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Federal Highway Administration
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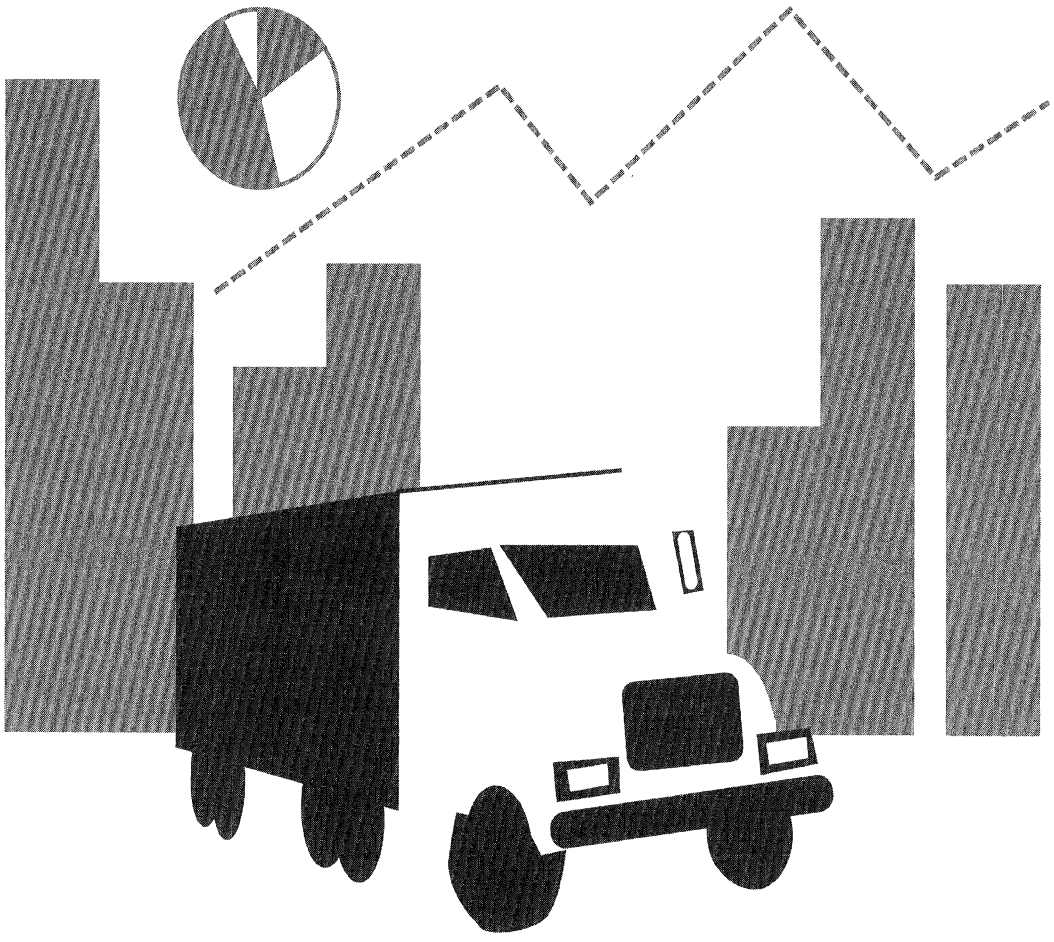
prepared by
The Center for National Truck Statistics
University of Michigan Transportation Research Institute



Truck and Bus
Crash Factbook 1995

UMTRI-97-30

Truck and Bus Crash Factbook, 1995

September 1997

Prepared By
The Center for National Truck Statistics
University of Michigan Transportation Research Institute

for
The Office of Motor Carriers
Federal Highway Administration

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16. Abstract

This document presents aggregate statistics on trucks and buses involved in traffic crashes in 1995. These statistics are derived from four sources: crash statistics reported through the SAFETYNET data system operated by the Federal Highway Administration's Office of Motor Carriers; the General Estimates System file maintained by the National Highway Traffic Safety Administration (NHTSA); the Fatality Analysis Reporting System, also maintained by NHTSA; and the Trucks Involved in Fatal Accidents file compiled by the University of Michigan Transportation Research Institute. All crashes reported on herein meet the Motor Carrier Management Information System (MCMIS) crash file severity threshold of either a fatality, an injured person transported from the scene for medical attention, or at least one vehicle towed from the scene as a result of disabling damage sustained in the crash.

An estimated 129,000 trucks and 16,000 buses were involved in traffic crashes in 1995. There were 5,091 fatalities and 99,000 nonfatal injuries in crashes involving trucks. Bus crashes resulted in 335 fatalities and 24,000 injuries. A total of 571 truck drivers received fatal injuries as a result of traffic crashes.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celcius temperature	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
rnL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.71	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	Celcius temperature	1.8C + 32	Fahrenheit temperature	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.

(Revised September 1993)

Summary Truck and Bus Crash Statistics

Crashes:

- 129,000 trucks were involved in traffic crashes in 1995
- 4,631 trucks were involved in fatal crashes; 51,000 trucks were involved in a crash with a nonfatal injury; and 73,000 trucks were involved in a crash in which no one was injured but at least one vehicle was towed
- There were 5,091 fatalities and 99,000 nonfatal injuries in crashes involving a truck

Truck drivers:

- 571 truck drivers died in traffic crashes; of those, 390 (68%) died in single-vehicle crashes
- 0.6% of truck drivers involved in all crashes had been using alcohol, compared with 5.7% of crash-involved passenger vehicle drivers

Truck configuration:

- About 38% of the trucks involved in all traffic crashes were single-unit (no trailers), 59% pulled one trailer, and 2% pulled two or more trailers; truck configuration could not be determined in 1% of the cases
- 32% of trucks involved in fatal crashes were single-unit, 64% pulled one trailer, and 4% pulled at least two trailers
- There were 50 "longer combination vehicles" (LCVs) involved in fatal crashes, including one triple-trailer combination

Buses:

- 16,000 buses were involved in traffic crashes in 1995
- 288 buses were involved in fatal crashes
- 335 people were killed in bus crashes and 24,000 were injured

Hazardous materials:

- There were 183 trucks carrying hazardous materials involved in fatal crashes in 1995, down from 212 in 1994
- There were spills of hazardous materials from 44 of the 4,631 trucks involved in fatal crashes in 1995 (1.0%), down from 62 spills in 1994

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I. Introduction

This document presents aggregate statistics on trucks and buses involved in traffic crashes that occurred in the United States in 1995. These statistics are derived from four sources: crash statistics reported to the MCMIS Crash file maintained by the Federal Highway Administration's Office of Motor Carriers (OMC); the General Estimates System (GES) file maintained by the National Highway Traffic Safety Administration (NHTSA); the Fatality Analysis Reporting System (FARS) file, also maintained by the NHTSA; and the Trucks Involved in Fatal Accidents (TIFA) file compiled by the University of Michigan Transportation Research Institute.

The *Truck and Bus Crash Factbook* is a comprehensive overview of truck and bus crashes in the United States. All truck and bus involvements meeting a uniform severity threshold are included, regardless of whether the carriers operate in interstate commerce. Data reported here are collected from police accident reports and telephone interviews with involved parties. The data sources are described in more detail below.

What this factbook covers

In this report, a **crash** is a traffic crash meeting the MCMIS crash file reporting criteria. MCMIS crash file reporting criteria consist of two parts: one defining the types of vehicles involved in the crash, the other defining a reportable crash.

