



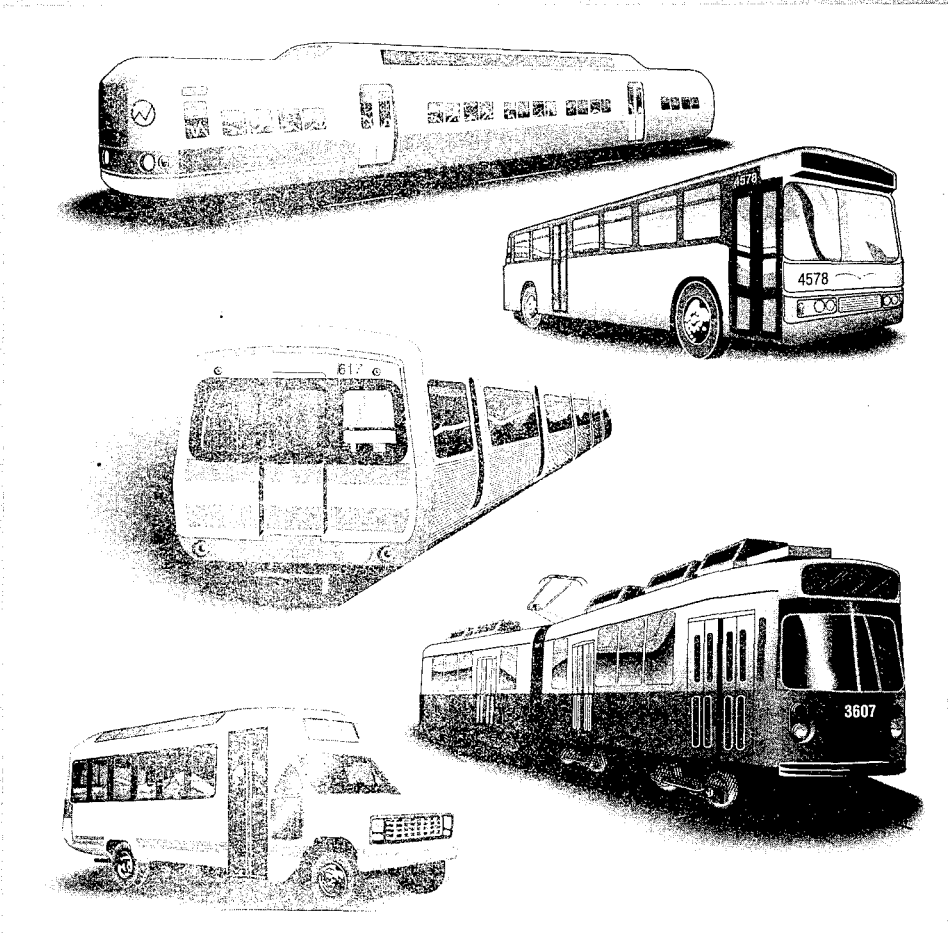
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U. S. Department
of Transportation
**Federal Transit
Administration**

Safety Management Information Statistics (SAMIS) 1990 Annual Report

U.S. Department of Transportation
Research and Special Programs Administration
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Cambridge MA 02142



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16. Abstract The <u>Safety Management Information Statistics 1990 Annual Report</u> is a compilation and analysis of mass transit accident and casualty statistics reported by transit systems in the United States during 1990, under FTA's Section 15 reporting system.			
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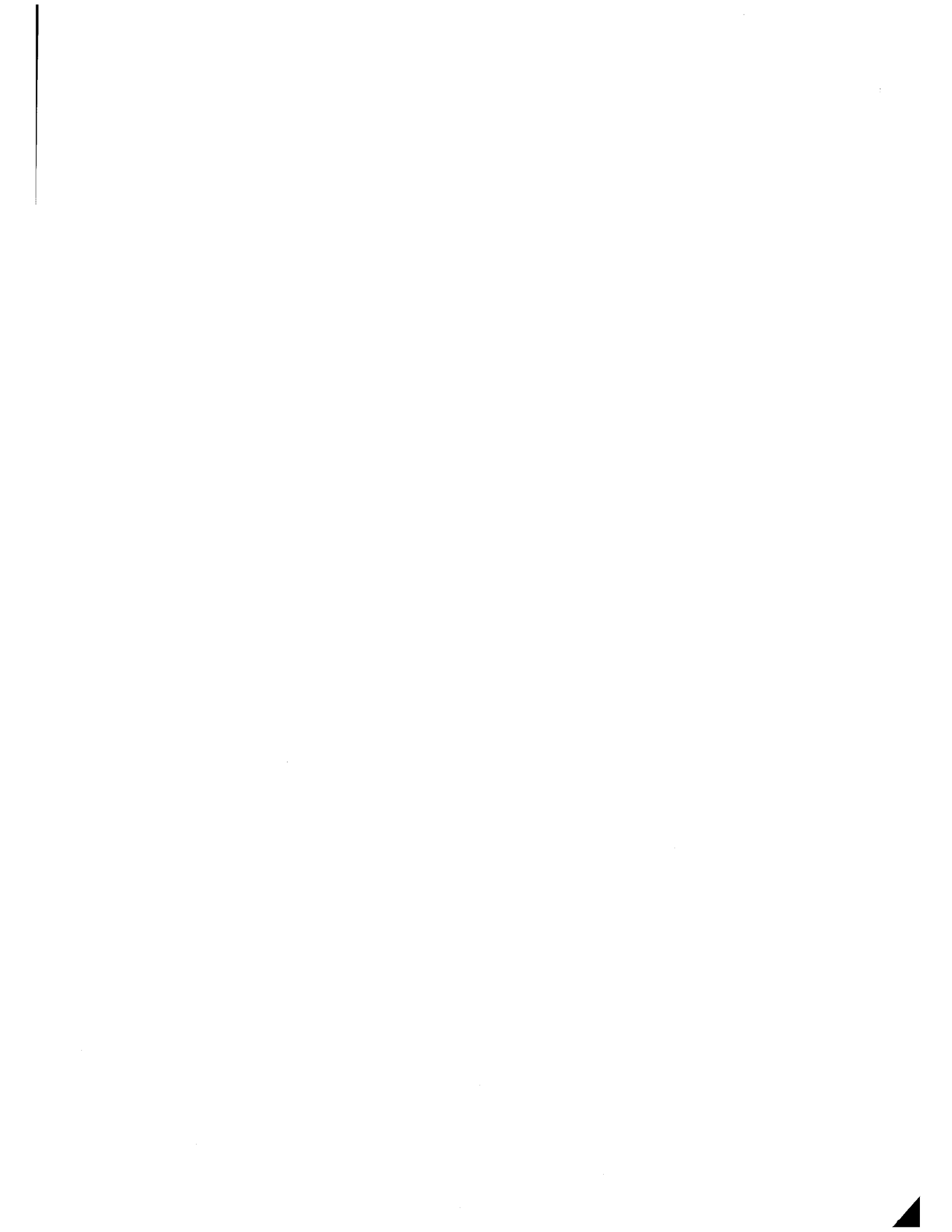


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METRIC / ENGLISH CONVERSION FACTORS

ENGLISH TO METRIC

LENGTH (APPROXIMATE)

1 inch (in) = 2.5 centimeters (cm)
 1 foot (ft) = 30 centimeters (cm)
 1 yard (yd) = 0.9 meter (m)
 1 mile (mi) = 1.6 kilometers (km)

AREA (APPROXIMATE)

1 square inch (sq in, in²) = 6.5 square centimeters (cm²)
 1 square foot (sq ft, ft²) = 0.09 square meter (m²)
 1 square yard (sq yd, yd²) = 0.8 square meter (m²)
 1 square mile (sq mi, mi²) = 2.6 square kilometers (km²)
 1 acre = 0.4 hectares (he) = 4,000 square meters (m²)

MASS - WEIGHT (APPROXIMATE)

1 ounce (oz) = 28 grams (gr)
 1 pound (lb) = .45 kilogram (kg)
 1 short ton = 2,000 pounds (lb) = 0.9 tonne (t)

VOLUME (APPROXIMATE)

1 teaspoon (tsp) = 5 milliliters (ml)
 1 tablespoon (tbsp) = 15 milliliters (ml)
 1 fluid ounce (fl oz) = 30 milliliters (ml)
 1 cup (c) = 0.24 liter (l)
 1 pint (pt) = 0.47 liter (l)
 1 quart (qt) = 0.96 liter (l)
 1 gallon (gal) = 3.8 liters (l)
 1 cubic foot (cu ft, ft³) = 0.03 cubic meter (m³)
 1 cubic yard (cu yd, yd³) = 0.76 cubic meter (m³)

TEMPERATURE (EXACT)

$$[(x - 32)(5/9)]^{\circ}\text{F} = y^{\circ}\text{C}$$

METRIC TO ENGLISH

LENGTH (APPROXIMATE)

1 millimeter (mm) = 0.04 inch (in)
 1 centimeter (cm) = 0.4 inch (in)
 1 meter (m) = 3.3 feet (ft)
 1 meter (m) = 1.1 yards (yd)
 1 kilometer (km) = 0.6 mile (mi)

AREA (APPROXIMATE)

1 square centimeter (cm²) = 0.16 square inch (sq in, in²)
 1 square meter (m²) = 1.2 square yards (sq yd, yd²)
 1 square kilometer (km²) = 0.4 square mile (sq mi, mi²)
 1 hectare (he) = 10,000 square meters (m²) = 2.5 acres

MASS - WEIGHT (APPROXIMATE)

1 gram (gr) = 0.036 ounce (oz)
 1 kilogram (kg) = 2.2 pounds (lb)
 1 tonne (t) = 1,000 kilograms (kg) = 1.1 short tons

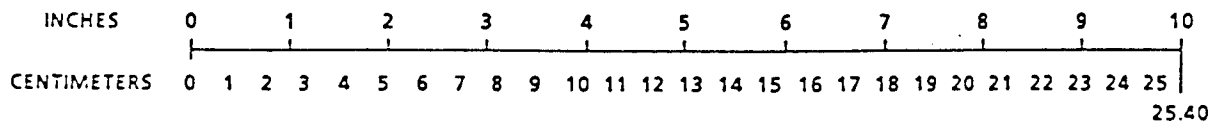
VOLUME (APPROXIMATE)

1 milliliter (ml) = 0.03 fluid ounce (fl oz)
 1 liter (l) = 2.1 pints (pt)
 1 liter (l) = 1.06 quarts (qt)
 1 liter (l) = 0.26 gallon (gal)
 1 cubic meter (m³) = 36 cubic feet (cu ft, ft³)
 1 cubic meter (m³) = 1.3 cubic yards (cu yd, yd³)

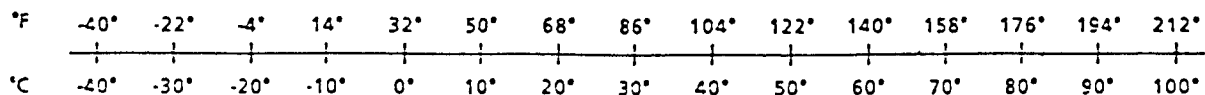
TEMPERATURE (EXACT)

$$[(9/5)y + 32]^{\circ}\text{C} = x^{\circ}\text{F}$$

QUICK INCH-CENTIMETER LENGTH CONVERSION



QUICK FAHRENHEIT-CELSIUS TEMPERATURE CONVERSION



For more exact and/or other conversion factors, see NBS Miscellaneous Publication 286, Units of Weights and Measures. Price \$2.50. SO Catalog No. C13 10 286.

