262.3
Heavy Rail	15,082	10,231	147.4
Commuter Rail	2,111	6,912	30.5
Light Rail	1,182	704	167.9
Demand Response	973	390	249.5
Total	64,893	35,601	-
Weighted Average	-	-	182.3

Total Incidents Per 100 Million Unlinked Passenger Trips by Mode

Exhibit 107 presents incidents per 100 million unlinked passenger trips. The relative safety of each of the five major modes is reflected in relation to the ridership each mode realizes. Again, the rail modes show the lowest rates of incidents per 100 million unlinked passenger trips, while bus and demand response reflect substantially higher rates. Light rail's rate of 630.4 is only approximately one-third the rate of demand response of 1,871.2.

Exhibit 107

Total Incidents Per 100 Million Unlinked Passenger Trips by Mode
1993

Mode	Incidents	Unlinked Passenger Trips (Millions)	Incidents Per 100 Million Unlinked Passenger Trips
Bus	45,545	4,639	981.9
Heavy Rail	15,082	2,046	737.3
Commuter Rail	2,111	321	658.0
Light Rail	1,182	188	630.4
Demand Response	973	52	1,871.2
Total	64,893	7,246	-
Weighted Average	-	-	895.6

Total Injuries Per 100 Million Passenger Miles by Mode

Exhibit 108 indicates the relative safety of the rail modes as compared to bus and demand response. Commuter rail experienced an extremely low rate of 22.6 injuries per 100 million passenger miles. This rate is approximately 10 percent of the rate of 220.6 incidents per 100 million passenger miles that bus experienced.

Exhibit 108

Total Injuries Per 100 Million Passenger Miles by Mode
1993

Mode	Injuries	Passenger Miles (Millions)	Injuries Per 100 Million Passenger Miles
Bus	38,300	17,364	220.6
Heavy Rail	10,532	10,231	102.9
Commuter Rail	1,560	6,912	22.6
Light Rail	982	704	139.5
Demand Response	649	390	166.4
Total	52,023	35,601	-
Weighted Average	-	-	146.1

Total Injuries Per 100 Million Unlinked Passenger Trips

Exhibit 109 demonstrates the relative safety of rail modes concerning injuries as related to ridership when compared to bus and demand response. Commuter rail's rate of 486.3 injuries per 100 million unlinked passenger trips is approximately 40 percent of that of demand response's rate of 1,248.1.

Total Injuries Per 100 Million Unlinked Passenger Trips
1993

Exhibit 109

Mode	Injuries	Unlinked Passenger Trips (Millions)	Injuries Per 100 Million Unlinked Passenger Trips
Bus	38,300	4,639	825.7
Heavy Rail	10,532	2,046	514.9
Commuter Rail	1,560	321	486.3
Light Rail	982	188	523.7
Demand Response	649	52	1,248.1
Total	52,023	7,246	-
Weighted Average	-	-	718.1

Fatalities Per 100 Million Passenger Miles

Exhibit 110 reflects the very low fatality rates experienced by all modes when measured in terms of the passenger miles that are realized. However, unlike the injury rates previously discussed, the rail modes experienced higher fatality rates than those realized by bus and demand response. The fatality rate of 0.5 per 100 million passenger miles for bus and demand response is less than 24 percent of light rail's 2.1 fatalities per 100 million passenger miles, and less than 42 percent of heavy rail's rate of 1.2.

Total Fatalities Per 100 Million Passenger Miles
1993

Exhibit 110

Mode	Fatalities	Passenger Miles (Millions)	Fatalities Per 100 Million Passenger Miles
Bus	83	17,364	0.5
Heavy Rail	83	10,231	0.8
Commuter Rail	86	6,912	1.2
Light Rail	15	704	2.1
Demand Response	2	390	0.5
Total	269	35,601	-
Weighted Average	-	-	0.8

Fatalities Per 100 Million Unlinked Passenger Trips

Exhibit 111 again demonstrates the lower fatality rates relative to ridership of bus and demand response when compared to the rail modes. Commuter rail shows a substantially higher rate of 26.8 fatalities per 100 million unlinked passenger trips as compared to heavy rail's rate of 4.1 and light rail's rate of 8.0. Demand response shows a rate of 3.8, closer to the rate of heavy rail than that reported by bus. A very low rate of 1.8 fatalities per 100 million unlinked passenger trips was realized by bus.