1. Vehicles

- Truck—a motor vehicle equipped for carrying property and having at least two axles and six tires or a vehicle displaying a hazardous materials placard

- Bus—a vehicle designed to carry at least sixteen people including the driver

2. Crashes

A reportable crash involves one or more trucks or buses and results in at least one of the following:

- A fatality (one or more persons killed as a result of the crash)

- An injury (one or more persons transported from the scene for immediate medical attention to injuries resulting from the crash)

- A towaway (one or more vehicles towed from the crash scene as a result of disabling damage sustained in the crash)

All crash statistics in this report conform to these criteria.

What this factbook does not cover

The *Truck and Bus Crash Factbook* replaces three older annual reports: OMC's *Accidents Reported by Motor Carriers of Property* and *Accidents Reported by Motor Carriers of Passengers*, and NHTSA's *Summary of Medium & Heavy Truck Crashes*. However, because the crash reporting threshold for this *Factbook* is different from either the OMC or the NHTSA reports, crash and involvement frequencies reported herein are not comparable to those in either the OMC or the NHTSA reports.

The OMC reports were based on data provided by motor carriers that were required to submit reports on traffic crashes involving either a fatality, injury, or property damage above a certain value. Only carriers operating in interstate commerce were required to file such crash reports. Since the MCMIS crash file also includes crashes of intrastate carriers, frequencies reported in this factbook are higher than those in the older OMC reports.

In contrast, NHTSA's *Summary of Medium & Heavy Truck Crashes* reported frequencies for all police-reported crashes, not just those meeting the MCMIS crash file reporting criteria of a fatality, injured person transported for treatment, or towaway. Accordingly, the *Summary* included a large number of relatively minor crashes (though of considerable cumulative economic importance) that are not considered here. To give an idea of the magnitude of the difference, there were an estimated 377,000 trucks involved in traffic crashes of all severities in 1995, according to the General Estimates System file. However, only an estimated 129,000 truck involvements met the MCMIS crash file reporting criteria. Truck involvement totals reported in this *Factbook* reflect only those 129,000 involvements.

The use of multiple data sources

This factbook is based on multiple sources of data. Each source has strengths and weaknesses, but when used together, they provide the best available description of truck and bus crashes that occurred in the United States.

The GES file:

- National estimates for crashes of all severities
- Extensive list of variables describing the crash and the vehicles involved
- Sample file
- Estimates from small subsets of the data, such as fatal involvements, have relatively large sampling errors associated with them

The TIFA file:

- Virtual census file of trucks involved in traffic crashes in which a fatality occurred, with sampling limited to major truck types
- Extensive list of variables providing a detailed description of the trucks involved
- Limited to fatal truck crashes only

The FARS file:

- Census file, with data on each fatal crash, including bus crashes, occurring in the United States and possessions
- Extensive list of variables describing the crash
- Limited detail about vehicles

The MCMIS crash file:

- Census file, with one record for each truck and bus in a reportable crash
- Twenty-two variables describing the crash and vehicle

The MCMIS crash file was not complete for all 1995 crashes. For the 1995 calendar year, all 50 States and the District of Columbia reported some data, though, in many cases, the data appear to be incomplete. Consequently, this factbook will be based primarily on data from the GES and TIFA files, with some data from the FARS file. Section IX, "A Preliminary Look at MCMIS Crash File Data," presents some initial findings from the MCMIS crash file. Factbooks in future years will incorporate more data from that file.

Data sources

MCMIS crash file: The Motor Carrier Management Information System (MCMIS) is a database consisting of five different files maintained by the Federal Highway Administration Office of Motor Carriers (OMC). These files support OMC's Federal and State motor carrier safety programs. One of the files is the MCMIS crash file, which contains reports of trucks and buses involved in crashes reported by States to the OMC through the SAFETYNET computer-based reporting system. States are required by the Intermodal Surface Transportation Efficiency Act of 1991 to report to the OMC crash data on all trucks and buses involved in crashes. To be included in the file a truck or bus must meet the definitions of those two vehicles recommended by the National Governors' Association (NGA), and the crash must also meet the definition of that event recommended by the NGA. The information that must be reported on all qualifying crashes and qualifying vehicles are the crash data elements recommended by the NGA. They include information on the truck or bus, truck or bus driver, motor carrier operating the truck or bus, crash environment, and crash events. When all States fully comply with the reporting mandate, the MCMIS crash file will provide a census of trucks and buses involved in crashes.

GENERAL ESTIMATES SYSTEM: GES is compiled by the National Center for Statistics and Analysis (NCSA) within the National Highway Traffic Safety Administration (NHTSA). The file incorporates data from a probability-based, nationally-representative sample of police-reported crashes. It covers all motor vehicle types, including medium and heavy trucks. All police-reportable crashes are included. Approximately 54,000 crashes are sampled each year. The police accident report (PAR) is the sole source of data. Frequencies based on the GES file reported in the tables in this report are national estimates, calculated using an appropriate weighting variable. Since GES is a sample file, estimates are subject to sampling error. The Technical Appendix herein includes information on confidence intervals for population estimates made from GES data.

FATALITY ANALYSIS REPORTING SYSTEM: FARS is compiled by the National Center for Statistics and Analysis within NHTSA. The file contains data on a census of fatal traffic crashes within the 50 States, the District of Columbia, and Puerto Rico. FARS includes records for all crashes involving a motor vehicle on a trafficway that resulted in the death of a vehicle occupant or nonmotorist within 30 days of the crash. Trained employees within each State code over 100 data elements from a variety of State documentary sources. These data are then transmitted to a central computerized database and compiled into the FARS file by NHTSA.

TRUCKS INVOLVED IN FATAL ACCIDENTS: The University of Michigan Transportation Research Institute (UMTRI) produces the TIFA file. TIFA contains detailed information on all medium and heavy trucks involved in fatal crashes in the United States, including Alaska and Hawaii. TIFA consists of a random sample of straight trucks with no trailers and tractor-semitrailers (as recorded in FARS) and all remaining medium and heavy trucks involved in a fatal crash. The file combines information from the FARS file, police accident reports, and comprehensive telephone interviews conducted by UMTRI research staff. TIFA includes most FARS variables, supplemented with a detailed description of each involved truck collected by the TIFA interview process. Mississippi does not supply police reports, precluding the TIFA interview process, so truck configuration is derived from FARS variables for Mississippi cases.

Note on the towaway criterion and GES

The GES file includes data for every vehicle in a sampled crash whether it was towed due to damage or towed for some other reason. A review of the variable showed that most of the cases coded as "towed not due to damage" should have been coded "towed due to damage." The GES data are coded entirely from police reports and few, if any, indicate the reason for towing. Police reports in many States simply permit the reporting officer to indicate whether the vehicle was towed and the location to which it was removed. Since the "towed not due to damage" code does not appear to be reliable, all truck or bus cases where at least one vehicle was towed, whether coded as due to damage or not, are included in the estimates derived from GES. This may result in an overestimation of towaway cases, but the amount of overestimation is probably small.

Note on data rounding and missing data

The GES file is a sample file, with associated sampling errors. The Technical Appendix discusses the GES sampling procedure and includes a table of sampling errors for different size estimates. Estimates from the GES file in this report are rounded to the nearest thousand. Percentages shown were calculated before the rounding was done. All figures for fatal crashes or fatalities in crashes are taken from the TIFA file or in some instances from the FARS file. Both TIFA and FARS are census files. Figures from TIFA or FARS are regarded as true population totals and are not rounded.