Introduction

The Safety Management Information Statistics (SAMIS) report has been developed by the Federal Transit Administration (FTA) in consultation with the American Public Transit Association (APTA). Data for this report are derived from 1990 Section 15 reports submitted to FTA by individual transit agencies. Thus, this report compiles uniformly collected comprehensive safety reports from nearly 600 agencies and provides a wealth of detail unmatched by any other mode in transportation. Because new thresholds for Section 15 safety data were set in 1990, data from earlier Section 15 reports are not directly comparable. Also, earlier SIRAS report data differ in thresholds and definitions, so they cannot be used to compare with this Rapid Rail data.

Transit modes covered in this report include: Automated Guideway (AG), Commuter Rail (CR), Demand Response (DR), Motor Bus (MB), Rapid Rail (RR), Light Rail (LR), and Van Pool (VP). The AG reports are for federally funded systems only (currently 2); airport systems are not included. Motor Bus agencies are divided into small, medium, and large (SMB, MMB, and LMB) properties to reflect differences in their operating environments and traffic mix. This is based on fleet size; 1 to 100 vehicles for a small fleet, 101 to 500 vehicles for a medium fleet, and above 500 vehicles for a large fleet. Information from four agencies that operate electric-powered trolleybuses has been added to motor bus data (all four are in the LMB group). Many of the graphs and tables also include an entry for "All Transit." "All Transit" values are derived by adding the respective values from the individual modes.

SAMIS presents a series of graphs and tables to summarize transit safety experience. The tables contain all of the data used for the preceding graphs plus additional performance data. There is also a section of text which briefly describes each of the graphs, and a glossary to define the terms used.

When using this report to make comparisons, one must keep in mind that transit modes differ in many ways. Some run on exclusive rights-of-way while others mix with general traffic on surface roads. Some have extensive stations and terminals with escalators while others have no such facilities. Though the data is presented in a way to make direct comparisons, underlying conditions vary from mode to mode and this can distort such comparisons.

Even more caution should be used if data from this report is used to make comparisons with data for other transportation modes derived from other reporting systems (e.g., TRANSIS). Thresholds, assumptions, and definitions may be very different. SAMIS was devised to reflect transit safety as accurately as possible by using thresholds just high enough to eliminate truly minor incidents while including as much as possible to get an accurate reflection of transit safety.

Glossary

Accident - Vehicle-only based incidents resulting from collision with a vehicle, object, or person (except suicides) or a derailment/left roadway.

Collision with Vehicle - An incident in which a transit vehicle strikes or is struck by another vehicle. Reports are made if the incident results in a death, injury, or property damage over \$1,000.

Collision with Object - An incident in which a transit vehicle strikes an obstacle (e.g., shopping cart, building or utility pole) other than a vehicle or person. Reports are made if the incident results in a death, injury, or property damage over \$1,000.

Collision with Person - An incident in which a transit vehicle strikes a person. Except where indicated, it does not include suicide attempts. Reports are made if the incident results in a death, injury, or property damage over \$1,000.

Derailment/Left Roadway - A non-collision incident in which a transit vehicle leaves the rails or road; this also includes rollovers. Reports are made for all occurrences.

Fatality - A transit-caused death confirmed within 30 days of a transit incident.

Fire - Uncontrolled combustion manifested by flame and/or smoke that requires suppression by equipment or personnel. All vehicle, facility, and right-of-way fires are reported even if no fatality, injury, or property damage occurs or if arson is suspected.

Incident - An unforeseen event which causes death, injury, fire or property damage over \$1,000. This includes all revenue vehicle operations and activities within transit facilities.

Injury - Any physical damage or harm to a person; there are no thresholds for reporting.

Passenger Accident - A passenger-based combination of incidents related only to the use of a transit vehicle. These result from collision with a vehicle, object, or person (except suicides); a derailment/left roadway; personal casualty on vehicle; or personal casualty entering/exiting the vehicle.

Personal Casualty on Vehicle - An event in which people are hurt on a transit vehicle, but not as a result of a collision, derailment, or fire.

Personal Casualty Enter/Exit - An event in which people are hurt while getting on or off a transit vehicle, not a result of a collision, derailment, or fire (e.g., falls or door incidents).

Personal Casualty Lifts - An event in which people are hurt while using a lift to get on or off a transit vehicle (not as a result of a collision, derailment, or fire).

Personal Casualty Station/Stop - An event in which people are hurt while using a transit facility. This includes all people on transit property (workers, patrons, and trespassers), but not incidents resulting from illness or criminal activity.

Personal Casualty Escalator - An event in which people are hurt while using an escalator in a transit facility.

Property Damage - The amount paid to restore or replace transit vehicles damaged by an accident. This does not include the cost of clearing wreckage.

Suicide - An intentional attempt by a person to end his or her life. These are not included in with "collision with person" figures except where indicated.

Graph Narratives

Accidents per 100,000 Veh. Miles

This graph shows an accident rate which is based only on vehicle incidents. Accidents include all vehicle incidents resulting from collision with a vehicle, object, or person (except suicides) or a derailment/left roadway. The vehicle mile figure includes both revenue and nonrevenue miles since there are risk factors during both operation types. The three rail modes report car rather than train miles for vehicle miles. The key at the bottom defines the abbreviations used for the transit modes.

Passenger Accident Rate by Mode

The passenger-on-vehicle accident rate is presented here. In addition to incidents resulting from collisions with vehicles, objects, and persons (not suicides), this graph includes personal casualties on the vehicle and personal casualties entering/exiting the vehicle. It is indexed to passenger miles rather than vehicle miles. Note that the reference rate is ten times larger than the corresponding rate on the previous graph. When analyzing the results on this page, consider that the number of incidents, the number of passengers, and the average trip length all affect the accident rate.

Passenger Accident Fatality and Injury Rates

The passenger accident fatality and injury rate provide a measure of the vehicle-related risk to transit patrons. While fatalities and injuries appear to be on the same scale, they are really one order of magnitude apart. This shows that, for the most part, deaths are 10 times or more less likely than injuries on a given mode. Relative comparisons of the various transit modes can also be made. Another interesting comparison is the degree of variability between only fatality rates and only injury rates among the modes.

Passenger Accidents and Passenger Distribution by Mode

The pie chart on the left gives the percent of total passenger accidents reported by each mode; the chart on the right shows the percent of the total passengers carried. Viewed individually, they put a context on the raw figures by showing relation to the whole. When compared, they give another view of accident rates. If all modes were equally safe, the numbers for a given mode would be the same in both charts. Disparity indicates a difference in relative safety performance. These charts also indicate the impact of the accident rates from earlier graphs by showing the size of the group affected and the contribution it makes to the accident total. The percents given as zero are rounded and actually mean less than .5% (most are around .1%).

Types of Transit Mishaps

Use of transit facilities, particularly when a fare is required, creates the impression that they are as much a part of using mass transit as riding the vehicles. Since incidents do occur in the facilities, this report uses the term "mishaps" to include all safety events without constraining them to the vehicle. This adds personal casualty station/stop and fire incidents to what is included in passenger accidents. These pie charts divide the incidents and combined deaths and injuries by the types reported via Section 15. Relating the two charts gives some indication of incident severity. However, this is skewed by the reporting requirements because personal casualties, unlike the others, requires an injury to be reported.

Mishap Fatality and Injury Rates

Since mishaps cover all incidents resulting from a patron's use of transit, these rates represent the entire risk associated with transit use. Both rates are indexed to passenger levels, however, the scale for the fatality rate is 100 times larger than the injury rate scale. This graph differs from the earlier Passenger Accident Fatality and Injury Rates (p. 9) in that it includes more incident types and is indexed by passengers rather than passenger miles.

Collision Rates

The Types of Transit Mishaps (p. 11) chart shows that collisions are the second largest cause of incidents and deaths/injuries. Collisions are also included in each of the accident rate formulas, so they merit closer examination. This graph provides the rates for collision incidents, deaths and injuries. These rates specify how often collision incidents, deaths, and injuries occur, based on passenger exposure. These rates should be kept in mind when looking at the next three figures which give only raw numbers. The point is that a low or high number alone does not give an indication about safety; data on the exposure that produced those numbers is also required.

Collision Incidents

This graph breaks down collision incidents into component types and provides insight into what the make up of the collision portion of the mishap incident pie chart (p. 11) is by transit mode and type. When related to the following fatality and injury graphs (pp. 14 and 15), the effects become clear of these incidents on the passengers.

Collision Fatalities

This graph depicts the fatalities which resulted from the collision incidents by type. When combined with the incident chart (p. 14) it gives an indication of the severity of collisions as a whole and by type for each transit mode.