Exhibit 111

Total Fatalities Per 100 Million Unlinked Passenger Trips
1993

Mode	Fatalities	Unlinked Passenger Trips (Millions)	Fatalities Per 100 Million Unlinked Passenger Trips
Bus	83	4,639	1.8
Heavy Rail	83	2,046	4.1
Commuter Rail	86	321	26.8
Light Rail	15	188	8.0
Demand Response	2	52	3.8
Total	269	7,246	-
Weighted Average	-	-	3.7

Incident, Injury, and Fatality Rates Per 100 Million Passenger Miles by Mode

Exhibit 112 summarizes the various rates per 100 million passenger miles for incidents, injuries, and fatalities for each mode.

Total Incidents, Injuries, and Fatalities Per 100 Million Passenger Miles by Mode
1993

Exhibit 112

Mode	Incident Rate	Injury Rate	Fatality Rate
Bus	262.3	220.6	0.5
Heavy Rail	147.4	102.9	0.8
Commuter Rail	30.5	22.6	1.2
Light Rail	167.9	139.5	2.1
Demand Response	249.5	166.4	0.5
Weighted Average	182.3	146.1	0.8

Incident, Injury, and Fatality Rates Per 100 Million Unlinked Passenger Trips

Exhibit 113 summarizes the various rates per 100 million unlinked passenger trips for incidents, injuries and fatalities for each mode.

Total Incidents, Injuries, and Fatalities Per 100 Million Unlinked Passenger Trips
1993

Exhibit 113

Mode	Incident Rate	Injury Rate	Fatality Rate
Bus	981.9	825.7	1.8
Heavy Rail	737.3	514.9	4.1
Commuter Rail	658.0	486.3	26.8
Light Rail	630.4	523.7	8.0
Demand Response	1,871.2	1,248.1	3.8
Weighted Average	895.6	718.1	3.7

Collision and Non-Collision Incidents by Mode

Exhibit 114 depicts the number of collision and non-collision incidents by mode. Bus accounted for the greatest portion of collision incidents, 93.5 percent. For non-collision incidents, bus accounted for 50 percent, but heavy rail accounted for 41.3 percent of such incidents.

Exhibit 114

Collision and Non-Collision Incidents by Mode
1993

Mode	Collision Incidents	Non-Collision Incidents	Total
Bus	28,143	17,402	45,545
Heavy Rail	714	14,368	15,082
Commuter Rail	245	1,866	2,111
Light Rail	454	728	1,182
Demand Response	546	427	973
Total	30,102	34,791	64,893

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Chapter 8
Reliability and Maintenance Effectiveness

Introduction

This chapter will discuss some possible measures of service quality, such as service reliability and the effectiveness of transit maintenance.

Chapter Organization

The chapter reviews service reliability in terms of vehicle revenue miles between roadcalls and discusses maintenance effectiveness by examining maintenance expense per vehicle revenue mile of service for each mode.

General Notes

Before proceeding through this chapter, some items should be noted. As for indicators of service reliability, the appropriate definition of roadcalls and their consistent reporting within the transit industry have not been fully resolved. The roadcalls discussed herein are those defined as roadcalls for mechanical failure as described in the *1993 Reporting Manual*. Thus, revenue service interruptions caused by failure of some mechanical element of the revenue vehicle are considered. These include breakdowns of air equipment, brushes, fuel system, engine, steering and front axle, rear axle and suspension, torque convertors, electrical units, heating system and cooling system. They involve revenue service interruptions that would prevent a vehicle from running and which require someone other than the vehicle operator or crew to restore the vehicle to an operating condition.

National Transit Database reporting deals with maintenance data only for directly operated service. Purchased transportation expenses are not typically split into individual maintenance functions, but are generally reported with total purchased transportation costs, which are reported as either vehicle operations or general administration expenses.