Cases with missing data in the TIFA or FARS files are reported in the tables. The GES file includes variables for which missing data have been removed through complex statistical procedures. These "imputed" variables are used in this report. A description of the statistical procedures for imputing data in the GES file is provided in *Imputation in the General Estimates System*, National Highway Traffic Safety Administration, National Center for Statistics and Analysis, 1993, (DOT HS 807 985).

II. Trends and Overview: Trucks

In 1995, almost 6.9 million trucks were registered to operate on U.S. roads (table II-1). Together, these trucks traveled an estimated 178 billion miles, averaging almost 26,000 miles per truck. Combination trucks, primarily tractors pulling a single semitrailer, averaged 69,000 miles per year, while single-unit trucks, primarily straight trucks, averaged 12,000 miles. There were 120,000 crashes involving at least one truck, with a total of 129,000 trucks involved. Over 4,600 trucks were involved in crashes in which at least one person was killed (**fatal** crash). An additional 51,000 trucks were involved in crashes in which at least one person was injured severely enough to be transported for immediate medical attention, though no one was killed (**injury** crash). Finally, an estimated 73,000 trucks were involved in crashes with no fatalities or injuries transported for treatment, but with at least one vehicle damaged severely enough to be towed (**towaway** crash).

Table II-1 Truck Statistics, 1995

	Single-Unit	Combination	Unknown	Total
Vehicles				
Registrations	5,203,810	1,677,264	0	6,881,074
Miles traveled (millions)	62,706	115,454	0	178,160
Average travel	12,050	68,835	0	25,891
Crashes				
Number	47,000	74,000	1,000	120,000
trucks involved	49,000	78,000	1,000	129,000
Vehicles by crash severity				
Fatal	1,495	3,133	3	4,631
Injury	21,000	30,000	1,000	51,000
Towaway	27,000	45,000	1,000	73,000
Total	49,000	78,000	1,000	129,000
Involvement rate per 100 million VMT				
Fatal	2.384	2.714	n/a	2.599
Injury	33.490	25.984	n/a	28.626
Towaway	43.058	38.977	n/a	40.974
Total	78.142	67.559	n/a	72.407

Sources: *Highway Statistics 1995*;
1995 TIFA; 1995 GES

Five-year trends of vehicles and injuries

The number of fatal involvements decreased in 1995 to 4,631 after two years of increases (table II-2). In 1991, 4,420 trucks were involved in a crash in which at least one fatality occurred. That number had declined to 4,185 by 1992, but increased over 6% to 4,451 in 1993 and again by almost 8% to 4,795 in 1994.

Some apparent year-to-year changes reported in the tables for injury and towaway involvements may not be statistically significant. Estimates of injury and towaway involvements are made using GES files. Since GES files are the product of sampling, each estimate has an associated sampling error. Tests of significance have been calculated for the differences between the yearly totals, and where those differences are statistically significant, they will be identified in the text. The number of fatal involvements is taken from the TIFA file. Because TIFA is a virtual census file, the number of fatal involvements and fatalities is known with confidence.

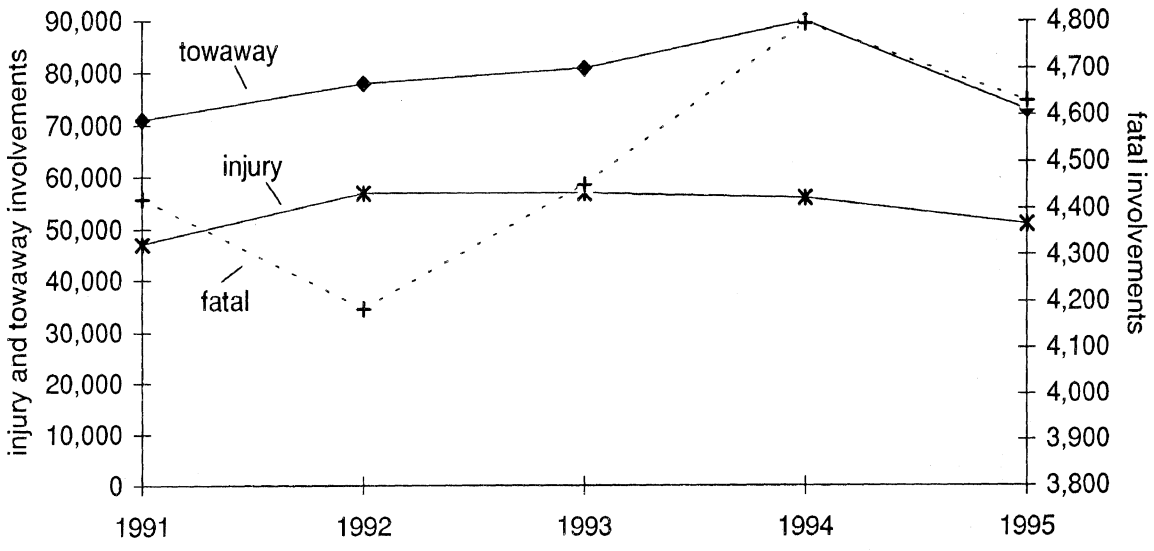
Figure II-1 shows annual estimates of fatal, injury, and towaway involvements for 1991-1995. Generally the year-to-year differences in total

Table II-2 Truck Involvements by Crash Severity, 1991-1995

	Fatal		Injury		Towaway		Total	
Year	N	%	N	%	N	%	N	%
1991	4,420	3.6	47,000	38.2	71,000	58.2	123,000	100.0
1992	4,185	3.0	57,000	41.0	78,000	56.0	139,000	100.0
1993	4,451	3.1	57,000	39.7	81,000	57.1	142,000	100.0
1994	4,795	3.2	56,000	37.4	90,000	59.4	151,000	100.0
1995	4,631	3.6	51,000	40.0	73,000	56.4	129,000	100.0

Sources: 1991-1995 TIFA, 1991-1995 GES

Figure II-1 Fatal, Injury, and Towaway Involvements, 1991-1995



Sources: 1991-1995 TIFA, 1991-1995 GES

involvements are not statistically significant. The decrease in involvements in 1995 over 1994 is also not statistically significant, though it is likely real since it parallels the decrease in fatal involvements in 1995.

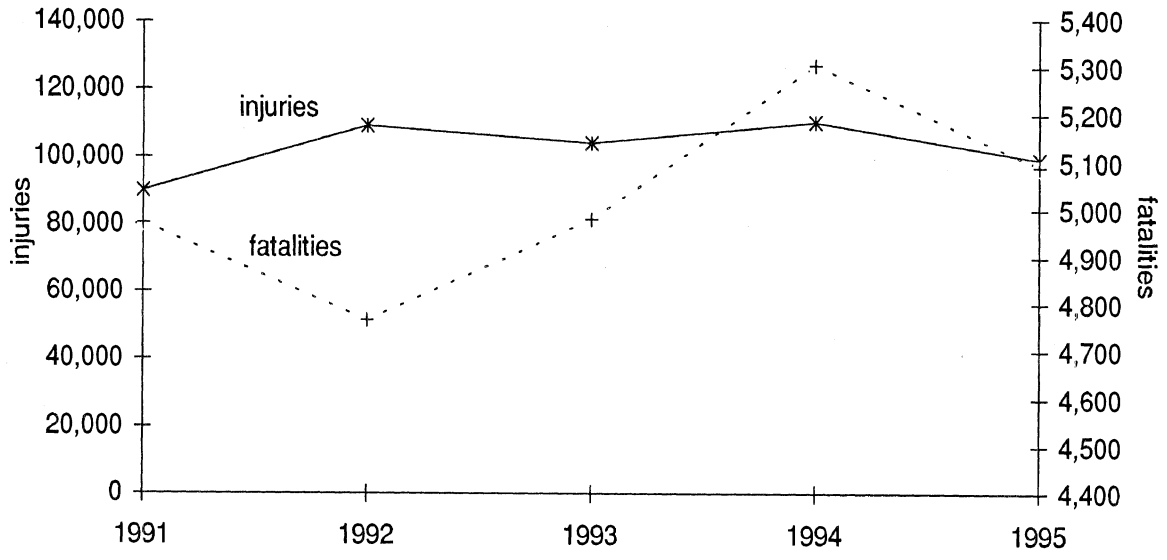
Table II-3 shows the number of persons killed and estimated number of persons injured in truck crashes, 1991-1995. The fatality column is from the TIFA files. The number of fatalities decreased by 4.2% from 1994. The estimated number of injuries in 1995 also shows a decrease, though not statistically significant, from 1994. None of the differences in the number of injuries in the table are statistically significant. Figure II-2 shows the number of fatalities and estimated injuries.