Collision Injuries

The injuries which resulted from the types of collision incidents are displayed here. When combined with the incident graph (p. 14) it gives an indication of the severity of collisions as a whole and by type for each transit mode. Comparison with the fatality (p. 15) graph shows that the various collision types produce different proportions of deaths and injuries both for a given mode and between different modes.

Personal Casualty Rates

Personal casualties are the predominant type of incident and fatality/injury, according to the Transit Mishap pie charts (p. 11). This graph provides rates for personal casualty incidents, fatalities, and injuries by transit mode. The rates show how often incidents, deaths, and injuries occur, based on passenger exposure. These rates should be kept in mind when looking at the next three figures (pp. 18, 19, and 20) which give only raw numbers. The raw numbers alone do not give a full idea about relative safety without data on exposure which is provided here.

Personal Casualty Incidents

The breakdown of personal casualty incidents given here gives some detail on the modes and types that contribute most. This incident information can also be compared to the following fatality and injury graphs (pp. 19 and 20) to determine the results of the incidents.

Personal Casualty Fatalities

Personal casualty deaths are broken down by type and mode in this graph. Comparison with the incident graph (p. 18) will provide information on the severity of the incidents by type and mode.

Personal Casualty Injuries

Personal casualty injuries are broken down by location and mode in this graph. Comparison with the incident graph (p. 18) will provide information on the severity of the incidents by location and mode. Comparison with the fatality graph shows that the pattern of deaths and injuries differs for both type and mode for personal casualties.

Transit Mode Definitions

Automated Guideway (AG) - consists of one or more automatically controlled vehicles operating over an exclusive guideway.

Commuter Rail (CR) - urban passenger train service for local short distance travel between a central city and adjacent suburbs. It does not include rail rapid transit or light rail service. Service of a predominately intercity nature is excluded, except where a local portion is operated under public agency contract for commuter purposes.

Demand Responsive (DR) - personal transit service operated on roadways to provide service on demand. Vehicles are normally dispatched, and used exclusively for this service.

Light Rail Transit (LR) - urban transit which uses predominantly reserved but not always grade-separated rights-of-way. Electrically powered rail vehicles operate alone or in trains.

Motorbus (MB) - rubber tired passenger vehicles that operate on roadways. Motorbus service implies fixed routes and schedules.

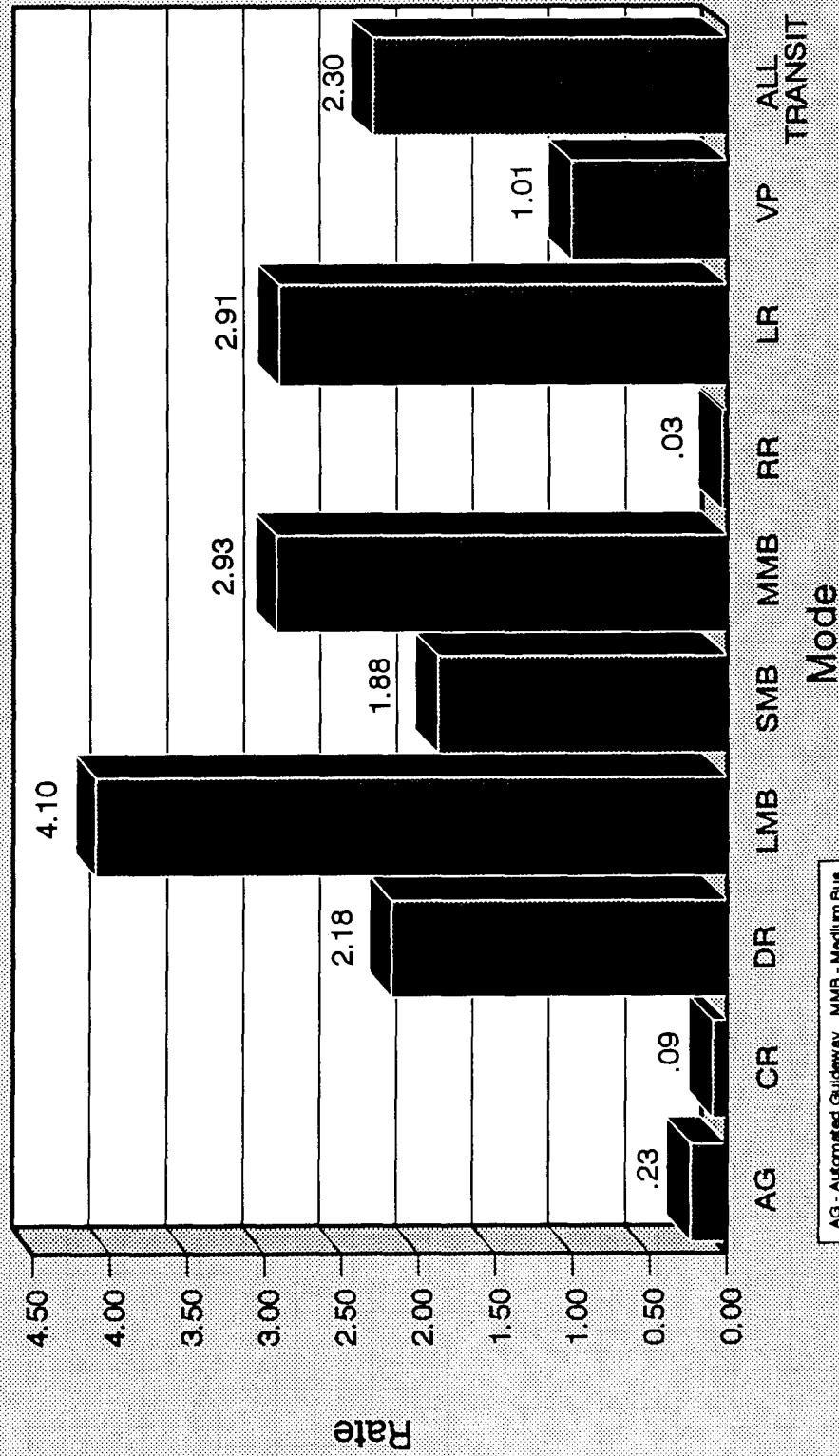
Rapid Rail Transit (RR) - transit service using rail cars driven by electricity usually drawn from a third rail, configured for passenger traffic and usually operated on exclusive rights-of-way. It generally uses longer trains and has longer station spacing than light rail.

Vanpool (VP) - public sponsored commuter service operating under prearranged schedules for pre-formed groups of riders in 8- to 18-seat vehicles. Drivers are also commuters who receive little or no compensation besides a free ride.