Maintenance Performance Measures: Maintenance Expense Per Vehicle Revenue Mile

Maintenance costs will vary greatly by mode due to differences in infrastructure, such as vehicle type and complexity and fixed guideway. As reflected in **Exhibit 115**, maintenance expense per vehicle revenue mile for bus and demand response have increased by 5.6 percent and 32.4 percent, respectively, from 1989 to 1993. However, maintenance expense per vehicle revenue mile for bus declined 4.3 percent from 1992 to 1993 to a point comparable with the 1991 figure. The figure for demand response increased by only 2.3 percent from 1992 to 1993 and in fact has remained stable since 1991. Heavy rail maintenance expense per vehicle revenue mile was 7.5 percent lower in 1993 than in 1992, while maintenance expense per vehicle revenue mile for commuter rail was practically unchanged from 1992 to 1993. Light rail, however, experienced a 10.4 percent increase from 1992 to 1993 in maintenance expense per vehicle revenue mile and has posted increases each year since 1989.

Exhibit 115

Maintenance Expense Per Vehicle Revenue Mile by Mode 1989-1993

Mode	1989	1990	1991	1992	1993
Bus	$1.25	$1.33	$1.32	$1.38	$1.32
Heavy Rail	2.99	2.93	3.00	3.08	2.85
Commuter Rail	4.31	4.29	4.25	4.38	4.34
Light Rail	4.11	4.30	4.43	4.50	4.97
Demand Response	0.34	0.35	0.44	0.44	0.45
Other	2.68	3.07	3.15	3.72	2.62

Vehicle Revenue Miles Per Mechanical Roadcall

Reporting of roadcall data for the National Transit Database is done only for directly operated bus and demand response services. Transit agencies may report other modes, but are not required to do so, as this is optional data. Thus, the only data available sufficient for offering a historical comparison are for bus and demand response. It should be noted that due to reporting changes and clarifications to the roadcall definition, analysis of changes over time is limited. However, miles between roadcalls is a common measure of maintenance performance within the transit industry.

As is shown in **Exhibit 116**, bus has seen a steady increase in miles between roadcalls from 1989 to 1992, though there was a slight decline from 1992 to 1993. While miles between roadcalls for bus are 31.2 percent greater in 1993 than in 1989, they are 3.7 percent less in 1993 than in 1992. However, miles between roadcalls for bus have averaged approximately 4,148 miles since 1991. For demand response, after steady improvements from 1989 to 1991, miles between roadcalls has been declining. Miles between roadcalls for demand response for 1993 were 14.7 percent less than in 1992 and 22 percent less than in 1991.

Vehicle Revenue Miles Per Mechanical Roadcall
(Directly Operated Service)
1989-1993

Exhibit 116

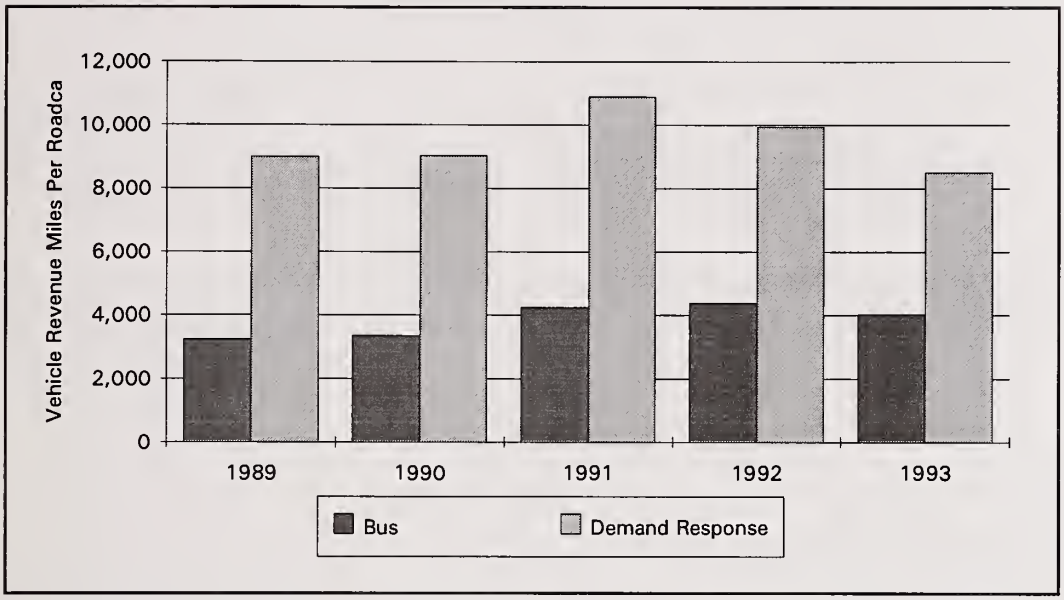

Exhibit 117 indicates the ratio of vehicle maintenance expenses to total operating expenses from 1989 to 1993. While vehicle maintenance expenses accounted for 18.9 percent of total operating expenses in 1993, an increase of over 0.2 percent from 1992, they were still less than the 19.8 percent reported in 1989. Also, total vehicle maintenance expenses in 1993 were only 6.0 percent greater than that of 1989.