Table II-3 Total Fatalities and Injuries in Truck Crashes 1991-1995

	Fatalities		Injuries		Total	
Year	N	% change	N	% change	N	% change
1991	4,974		90,000		95,000	
1992	4,767	-4.3	109,000	17.2	114,000	16.3
1993	4,981	4.3	104,000	-4.5	109,000	-4.1
1994	5,306	6.1	110,000	5.0	115,000	5.0
1995	5,091	-4.2	99,000	-11.2	104,000	-10.9

Sources: 1991-1995 TIFA, 1991-1995 GES

Figure II-2 Fatalities and Injuries, 1991-1995



Sources: 1991-1995 TIFA, 1991-1995 GES

Fatal involvements by configuration

The distribution of trucks involved in fatal crashes by combination type has been quite stable over time (table II-4). In each year between 1991 and 1995, about 30% of the trucks were single-unit, about 64% pulled one trailer, and fewer than 5% were multitrailer. The multitrailer category includes straight trucks with more than one trailer and tractors pulling three trailers, but the large majority of that category is the tractor-semitrailer, full-trailer combination. Despite an increasing reliance on tractors pulling two trailers ("doubles") in hauling freight, the annual proportion of fatal multitrailer involvements has remained steady.

Table II-4 Combination Type for Fatal Involvements, 1991-1995

	Single-Unit		One-Trailer		Multitrailer		Unknown		Total	
Year	N	%	N	%	N	%	N	%	N	%
1991	1,314	29.7	2,857	64.6	175	4.0	74	1.7	4,420	100.0
1992	1,257	30.0	2,660	63.6	189	4.5	79	1.9	4,185	100.0
1993	1,375	30.9	2,811	63.2	178	4.0	87	2.0	4,451	100.0
1994	1,522	31.7	3,011	62.8	172	3.6	90	1.9	4,795	100.0
1995	1,495	32.3	2,950	63.7	183	4.0	3	0.1	4,631	100.0

Sources: 1991-1995 TIFA, 1991-1992 FARS

Table II-5 shows the number of involvements for each truck combination in each State in 1995. The table is restricted to fatal involvements, since data on the state in which the crash occurred are available only for fatal crashes. (Once the MCMIS crash file is complete, State data will be available for all crash severities.) Three States, California, Texas, and Florida, accounted for 1,019 involvements, or 22% of total fatal truck involvements. (Those three States also account for 25% of the population of the United States.) Hawaii, Rhode Island, and the District of Columbia had the fewest fatal involvements, with a total of just 14 among them. One-trailer combinations were the primary truck configuration in fatal crashes. Only three jurisdictions, New York, Hawaii and the District of Columbia, had more single-unit than one-trailer involvements. Multitrailer involvements were found more often in the western States. California recorded 51 multitrailer fatal involvements, by far the largest number and 27.9% of all multitrailer involvements. The next highest count was 11 in Michigan and Washington. Illinois and Texas had eight each; Montana accounted for seven.

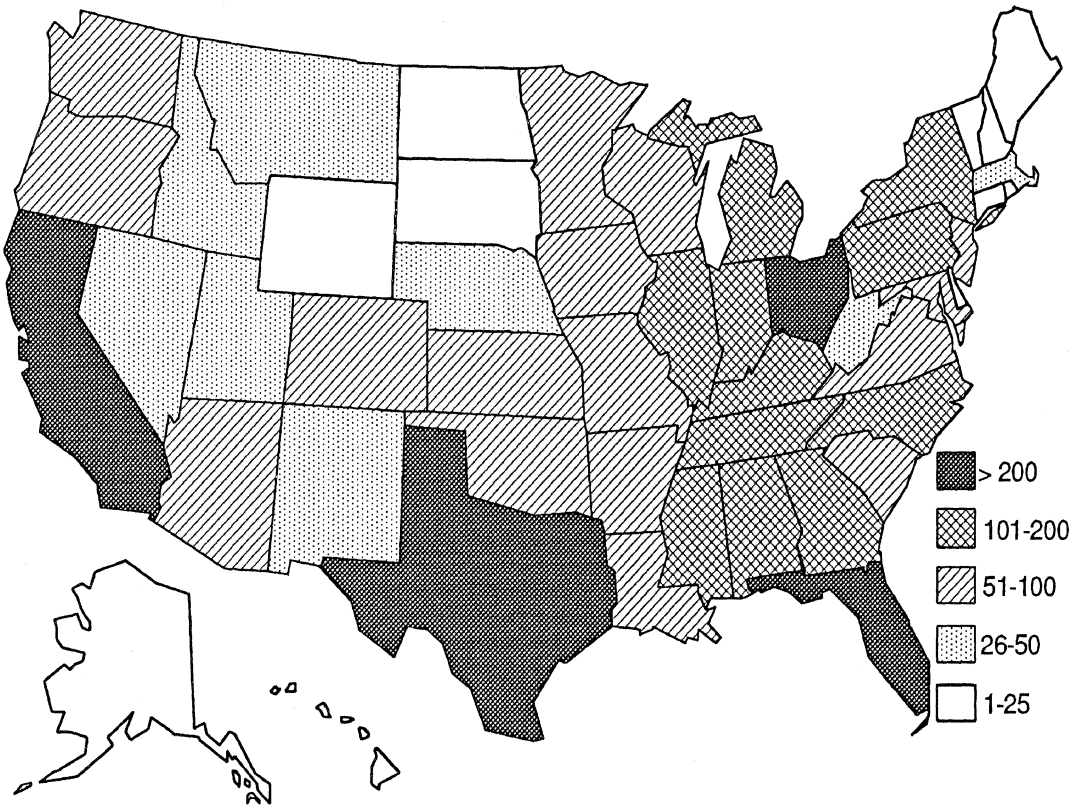
Table II-5 Fatal Involvements by State and Combination Type, 1995