Accidents per 100,000 Vehicle Miles

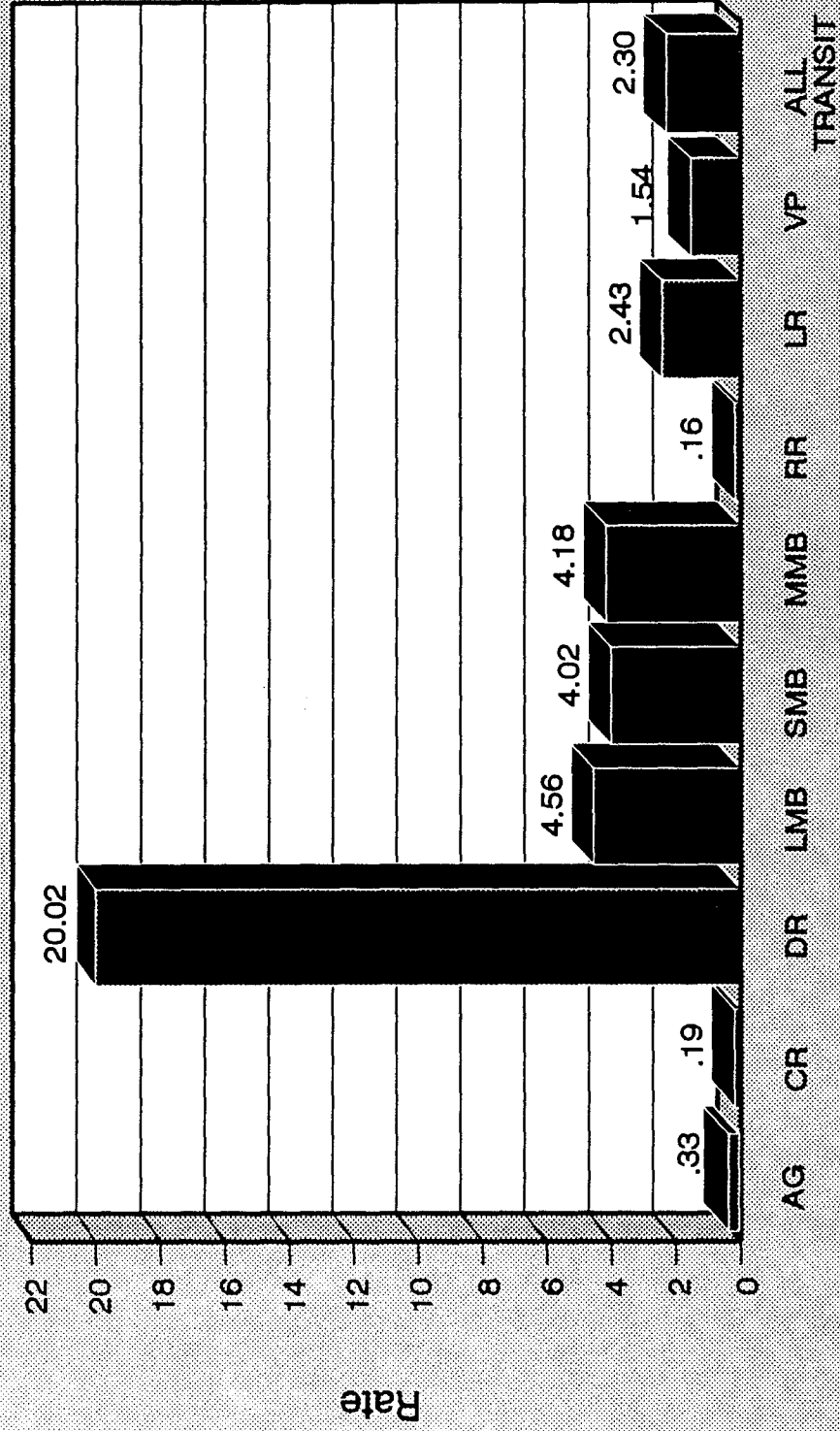
by Transit Mode



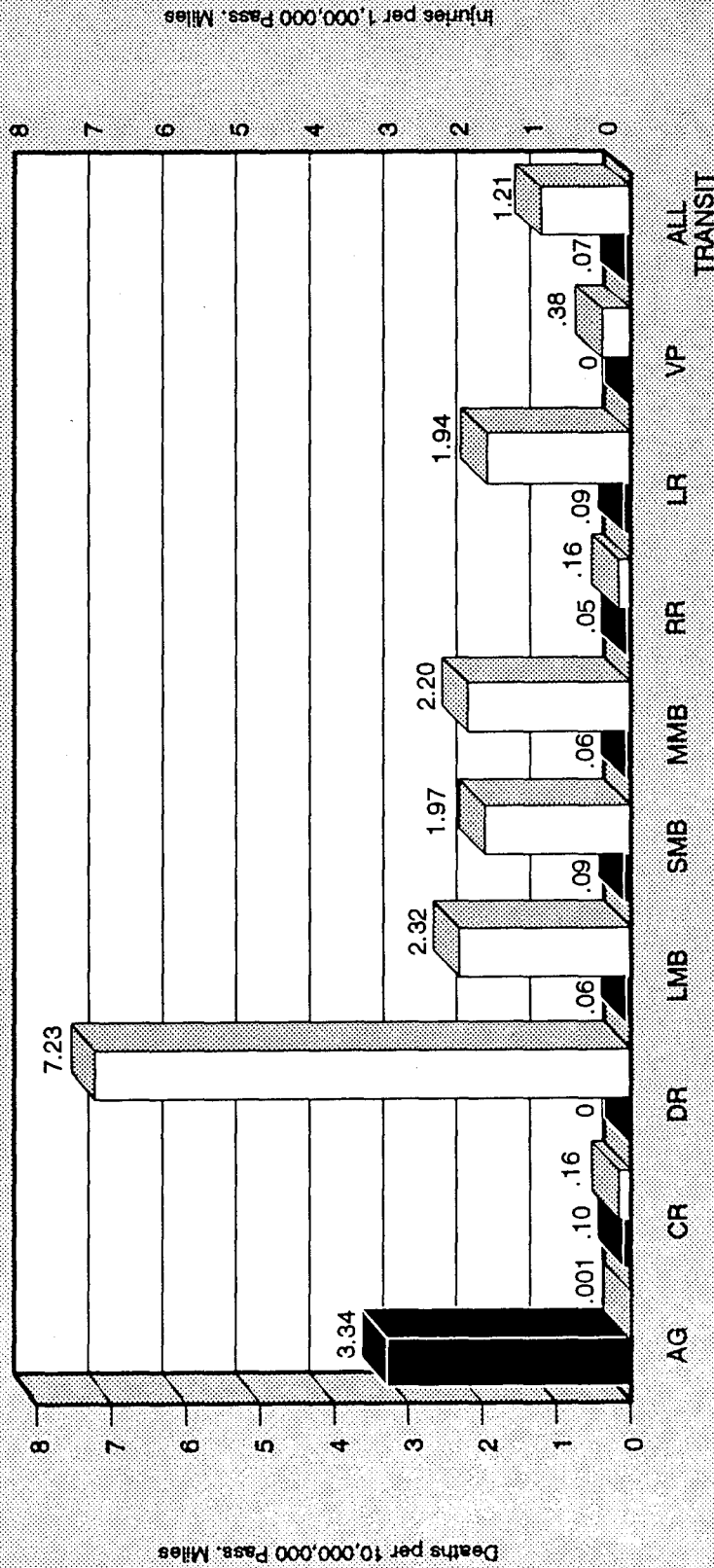
AG - Automated Guideway MMB - Medium Bus
 CR - Commuter Rail RR - Rapid Rail
 DR - Demand Responsive LR - Light Rail
 LMB - Large Bus VP - Van Pool
 SMB - Small Bus

Passenger Accident Rate by Mode

per 1,000,000 Passenger Miles



Passenger Accident Fatality and Injury Rates by Passenger Miles



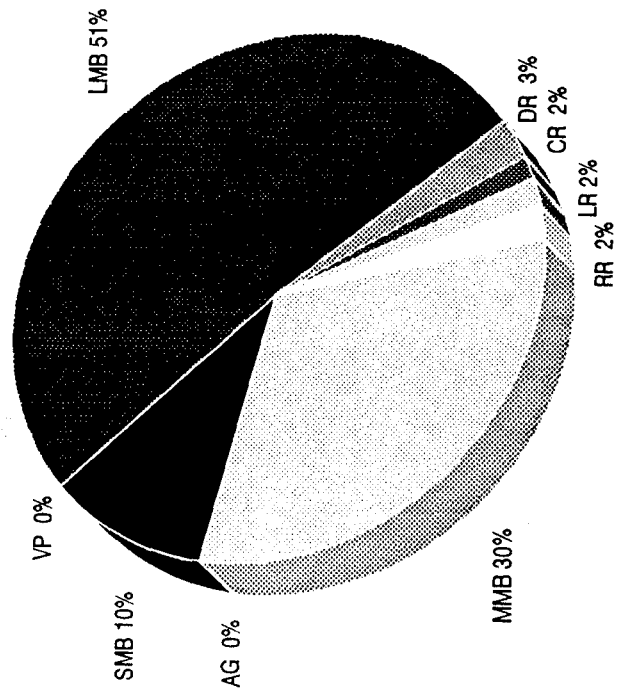
Mode

■ Deaths □ Injuries

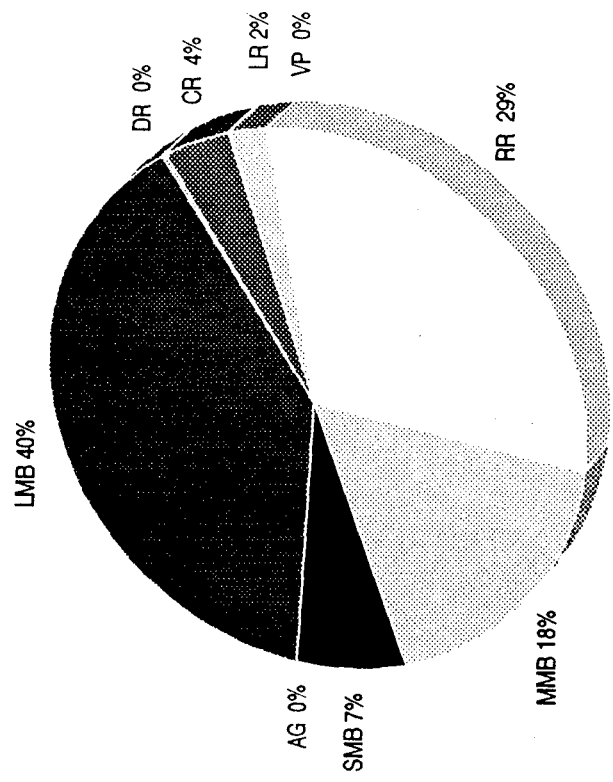
AG - Automated Guideway MMB - Medium Bus
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 DR - Demand Responsive LR - Light Rail
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 SMB - Small Bus

Passenger Accidents and Passenger Distribution by Mode

Passenger Accidents by Mode



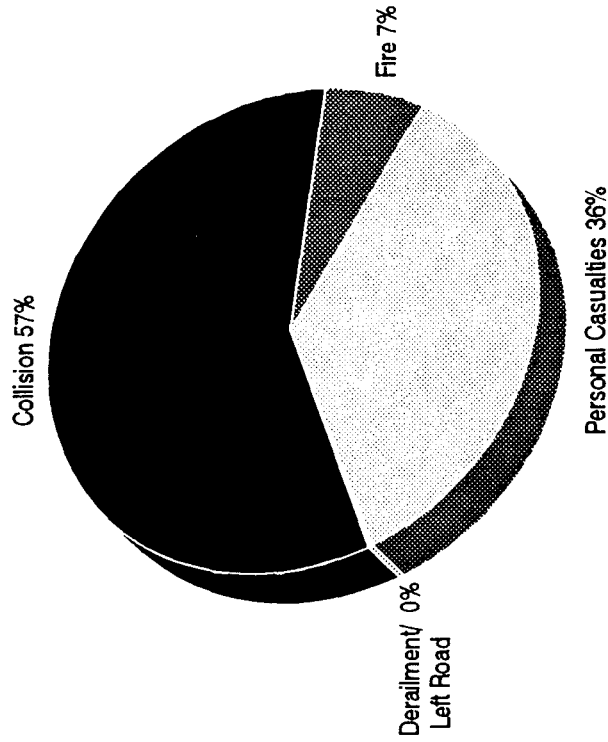
Passengers by Mode



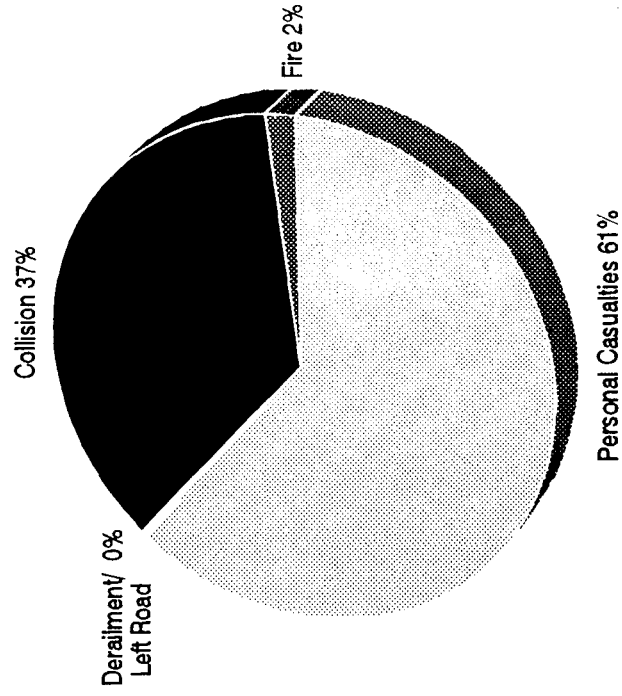
AG - Automated Guideway	MMB - Medium Bus
CR - Commuter Rail	RR - Rapid Rail
DR - Demand Responsive	LR - Light Rail
LMB - Large Bus	VP - Van Pool
SMB - Small Bus	