Ratio of Vehicle Maintenance Expenses to Total Operating Expenses

Ratio of Vehicle Maintenance Expenses to Total Operating Expenses
(Millions)
1989-1993

Exhibit 117

Year	Vehicle Maintenance Expenses	Total Operating Expenses	Ratio of Vehicle Maintenance Expenses to Total Operating Expenses
1989	$2,753.4	$13,882.6	19.8%
1990	2,874.0	14,714.6	19.5%
1991	2,882.0	15,404.1	18.8%
1992	2,902.4	15,498.5	18.7%
1993	2,919.5	15,472.7	18.9%

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Appendix
Aggregate Data by Reporting Form

Purpose of this Appendix

For the 1993 Report Year, the entire National Transit Database has been aggregated by reporting form for Capital, Operating Funding, Operating Expenses, Non-Financial Data, and Reconciling Cash Expenditures.

Form 103

Capital Funding Form (103)

Capital Funds Applied to Transit System*			
a	b	c	d
Part A. Federal Government			
I. Funds received from FTA			
01 Section 3 funds			1,038,550.6
02 Section 9 funds			989,323.4
03 Other FTA funds			279,434.1
04 Total FTA funds			2,307,308.1
05 II. Funds received from other U.S. DOT grant programs			24,197.1
06 III. Other Federal funding			52,036.9
07 Total Federal assistance			2,383,542.1

	State Funds	Local Funds	Directly Generated Funds
Part B. State & local sources			
I. Funds allocated to transit out of general revenues			
08 of the government entity	433,312.1	343,608.3	
II. Funds dedicated to transit at their source			
Dedicated taxes:			
09 1. Income taxes	0.0	1,603.0	0.0
10 2. Sales taxes	31,658.8	121,143.0	256,032.7
11 3. Property taxes	56,172.6	3,860.0	16,085.0
12 4. Gasoline taxes	52,995.9	0.0	0.0
13 5. Other taxes	20,497.6	4,170.4	6,522.0
14 Bridge, tunnel & hwy tolls	8,508.7	2,641.1	36,592.0
15 Other dedicated funds	81,014.5	4,100.4	140,403.6
16 III. Other funds	632,577.5	573,385.0	523,231.1
17 Total State, local, & directly generated funding	1,316,737.8	1,054,511.3	978,866.3

Uses of Capital Funds

Mode	Rolling Stock	Facilities	Other	Total
18 AG	1,879.5	22,862.9	6,638.3	31,380.7
19 CC	44.8	227.3	36.2	308.4
20 CR	266,100.1	1,161,063.8	217,889.3	1,645,053.2
21 DR	48,108.2	9,276.2	11,364.7	68,749.2
22 FB	27,663.3	37,893.7	17,689.0	83,246.0
23 HR	409,128.9	762,601.7	733,516.0	1,905,246.6
24 IP	0.0	1,067.9	1,057.0	2,124.9
25 JT	0.0	0.0	0.0	0.0
26 LR	46,459.4	243,585.0	174,243.4	464,287.8
27 MB - NF	707,309.6	447,235.9	198,559.4	1,353,104.9
28 MB - FG	35,338.4	107,404.1	5,726.4	148,468.8
29 MO	27.2	39.6	0.0	66.8
30 PB	0.0	0.0	0.0	0.0
31 TB	6,365.5	10,027.0	2,436.6	18,829.1
32 TR	0.0	0.0	0.0	0.0
33 VP	6,150.0	284.0	3,763.0	10,197.0
34 OR	0.0	0.0	0.0	0.0
35 Total expenditures	$ 1,554,575.0	$ 2,803,569.1	$ 1,372,919.4	$ 5,731,063.0

* In thousands

Report Year 1993

Operating Funding Form (203)