State	Single-Unit		One-Trailer		Multitrailer		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%
Alabama	43	2.9	104	3.5	4	2.2	0	0.0	151	3.3
Alaska	2	0.1	6	0.2	1	0.5	0*	0.0	9	0.2
Arizona	23	1.5	49	1.7	6	3.3	0	0.0	78	1.7
Arkansas	14	0.9	83	2.8	1	0.5	0	0.0	98	2.1
California	117	7.8	210	7.1	51	27.9	1	33.3	379	8.2
Colorado	24	1.6	33	1.1	2	1.1	0	0.0	59	1.3
Connecticut	8	0.5	17	0.6	0	0.0	0	0.0	25	0.5
Delaware	2	0.1	8	0.3	0	0.0	0	0.0	10	0.2
D.C.	3	0.2	0	0.0	0	0.0	0	0.0	3	0.1
Florida	109	7.3	177	6.0	1	0.5	0	0.0	287	6.2
Georgia	61	4.1	128	4.3	4	2.2	0	0.0	193	4.2
Hawaii	3	0.2	2	0.1	0	0.0	0	0.0	5	0.1
Idaho	7	0.5	17	0.6	5	2.7	0	0.0	29	0.6
Illinois	62	4.1	97	3.3	8	4.4	0	0.0	167	3.6
Indiana	45	3.0	109	3.7	6	3.3	0	0.0	160	3.5
Iowa	20	1.3	44	1.5	3	1.6	0	0.0	67	1.4
Kansas	12	0.8	51	1.7	0	0.0	0	0.0	63	1.4
Kentucky	34	2.3	69	2.3	1	0.5	0	0.0	104	2.2
Louisiana	30	2.0	56	1.9	1	0.5	0	0.0	87	1.9
Maine	7	0.5	15	0.5	0	0.0	0	0.0	22	0.5
Maryland	21	1.4	31	1.1	0	0.0	0	0.0	52	1.1
Massachusetts	16	1.1	18	0.6	0	0.0	0	0.0	34	0.7
Michigan	59	3.9	104	3.5	11	6.0	0	0.0	174	3.8
Minnesota	27	1.8	51	1.7	2	1.1	0	0.0	80	1.7
Mississippi	15	1.0	88	3.0	2	1.1	2	66.7	107	2.3
Missouri	29	1.9	64	2.2	3	1.6	0	0.0	96	2.1
Montana	6	0.4	15	0.5	7	3.8	0	0.0	28	0.6
Nebraska	14	0.9	29	1.0	0	0.0	0	0.0	43	0.9
Nevada	6	0.4	21	0.7	5	2.7	0	0.0	32	0.7
New Hampshire	2	0.1	5	0.2	0	0.0	0	0.0	7	0.2
New Jersey	45	3.0	45	1.5	1	0.5	0	0.0	91	2.0
New Mexico	7	0.5	34	1.2	1	0.5	0	0.0	42	0.9
New York	92	6.2	65	2.2	0	0.0	0	0.0	157	3.4
N.Carolina	68	4.5	119	4.0	1	0.5	0	0.0	188	4.1
N.Dakota	2	0.1	5	0.2	0	0.0	0	0.0	7	0.2
Ohio	73	4.9	132	4.5	6	3.3	0	0.0	211	4.6
Oklahoma	20	1.3	67	2.3	2	1.1	0	0.0	89	1.9
Oregon	26	1.7	40	1.4	4	2.2	0	0.0	70	1.5
Pennsylvania	80	5.4	104	3.5	3	4.0	0	0.0	187	4.0
Rhode Island	3	0.2	3	0.1	0	0.0	0	0.0	6	0.1
S.Carolina	23	1.5	68	2.3	1	0.5	0	0.0	92	2.0
S.Dakota	3	0.2	10	0.3	1	0.5	0	0.0	14	0.3
Tennessee	33	2.2	77	2.6	6	3.3	0	0.0	116	2.5
Texas	89	6.0	256	8.7	8	4.4	0	0.0	353	7.6
Utah	4	0.3	18	0.6	5	2.7	0	0.0	27	0.6
Vermont	6	0.4	8	0.3	0	0.0	0	0.0	14	0.3
Virginia	30	2.0	64	2.2	3	1.6	0	0.0	97	2.1
Washington	15	1.0	42	1.4	11	6.0	0	0.0	68	1.5
W.Virginia	15	1.0	31	1.1	1	0.5	0	0.0	47	1.0
Wisconsin	36	2.4	55	1.9	2	1.1	0	0.0	93	2.0
Wyoming	4	0.3	6	0.2	3	1.6	0	0.0	13	0.3
Total	1,495	100.0	2,950	100.0	183	100.0	3	100.0	4,631	100.0

Source: 1995 TIFA

Figure II-3 shows the distribution of all fatal truck involvements in the United States in 1995. The distribution reflects both population size and truck usage. California, Texas, Florida, and Ohio had the greatest number of fatal truck involvements, while the New England States and the States of the upper Great Plains had the fewest. The States of the industrial Midwest also had large numbers of involvements, reflecting both population size and industrial concentration.

Figure II-3 Fatal Truck Involvements, 1995

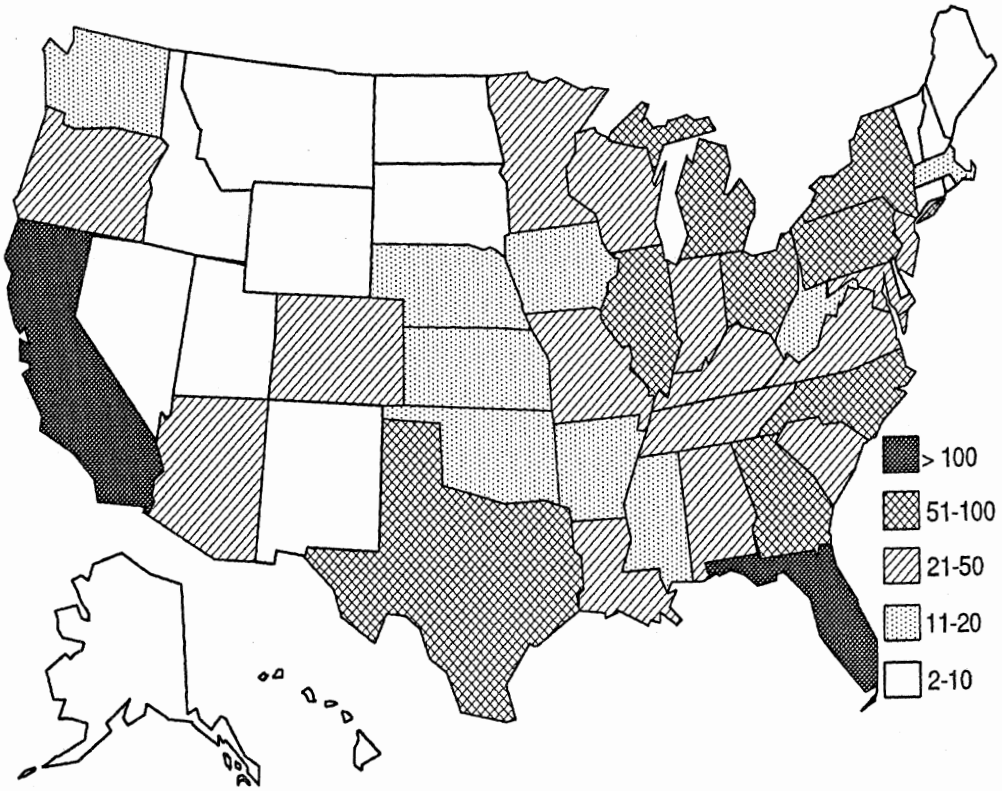


Source: 1995 TIFA

The geographical distribution of single-unit trucks involved in fatal crashes is shown in figure II-4. Of the total of 4,631 trucks involved in a fatal crash, 1,495 were single-unit trucks.