Types of Transit Mishaps

Percent of Incidents

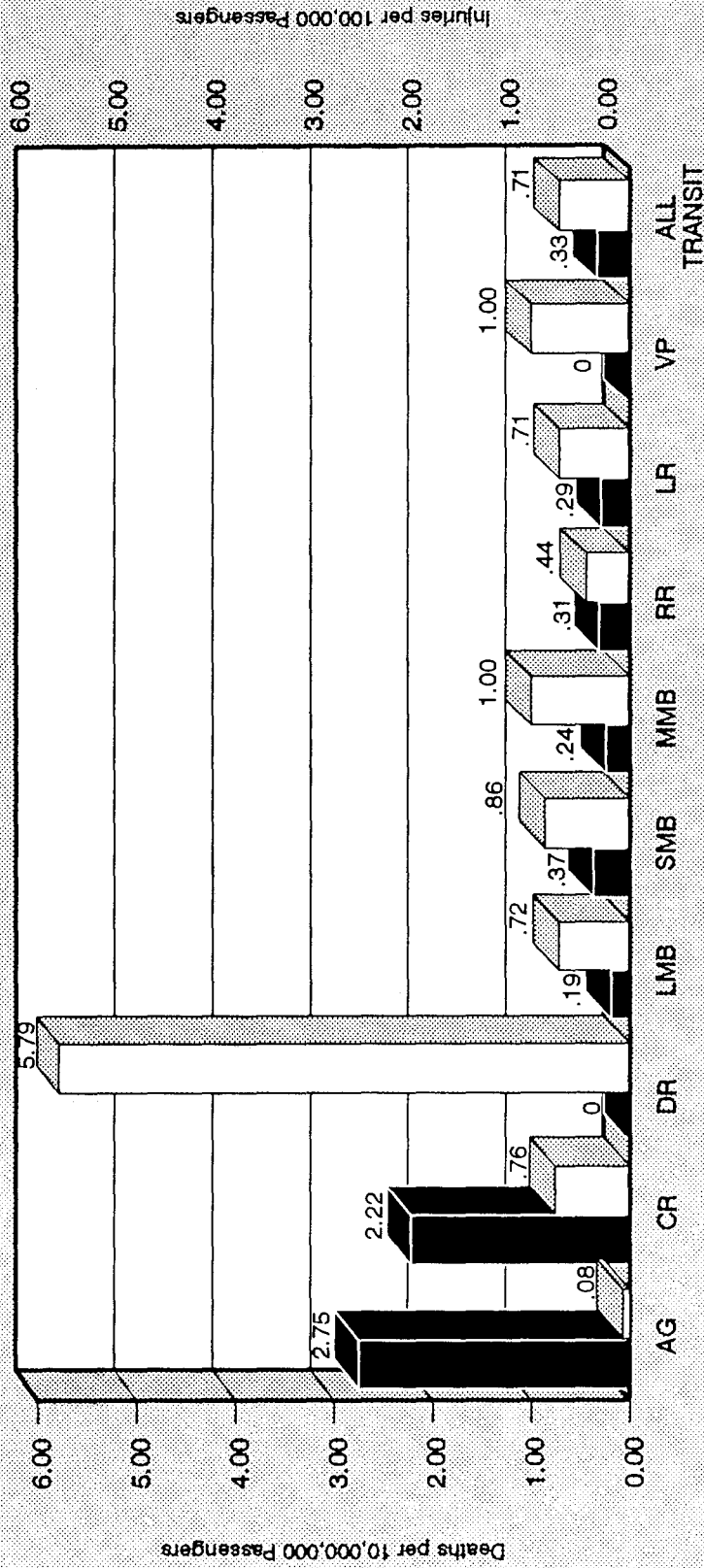


Percent of Deaths & Injuries

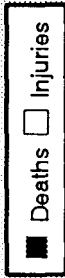


Mishap Fatality and Injury Rates

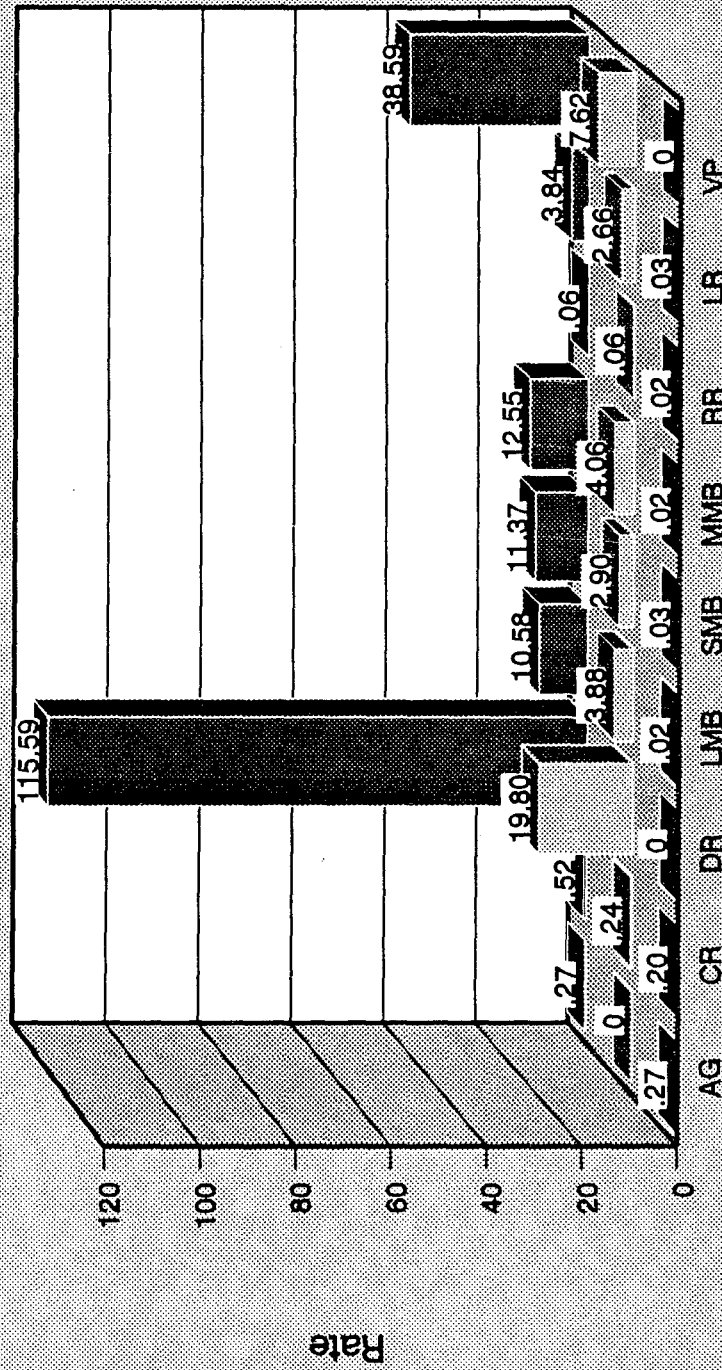
From All Causes by Passenger Count



Mode



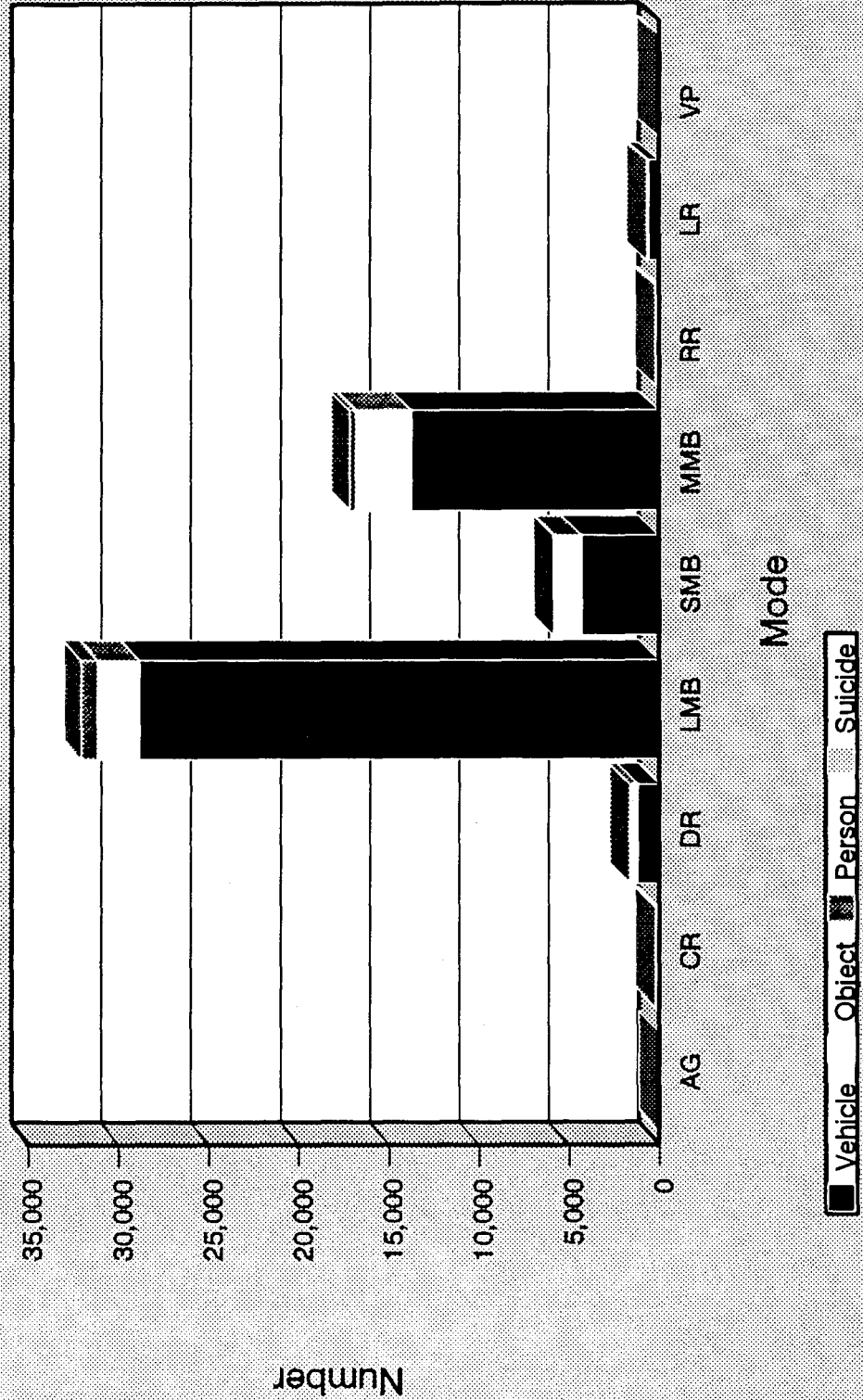
Collision Rates per 1,000,000 Passengers