Form 203

	Operating Funds Applied to Transit System* - page 1	b
	Part A. Directly generated funds	Funds
	I. Passenger fares	<----optional---->
01	1. Full adult fares	< >
02	2. Senior citizen fares	< >
03	3. Student fares	< >
04	6. Park and ride - parking revenue only	< >
05	5. Special ride fares	< >
06	Total passenger fares for directly operated service	$ 5,763,545.2
07	II. Special transit fares	80,073.1
08	III. School bus service funds	2,137.8
09	IV. Freight tariffs	7,587,3
10	V. Charter service funds	24,758.3
11	VI. Auxilliary transportation funds	163,194.8
	VII. Non-transportation funds	<----optional---->
12	1. Investment income	< >
13	2. Other non-transportation funds	< >
14	Total non-transportation funds	346,743.7
	VIII. Funds dedicated to transit at their source	
	Dedicated taxes	
15	1. Income taxes	0
16	2. Sales taxes	849,537.6
17	3. Property taxes	202,132.7
18	4. Gasoline taxes	13,956.4
19	5. Other taxes	120,290.3
20	Bridge, tunnel and highway tolls	176,479.8
21	Other dedicated funds	-23,116.4
	IX. Revenue accrued through a purchased	
22	transportation agreement	407,835.8
23	X. Fare revenue returned by seller (contractor)	273,447.2
	XI. Contributed services	
24	1. State and local government	15,999.9
25	2. Contra account for expense	(14,631.5)
26	Net contributed services	-0-
27	XII. Subsidy from other sectors of operations	137,537.0
28	Total directly generated funds	$ 8,551,210.2

* In thousands

Report Year 1993

Form 203

Operating Funding Form (203)

	Operating Funds Applied to Transit System* - page 2			
			d	
	Total directly generated funds (from page 1)			8,507,587.8
	Part B. Federal Government			Funds
29	I. Funds from FTA Section 9 program			781,043.8
30	II. Funds from other Federal programs			131,907,1
31	Total Federal assistance			$ 913,025.8
		b	c	
	Part C. State and local government		State Funds	Local Funds
	I. Funds allocated to transit out of the general revenues			
32	of the government entity.		1,661,492.1	2,017,563.3
	II. Funds dedicated to transit at their source			
	Dedicated taxes			
33	1. Income taxes		295,143.9	5,223.4
34	2. Sales taxes		339,829,4	1,289,568.6
35	3. Property taxes		1,906.4	138,695.7
36	4. Gasoline taxes		201,151.5	28,813.3
37	5. Other taxes		436,979,5	108,327.5
38	Bridge, tunnel and hghwy toll		11,994.4	68,893.0
39	Other dedicated funds		19,113,1	18,699.5
40	III. Other funds		507,447.3	150,478.2
41	Total State and local assistance		$ 3,475,057.5	$ 3,826,262.5
42	Total operating funds applied to transit system			$ 16,757,857.1
	Part D. Passenger fares for directly operated transit service	Mode b		Funds < ---optional-->
43				< >
44				< >
45				< >
46				< >
47				< >
48				< >
49				< >
50				< >

* In thousands

Report Year 1993

Operating Expenses Summary Form (301)