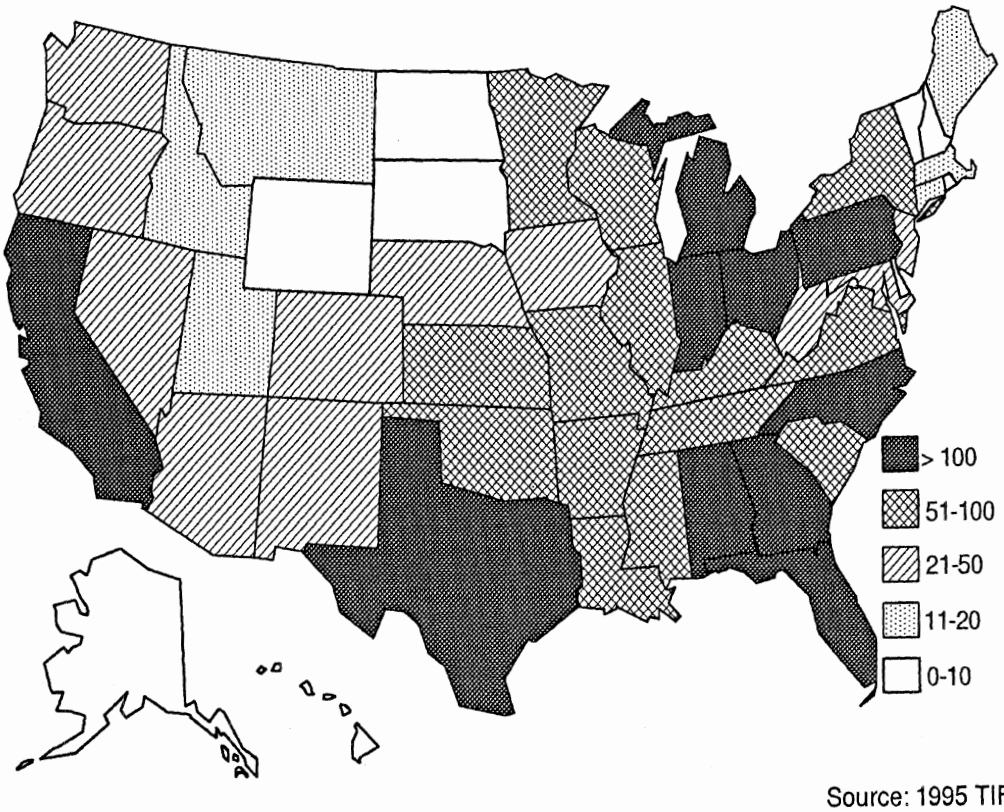
One-trailer combinations make up the majority of all truck fatal involvements, so figure II-5 is similar to figure II-3. Texas, California, and Florida had the largest number of one-trailer fatal involvements in 1995; one-trailer fatal involvements were also concentrated in the industrial States of the Midwest as well as North Carolina, Alabama and Georgia.

Figure II-4 Single-Unit Fatal Truck Involvements, 1995



Source: 1995 TIFA

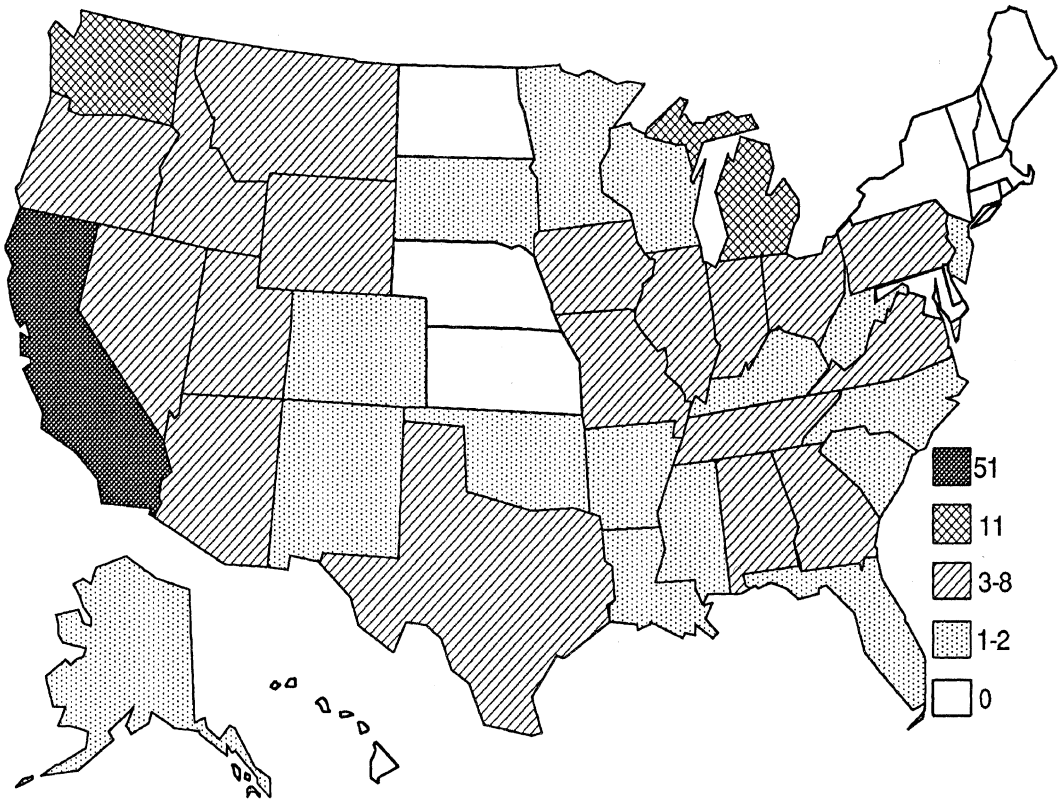
Figure II-5 One-Trailer Fatal Truck Involvements, 1995



Source: 1995 TIFA

The pattern of multitrailer fatal involvements across the U.S. differs significantly from either all fatal involvements or any of the other combination types. Multitrailer involvements were heavily concentrated in the West and especially in California. California had 51 fatal involvements of multitrailer trucks in 1995, while Michigan and Washington had eleven each, and Texas and Illinois had eight each. Thirteen States and the District of Columbia recorded no multitrailer fatal involvements, eleven states counted only one, and five had only two.