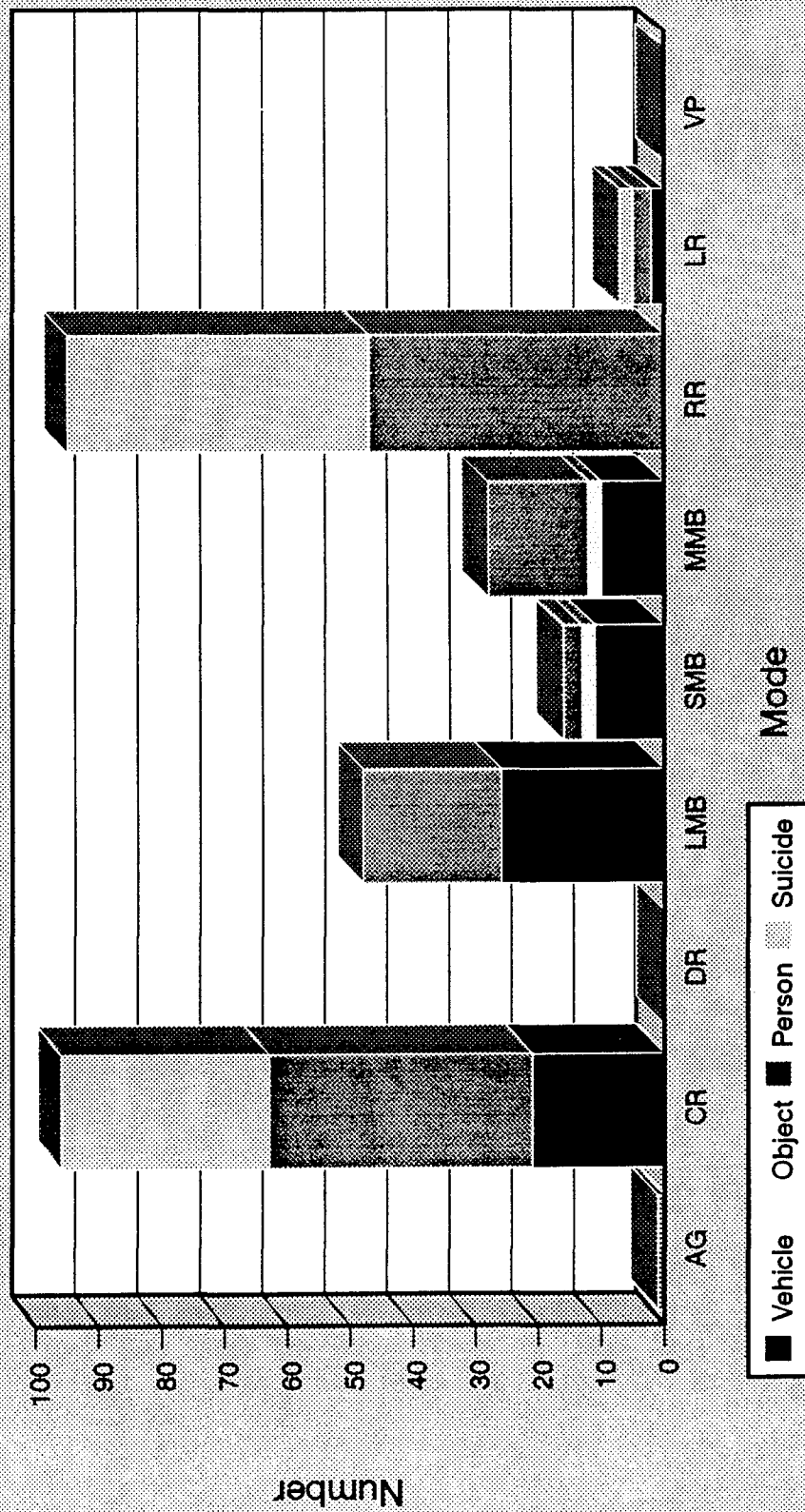
Deaths
 Injuries
 Incidents

AG - Automated Guideway MMB - Medium Bus
 CR - Commuter Rail RR - Rapid Rail
 DR - Demand Responsive LR - Light Rail
 LMB - Large Bus VP - Van Pool
 SMB - Small Bus

Collision Incidents by Type and Mode



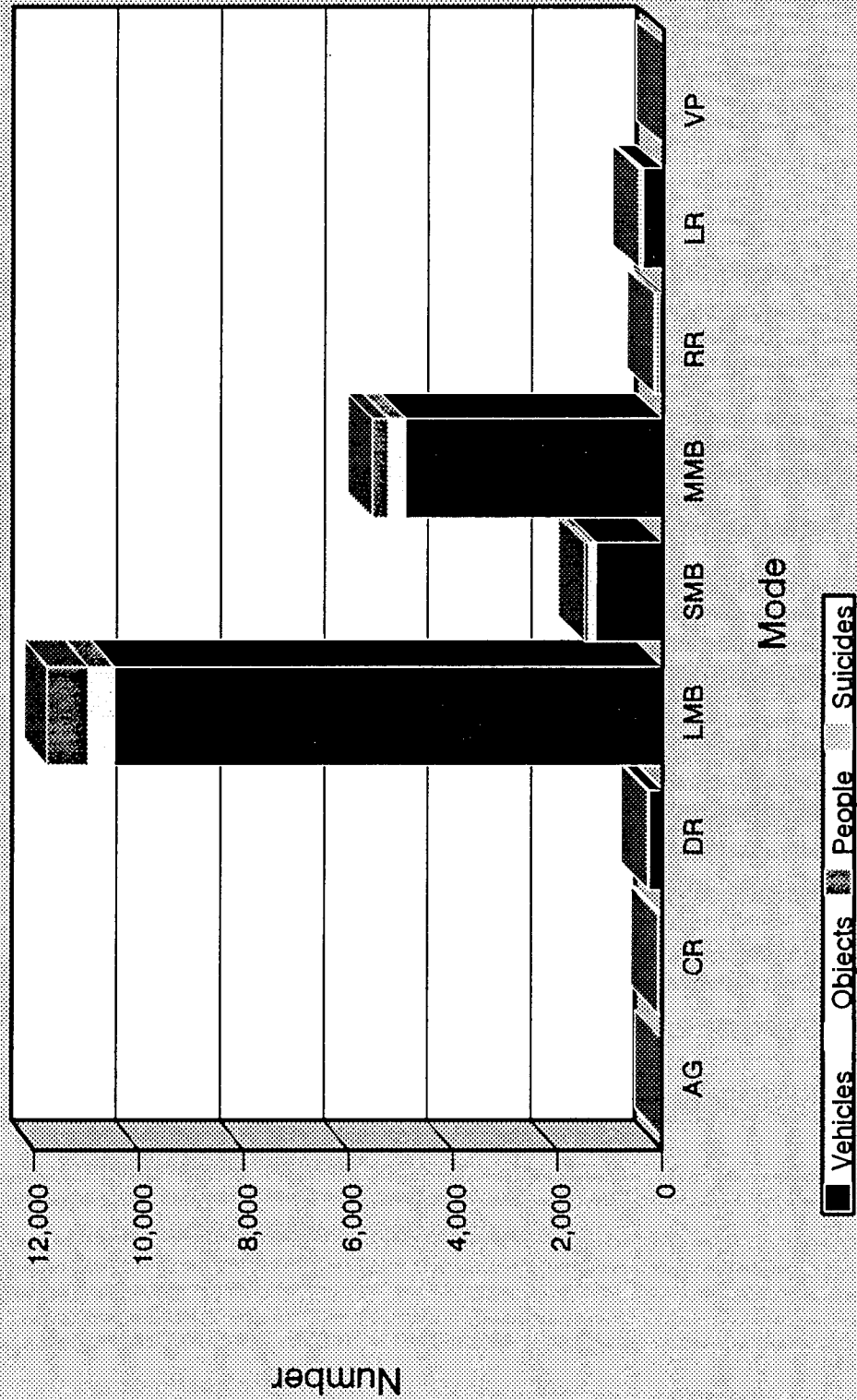
Collision Fatalities by Collision Type and Mode