Form 301

a		Expense Object Class	Function* b Vehicle Operations 010	c Vehicle Maintenance 041	d Non-Vehicle Maintenance 042	e General Administration 160	f Total Expense for Period
	501.	Labor					
01	01	Operator salaries/wages	2,951,244.3	2,832.3	2,214.3	3,491.6	2,959,782.5
02	02	Other salaries & wages	1,259,386.1	1,390,168.3	924,991.6	896,969.3	4,471,515.3
03	502.	Fringe benefits	2,255,162.9	768,758.0	537,453.0	609,095.4	4,170,469.2
04	503.	Services	145,266.1	116,241.2	163,935.4	412,664.8	838,107.4
	504.	Materials & supplies					
05	01	Fuel & lubricants	380,112.7	14,281.1	2,084,6	20.8	396,499.2
06	02	Tires & tubes	73,442.9	3,044.7	507.4	122.4	77,117.4
07	99	Other mater'ls/supplies	47,003.4	618,249.2	192,599.2	92,319.4	950,171.2
08	505.	Utilities	190,675.8	14,189.5	247,114.7	154,745.8	606,725.9
09	506.	Casualty/liability cost	46,444.2	16,528.8	5,097.2	489,127.7	557,197.8
10	507.	Taxes	23,832.3	2,550.5	280.1	12,798.5	39,461.3
	508.	Purchased transportn					
11	01	In report	519,820.5	26,170.5	11,563.9	310,081.9	867,636.8
12	02	Filing separate report	291,892.0	27,998.5	20,318.7	190,317.2	530,526.4**
13	509.	Miscellaneous expense	49,179.1	12,715.4	31,510.1	144,367.7	237,772.3
14	510.	Expense transfers	65,046.6	-68,877.5	-411,656.3	-284,312.1	-699,799.3
15		Total system expenses	8,298,508.8	2,944,850.5	1,728,013.9	3,032,053.2	16,003,426.4**
	Reconciling Items						
16	511.	Interest expenses					557,899.5
17	512.	Leases & rentals					185,263.8
18	513.	Depreciation					2,189,014.5
19	513.13	Amortization of intangibles					68,756.8
20	514.	Purchase lease agreement					4,118.7
21	515.	Related parties lease agreement					-10,534.9
22	516.	Other reconciling items					177,518.9
23		Total reconciling items					3,172,037.4
24	Total expenses from published reports						19,175,244.6
25	Memo item: Expenses not allowable for Federal operating assistance						1,644,107.5

* In thousands

Report Year 1993

** Includes Purchased Transportation Expenses as reported by both the contracting transit agency and the purchased transportation provider. When double counting is removed, total system expenses are $15,472,900, rounded.

Form 321

Operator's Wages Form (321)

	Time Classification	Dollars*	Hours
	a	b	c
	1. Operating time		
01	01 Report, turn-in time, breaks & allowances	133,609.8	8,509.5
02	02 Platform time - line service	2,213,065.0	148,101.1
03	03 Platform time - charter & special	13,675.6	1,015.2
04	04 Travel & intervening time	77,225.0	5,175.5
05	05 Minim. guaran. time - call out, daily,wkly	32,020.0	1,983.2
06	06 Overtime premium - scheduled & unscheduled	125,415.9	15,621.8
07	07 Spread time premium	31,233.8	3,479.2
08	08 Other operating time	33,337.1	16,629.4
09	Total operating time	$ 2,659,582.1	
	2. Non-operating paid work time		
10	01 Stand-by time	40,726.8	2,774.8
11	02 Other non-operating paid work time	87,443.5	6,464.0
12	Total non-operating paid work time	$ 128,170.3	
13	Total operating and non-operating time	$ 2,787,752.1	

* In thousands

Report Year 1993

Fringe Benefits Form (331)

Form 331

Fringe Benefit Object Class	Employer Total*
502. Fringe benefits	
01 FICA or railroad retirement and/or PERS	766,561.9
02 Pension plans (including long-term disability insurance)	706,408.5
03 Hospital, medical, and surgical plans	971,556.4
04 Dental plans	45,980.6
05 Life insurance plans	25,866.2
06 Short-term disability insurance	12,113.1
07 Unemployment insurance	22,284.9
08 Workers' comp. insur. or Fed. Empl. Liability Act contrib.	294,612.7
09 Sick leave	200,896.7
10 Holiday (including all premiums paid for work on holidays)	270,667.4
11 Vacation	506,866.5
12 Other paid absence (bereavement, military, jury duty, etc.)	73,530.8
13 Uniform and work clothing allowances	33,110.6
14 Other fringe benefits	175,403.6
15 Total fringe benefits	$ 4,105,859.8

* In thousands

Report Year 1993

Form 402

Revenue Vehicle Maintenance and Energy Form (402)

	Item	Amounts
	Number of revenue service interruptions	
01	Mechanical reasons	391,833.0 *
02	Other reasons	214,277.0 *
03	Total revenue service interruptions	606,110.0 *
04	Total labor hours for inspection and maintenance	60,526,755.3
	Number of maintenance facilities	
	Number of general purpose facilities	
05	Serving under 200 vehicles	563.3
06	Serving 200-300 vehicles	90.8
07	Serving more than 300 vehicles	25.1
08	Number of heavy maintenance facilities	51.0
09	Total maintenance facilities	730.2
	Energy consumption	
10	Kilowatt hours of propulsion power	4,770,787,875.0
11	Gallons of diesel fuel	550,547,369.0
12	Gallons of gasoline	8,085,464.5
13	Gallons of LPG	358,238.0
14	Gallons of LNG	463,970.0
15	Gallons on methanol	5,203,437.0
16	Gallons of ethanol	237,879.0
17	Pounds of CNG	6,889,704.0
18	Gallons of bunker fuel	1,500.0
19	Other fuel	2,101,705.0