Figure II-6 Multitrailer Fatal Truck Involvements, 1995



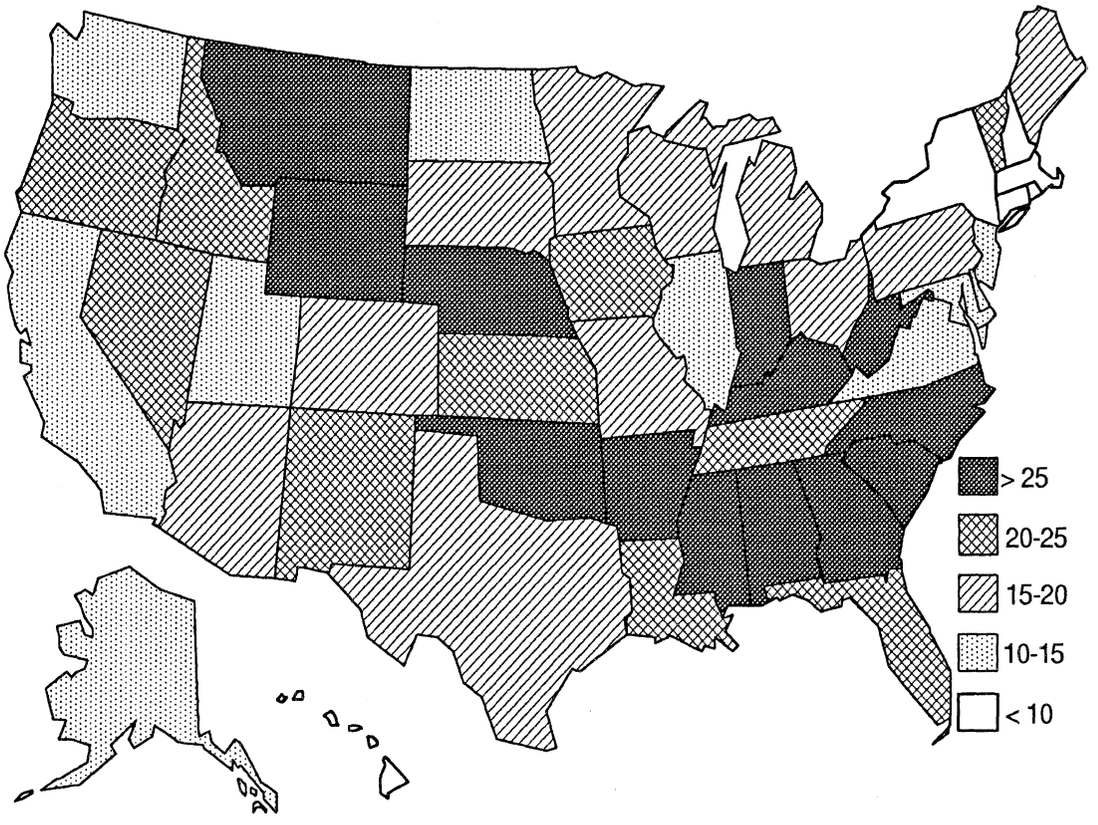
Source: 1995 TIFA

Fatal involvements per capita

Finally, figure II-7 provides a context for interpreting the previous maps. It shows the rate of fatal truck involvements per million population in each State. Note that the States with the greatest number of fatal involvements, (i.e., California, Texas, and Florida) have low or average involvements per million population. In contrast, some States with relatively few fatal involvements have among the highest rates of involvement per million population.

There are many methods of measuring "exposure" to traffic crashes. Truck involvements per million population is just one of them. The purpose of figure II-7 is not to measure "traffic safety" in the States, but instead to "correct" the previous figures for the population sizes of the States. The total number of fatal truck involvements in a State is related to population size as well as to many other factors.

Figure II-7 Fatal Truck Involvements per Million Population, 1995



Sources: 1995 TIFA; *Statistical Abstract 1995*

III. Crash Environment: Trucks

This section presents statistics describing the environment in which truck traffic crashes occurred in 1995. All tables in this section show counts and proportions of vehicles by features of the crash environment.

Highlights of this section:

- Over 89% of truck crash involvements occurred during the work week
- 79.5% of truck involvements occurred with no adverse weather conditions; 83.5% of fatal involvements occurred with no adverse weather conditions
- 72.5% of all truck involvements and 79.2% of fatal involvements occurred on dry roads
- 24.2% of fatal involvements occurred in the dark compared with 15.2% of nonfatal involvements
- 26.9% of the fatal involvements of one-trailer trucks and 31.2% of multitrailer trucks occurred on Interstate highways
- Head-on collision was identified in 23.1% of fatal involvements compared with only 2.5% of all truck crash involvements
- A collision with a pedestrian or bicyclist was identified in 7.8% of fatal involvements, but only 0.9% of all involvements

Month, day of week, and time of day

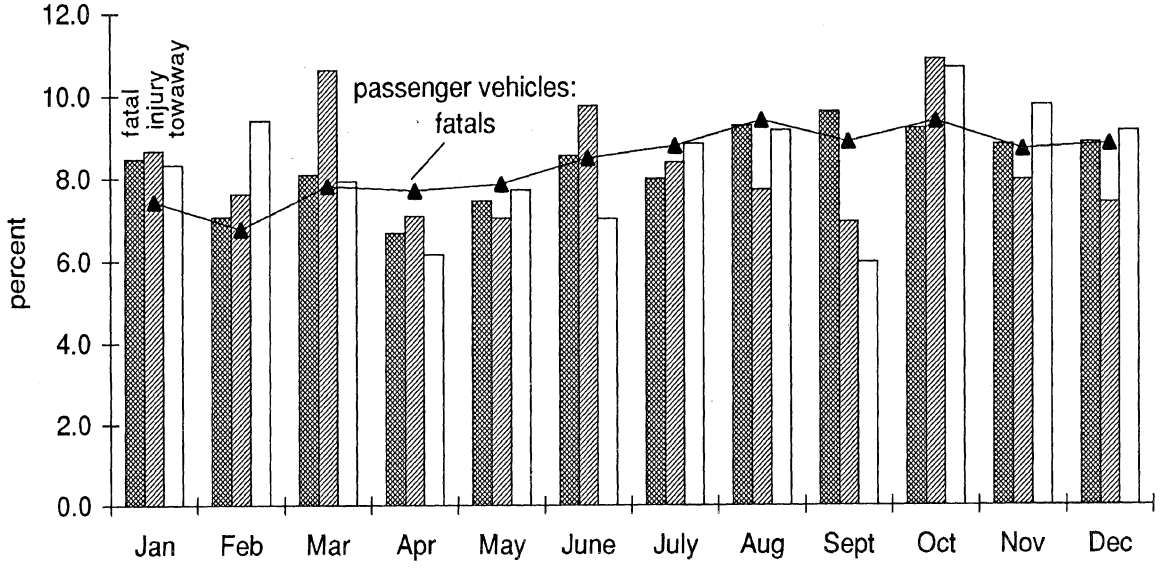
Fatal truck involvements appear to follow a seasonal pattern, with fewer involvements in the winter months and more in August and September. In 1995, April had the fewest fatal truck involvements with 309, while September had the greatest number, 445, a difference of 44%. The pattern of injury and towaway involvements is not as clear, though the lack of clarity may be due to relatively small sample sizes in GES. The monthly distribution of fatal passenger vehicle involvements is included in figure III-1 for comparison.

Table III-1 Crash Severity by Month

	Fatal		Injury		Towaway		All	
Month	N	%	N	%	N	%	N	%
January	392	8.5	4,000	8.7	6,000	8.3	11,000	8.5
February	327	7.1	4,000	7.6	7,000	9.4	11,000	8.6
March	374	8.1	5,000	10.6	6,000	7.9	12,000	9.0
April	309	6.7	4,000	7.1	4,000	6.2	8,000	6.5
May	345	7.4	4,000	7.0	6,000	7.7	10,000	7.4
June	396	8.6	5,000	9.7	5,000	7.0	10,000	8.2
July	370	8.0	4,000	8.4	6,000	8.8	11,000	8.6
August	429	9.3	4,000	7.7	7,000	9.1	11,000	8.6
September	445	9.6	4,000	6.9	4,000	6.0	8,000	6.5
October	426	9.2	6,000	10.9	8,000	10.7	14,000	10.7
November	408	8.8	4,000	8.0	7,000	9.8	12,000	9.0
December	410	8.9	4,000	7.4	7,000	9.1	11,000	8.4
Total	4,631	100.0	51,000	100.0	73,000	100.0	129,000	100.0