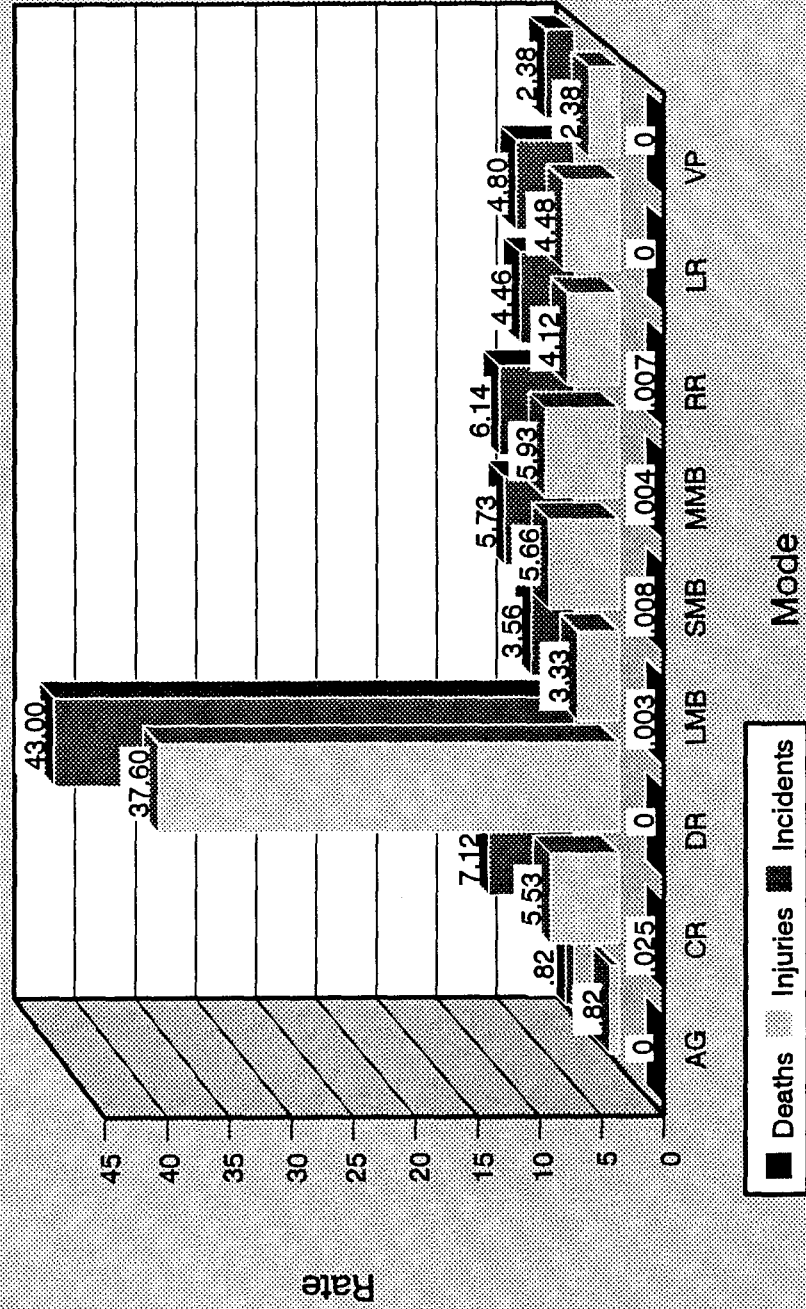
AG - Automated Guideway MMB - Medium Bus
 CR - Commuter Rail RR - Rapid Rail
 DR - Demand Responsive LR - Light Rail
 LMB - Large Bus VP - Van Pool
 SMB - Small Bus

Collision Injuries

by Collision Type and Mode



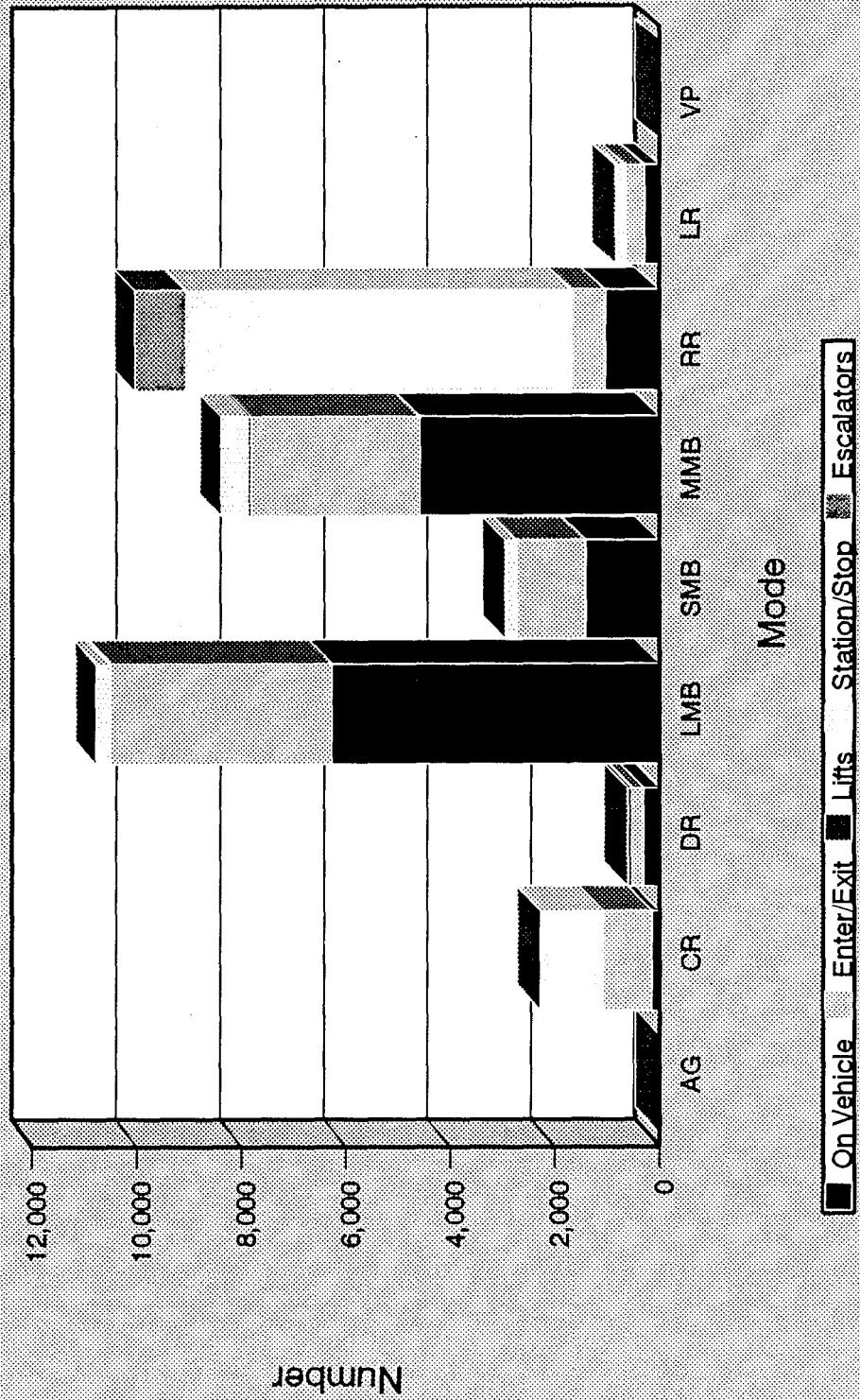
Personal Casualty Rates per 1,000,000 Passengers



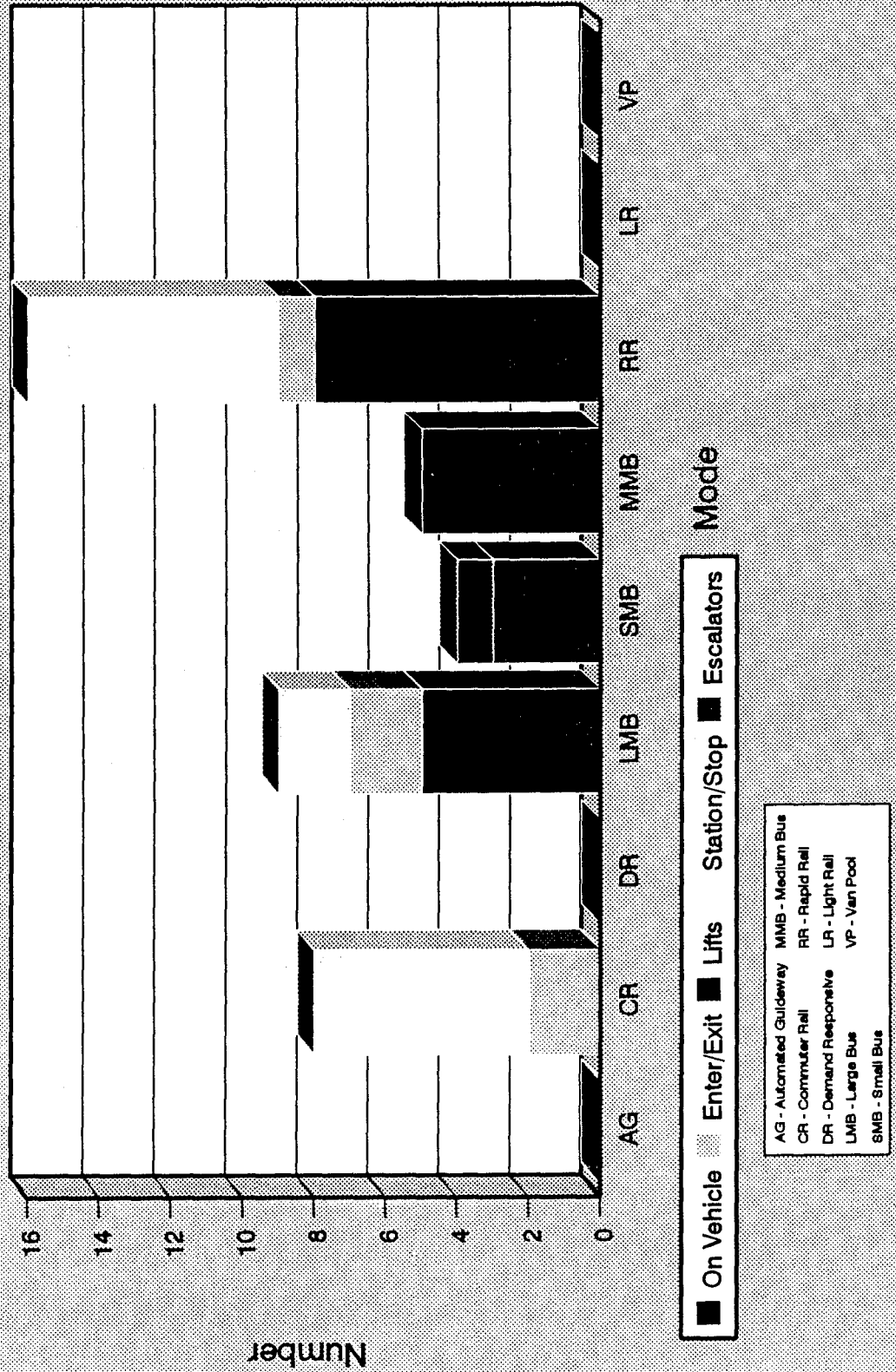
- AG - Automated Guideway
- CR - Commuter Rail
- DR - Demand Responsive
- LMB - Large Bus
- SMB - Small Bus
- MMB - Medium Bus
- RR - Rapid Rail
- LR - Light Rail
- VP - Van Pool