* Lines 01, 02, and 03 are optional for fixed guideway modes

As reported — Report Year 1993

Transit Way Mileage Form (403)

Form 403

	Guideway Classifications Rail Modes	Directional Route Miles*	Miles of Track*	Number of Crossings*	# of Stations Total*	# of Stations ADA*	Average Monthly DRM*
a		b	c	d	e	f	g
	Mode code: CR						
01	At grade, exclusive ROW	2,402.9	2760.0				
02	At grade, with cross traffic	3,019.9	3080.4	1765			
03	At grade, mixed/cross traffic	62.0	60.0	306			
04	Elevated on structure	51.8	52.6				
05	Elevated on fill	277.2	399.7				
06	Open cut	36.0	63.1				
07	Subway	25.3	25.3				
08	Total	5,875.1	6,441.1	2071	1079	242	1258.7*
	Mode code: HR						
09	At grade, exclusive ROW	380.4	691.9				
10	At grade, with cross traffic	10.9	11.5	27			
11	At grade, mixed/cross traffic	0.0	0.0	0			
12	Elevated on structure	401.3	455.8				
13	Elevated on fill	71.9	88.9				
14	Open cut	37.7	49.4				
15	Subway	549.4	709.7				
16	Total	1,451.7	2,007.2	27	984	217	345.3*
	Mode code: LR						
17	At grade, exclusive ROW	132.9	154.9				
18	At grade, with cross traffic	208.0	197.5	586			
19	At grade, mixed/cross traffic	106.9	219.1	2041			
20	Elevated on structure	16.1	13.9				
21	Elevated on fill	16.9	16.8				
22	Open cut	15.8	15.8				
23	Subway	40.8	41.5				
24	Total	537.4	659.5	2627	387	92	160.1*
	Mode code: AG						
25	Exclusive ROW	8.0	8.3		25	16	0*
	Mode code: CC						
26	Exclusive ROW	8.8	8.8	0	0	0	0*
	Mode code: IP						
27	Exclusive ROW	2.7	1.7		8	8	1.3*
	Mode code: MO						
28	Exclusive ROW	2.2	2.2		2	2	0*
	Non-Rail Modes	Directional Route Miles on Exclusive ROW	Directional Route Miles on Controlled Access ROW	Directional Route Miles on Mixed Traffic ROW			
29	Mode code: MB	558.9	625.5	514,953.5			1,390.7*
30	TB	405.2	0.0	0.0			104.5*
31	FB	475.6					2.5*
32	TR	0.0					0*
33	OR	0.0	0.0	0.0			0*

* Complete column g only if there was a change (increase/decrease) in service during reporting period that affected the number of fixed guideway directional route miles.

As reported

Report Year 1993

Form 404

Transit System Employee Form (404)

Labor Classification	Employee Work Hours		Actual Person Count	
	Directly Opertd	Purchased Transp	Full Time Empl	Part Time Empl
a	b	c	d	e
501. Labor		<---optional---->		<--optional--->
01 010 Vehicle operations	248,576,776.0	< >	120,651.0	< >
02 010 Trans. admin. & support	< >	< >	< >	< >
03 030 Revenue veh operation	< >	< >	<	< >
04 151 Ticketing/fare collectn	< >	< >	< >	< >
05 161 System security	< >	< >	< >	< >
06 041 Vehicle maintenance	80,638,143.8	< >	42,239.4	< >
07 042 Non-vehicle maintenance	47,566,154.4	< >	25,530.6	< >
08 160 General administration	40,412,889.2	< >	21,031.1	< >
09 Total system operating labor	423,529,493.0	< >	212,007.0	< >
10 Total system capital labor	18,821,659.5	< >	8,197.7	< >
11 Total system	442,310,203.0	< >	220,972.0	< >

As reported

Report Year 1993

Form 405

Transit Safety Form (405)