Personal Casualty Incidents

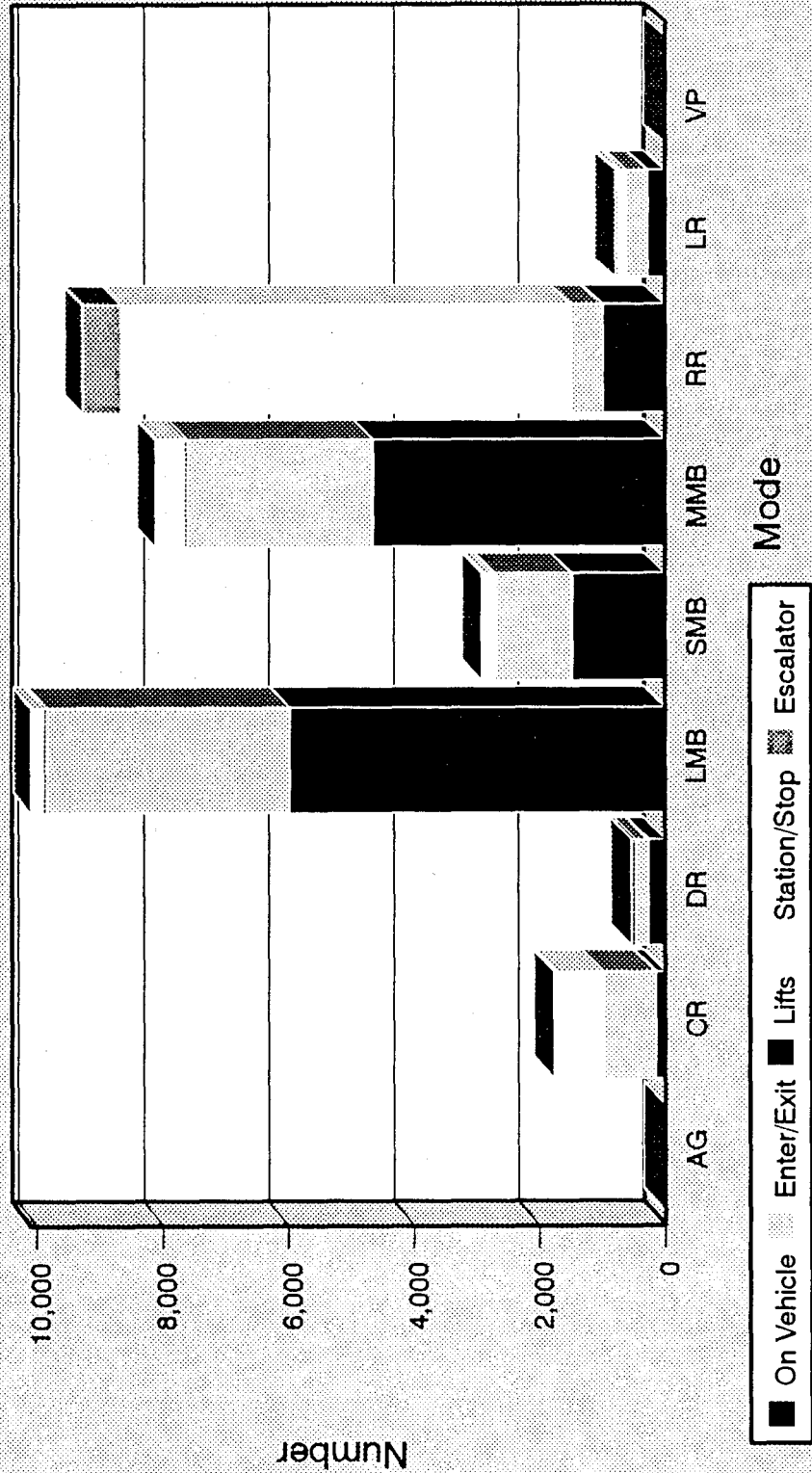
by Type and Mode



Personal Casualty Fatalities by Type and Mode



Personal Casualty Injuries by Type and Mode



AG - Automated Guideway
 CR - Commuter Rail
 DR - Demand Responsive
 LMB - Large Bus
 SMB - Small Bus
 MMB - Medium Bus
 RR - Rapid Rail
 LR - Light Rail
 VP - Van Pool

Collisions

by Result and Mode

Incidents				
	VEHICLE	OBJECT	PEOPLE	SUICIDE*
AG	0	0	1	0
CR	69	15	120	39
DR	1,199	431	5	0
LMB	28,866	2,307	912	0
SMB	4,322	1,423	110	6
MMB	13,760	3,088	329	2
RR	11	17	183	77
LR	567	33	70	2
VP	71	7	3	0
ALL TRANSIT	48,865	7,321	1,733	126

Deaths				
	VEHICLE	OBJECT	PEOPLE	SUICIDE*
AG	0	0	1	0
CR	21	0	75	33
DR	0	0	0	0
LMB	26	0	22	0
SMB	11	2	3	0
MMB	10	2	16	0
RR	0	0	95	48
LR	2	0	5	2
VP	0	0	0	0
ALL TRANSIT	70	4	217	63

Injuries				
	VEHICLE	OBJECT	PEOPLE	SUICIDE*
AG	0	0	0	0
CR	28	3	51	6
DR	258	18	4	0
LMB	10,496	492	783	0
SMB	1,286	133	77	2
MMB	4,928	323	310	2
RR	76	5	91	30
LR	393	13	57	0
VP	6	8	2	0
ALL TRANSIT	17,471	995	1,375	40

* Suicide figures are included in collision with people figures.

Personal Casualties

by Result and Mode

Incidents					
	On Vehicle	Enter/Exit	Lifts*	Station/Stop	Escalators**
AG	0	0	0	3	1
CR	147	934	0	1,192	20
DR	312	282	63	15	0
LMB	6,289	4,253	38	255	0
SMB	1,416	1,334	24	197	2
MMB	4,597	3,297	58	507	0
RR	1,046	618	0	8,361	969
LR	292	355	0	188	38
VP	2	3	0	0	0
ALL TRANSIT	14,101	11,076	183	10,737	1,030

Deaths					
	On Vehicle	Enter/Exit	Lifts*	Station/Stop	Escalators**
AG	0	0	0	0	0
CR	0	2	0	6	0
DR	0	0	0	0	0
LMB	5	2	0	2	0
SMB	3	1	1	0	0
MMB	5	0	0	0	0
RR	8	1	0	7	0
LR	0	0	0	0	0
VP	0	0	0	0	0
ALL TRANSIT	21	6	1	15	0

Injuries					
	On Vehicle	Enter/Exit	Lifts*	Station/Stop	Escalators**
AG	0	0	0	3	1
CR	145	840	0	780	25
DR	264	260	55	9	0
LMB	5,979	3,906	42	203	0
SMB	1,475	1,248	23	188	2
MMB	4,649	3,014	56	451	0
RR	991	493	0	7,788	615
LR	274	335	0	170	37
VP	2	3	0	0	0
ALL TRANSIT	13,779	10,099	176	9,592	680

* Lift figures are included in the Enter/Exit figures.
 ** Escalator figures are included in the Station/Stop figures.

Fires

by Result and Mode

Incidents			
	Vehicle	Station	R-O-W/Road
AG	0	0	0
CR	64	67	1,095
DR	11	1,011	0
LMB	143	6	2
SMB	61	0	1
MMB	72	0	1
RR	770	1,444	2,003
LR	20	17	35
VP	0	0	0
ALL TRANSIT	1,141	2,545	3,137

Deaths			
	Vehicle	Station	R-O-W/Road
AG	0	0	0
CR	0	0	0
DR	0	0	0
LMB	0	0	0
SMB	0	0	0
MMB	0	0	0
RR	2	0	0
LR	0	0	0
VP	0	0	0
ALL TRANSIT	2	0	0

Injuries			
	Vehicle	Station	R-O-W/Road
AG	0	0	0
CR	1	0	582
DR	0	0	0
LMB	8	0	0
SMB	2	0	0
MMB	2	0	0
RR	230	173	35
LR	0	0	0
VP	0	0	0
ALL TRANSIT	243	173	617

Derailment or Left Roadway Number and Result by Mode

	INCIDENTS	FATALITIES	INJURIES
AG	0	0	0
CR	15	0	8
DR	15	0	6
LMB	109	0	24
SMB	32	0	9
MMB	72	0	19
RR	10	4	154
LR	31	0	2
VP	0	0	0
ALL TRANSIT	284	4	222

Operating Statistics

	Veh. Miles	Passengers	Pass. Miles	Property Dmg.
AG	443,243	3,641,521	2,996,728	\$0
CR	204,196,125	319,403,668	6,611,516,569	\$861,513
DR	75,528,542	14,144,766	112,109,874	\$609,484
LMB	784,544,120	3,032,854,305	9,363,514,008	\$14,760,209
SMB	312,279,488	514,443,356	2,147,093,454	\$3,301,762
MMB	588,952,469	1,368,216,805	6,012,529,526	\$9,306,400
RR	528,627,222	2,252,462,303	11,373,197,592	\$7,929,642
LR	24,055,177	174,000,077	554,554,894	\$1,144,000
VP	7,995,853	2,099,082	55,707,613	\$68,549
ALL TRANSIT	2,526,662,239	7,681,265,883	36,233,220,258	\$37,981,559