	Items	Incidents	Fatalities	Injuries
		b	c	d
	Collisions			
01	Collisions with other vehicles	25,717	74	19,727
02	Collisions with objects	3,481	5	1,131
03	Collisions with people	1,333	167	1,244
03a	(attempted/successful suicides)	[95]	[67]	[42]
	Non-collisions			
	Derailments			
04	Derailments/buses going off road	222	0	77
	Personal casualties			
05	Inside vehicle	11,926	13	12,581
06	Boarding and alighting vehicle	9,080	2	8,846
06a	(associated with lifts)	[290]	[0]	[304]
07	In stations/bus stops	9178	9	9,236
07a	(associated with escalators)	[1285]	[1]	[1,303]
	Fires (no thresholds)			
08	In vehicles	769	0	78
09	In stations	2348	0	92
10	Right of way & others	2180	0	45
11	Total	66233	270	53,057
11a	Total patrons		[136]	[41,823]
12	Transit property damage	$45,118,176.3		

As reported

Report Year 1993

Form 406

Transit System Service Form (406)

Item	Average Weekday: AM Peak* (b)	Average Weekday: Midday* (c)	Average Weekday: PM Peak* (d)	Average Weekday: Other* (e)	Average Weekday Total* (f)	Average Saturday Total* (g)	Average Sunday Total* (h)	Annual Total* (i)
Maximum service vehicles (veh)								
01 Veh operated in maximum service								70.3
02 Veh available for maximum service								88.3
Limits of service								
03 Time service begins								
04 Time service ends								
Service supplied (Non-Rail modes)								
05 Number of veh in operation	44,589	25,517	44,778	15,499	54,957	22,416	13,154	
06 Total actual veh miles	< >	< >	< >	< >	7,193,701.2	3,563,667.7	2,068,721.4	2,130,198.3
07 Total actual veh hours	< >	< >	< >	< >	535,285.1	279,590.6	165,759.1	160,631.7
08 Total actual veh revenue miles	< >	< >	< >	< >	6,220,681.2	3,239,323.2	1,877,317.1	1,855,943.1
09 Total actual veh revenue hours	< >	< >	< >	< >	473,804.6	255,517.0	151,704.7	142,013.1
10 Total scheduled veh revenue miles	< >	< >	< >	< >	5,698,291.3	3,086,728.2	1,774,222.1	1,711,130,699
11 Charter service hours								666.6
12 School bus hours								879.7
Service supplied (Rail modes)								
13 Number of trains in operation	2,206.5	1,341.5	2,120.5	1,003.0	2,268.5	1,344.0	1,108.5	
14 Number of pass. cars in operation	12,556.5	6,638.5	12,165.5	4,814.0	12,666.5	6,118.0	5,211.5	
15 Total actual train miles	< >	< >	< >	< >	446,229	288,447	232,558	142,485.2
16 Total actual train hours	< >	< >	< >	<>	22,807	14,750	11,828	7,292.7
17 Total actual train revenue miles	< >	< >	< >	< >	426,748	281,450	226,332	136,659.8
18 Total actual train revenue hours	< >	< >	< >	< >	20,937	13,706	10,857	6,706.3
19 Tot actual passngr car miles	< >	< >	< >	< >	2,473,485	1,442,849	1,113,941	774,236.1
20 Tot actual passngr car rev miles	< >	< >	< >	< >	2,356,545	1,402,606	1,083,130	737,295.8
21 Tot sched passngr car rev miles	< >	< >	< >	< >	2,383,293	1,328,682	1,060,996	737,387.3
22 Tot actual passngr car hours	< >	< >	< >	< >	115,408	67,449	51,163	36,021.2
23 Tot actual passngr car rev hours	< >	< >	< >	< >	105,226	62,550	47,308	32,904.7
Service consumed								
24 Unlinked passenger trips	< >	< >	< >	< >	25,017,074.6	12,604,279.5	7,729,155	7,432,723.2
25 Passenger miles					124,726,940	54,735,959.1	34,143,926	36,224,860.6

Service operated (days)	Weekdays	Saturdays	Sundays	Annual Total
26 Days schedules operated........(Average)	253	55	57	365
27 Days not operated due to strikes........				
28 Days not operated due to........ officially declared emergencies				

* Cols b-h as reported, col i, lns 01 through 25 in thousands

Report Year 1993

U.S. Department of Transportation
Federal Transit Administration