Sources: 1995 TIFA, 1995 GES

Figure III-1 Crash Severity by Month



Sources: 1995 TIFA, 1995 GES, 1995 FARS

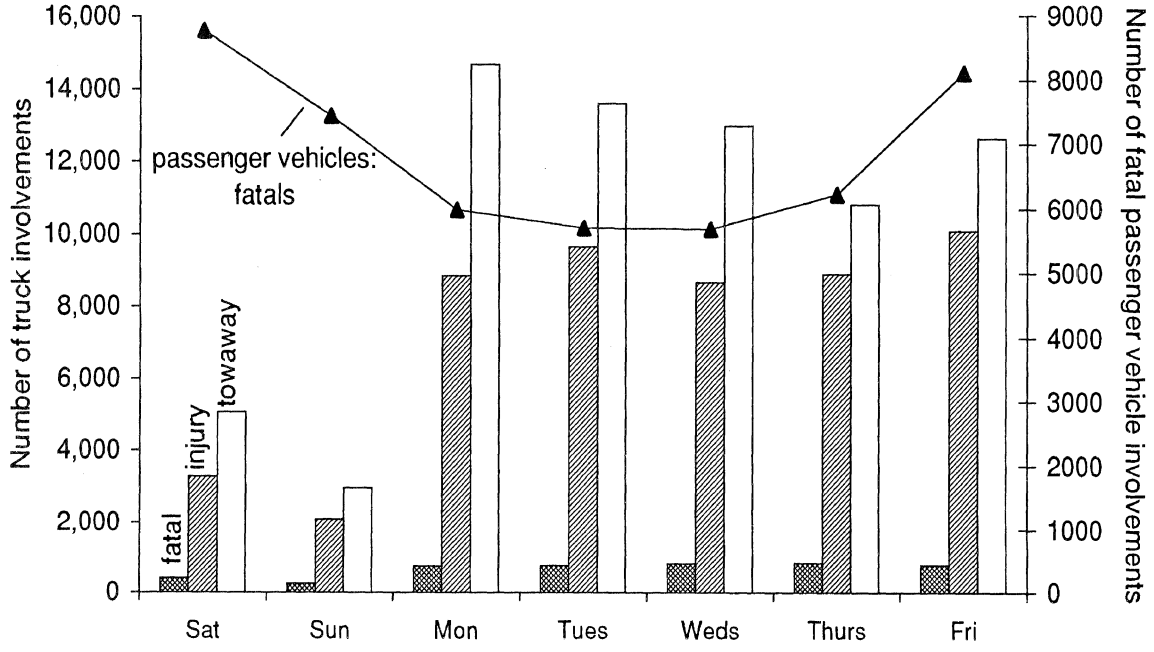
Most truck involvements in traffic crashes occurred during the work week. Over 89% of truck involvements took place from Monday to Friday in 1995 (table III-2). The number of trucks involved in traffic crashes declined steeply on the weekend, though note that Saturday had about 60% more involvements than Sunday. The weekend proportion was slightly higher for fatal truck involvements than for nonfatal, with 14.6% of fatal truck involvements occurring on Saturday or Sunday, compared with 10.9% of all truck involvements. On weekends, many businesses are closed, though trucks used for long-distance freight haulage continue to operate. These trucks use roads with higher travel speeds, where traffic crashes are more likely to include a fatality. Figure III-2 includes fatal passenger vehicle involvements by day of week for comparison. Passenger vehicles are often used for recreational driving and so have a higher proportion of crashes on weekends, compared with trucks.

Table III-2 Day of Week by Crash Severity

	Fatal		Injury		Towaway		All	
Day	N	%	N	%	N	%	N	%
Saturday	414	8.9	3,000	6.4	5,000	7.0	9,000	6.8
Sunday	262	5.7	2,000	4.1	3,000	4.1	5,000	4.1
Monday	745	16.1	9,000	17.2	15,000	20.2	24,000	18.8
Tuesday	769	16.6	10,000	18.7	14,000	18.7	24,000	18.7
Wednesday	821	17.7	9,000	16.8	13,000	17.8	22,000	17.4
Thursday	839	18.1	9,000	17.2	11,000	14.9	20,000	15.9
Friday	781	16.9	10,000	19.6	13,000	17.4	23,000	18.2
Total	4,631	100.0	51,000	100.0	73,000	100.0	129,000	100.0

Sources: 1995 TIFA, 1995 GES

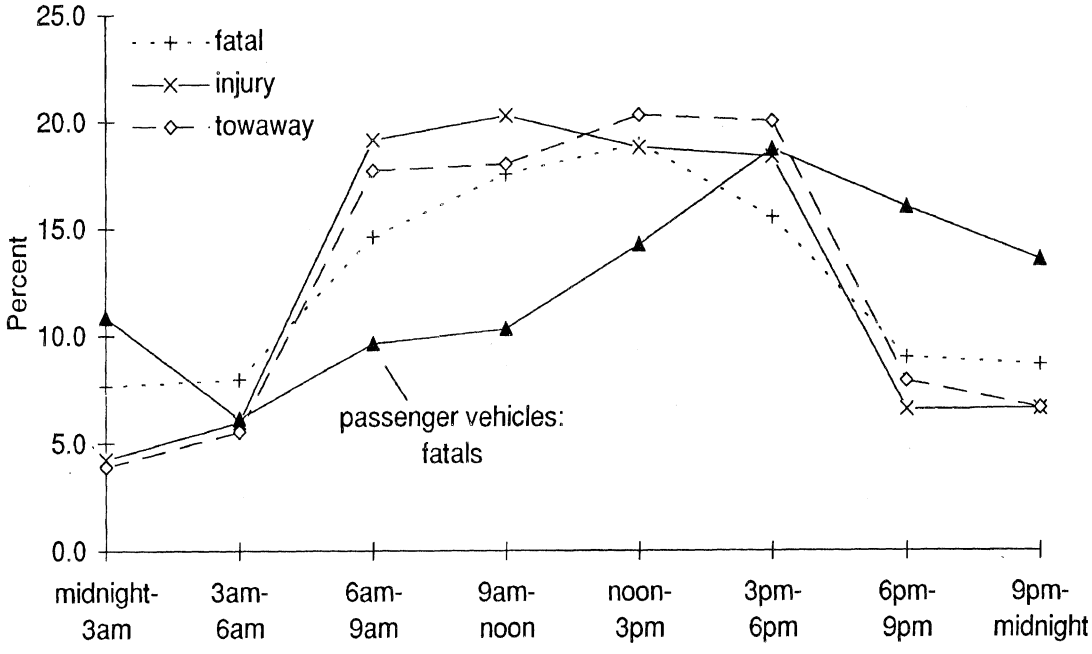
Figure III-2 Day of Week by Crash Severity



Sources: 1995 TIFA, 1995 GES, and 1995 FARS

The distribution of truck involvements over the course of a day also varies greatly. Figure III-3 shows the distribution of each crash severity in 1995 by time of day. Passenger vehicle fatal involvements are included for comparison. Injury and towaway involvements rose gradually from about 6% for the three-hour period from 3 a.m. to 6 a.m. to about 19% for each successive three-hour period between 6 a.m. and 6 p.m. The percentage of injury and towaway involvements then declined sharply overnight. The distribution of fatal involvements followed the same general trend, although it fluctuated within a more narrow range—the increase was not as great during normal working hours and fatal involvements declined less overnight compared with the other crash severities. The proportion of fatal involvements was about fifty percent higher than nonfatal involvements between midnight and 6 a.m. Why is the proportion of fatal involvements higher at night? During the day, a substantial amount of travel is related to pickup and delivery operations. At night, more travel is on high-speed roads, carrying freight between cities. Driver fatigue and shortened sight distances due to darkness are also a problem. In such circumstances, if a crash occurs, it is more likely to be serious.

Figure III-3 Time of Day by Crash Severity



Sources: 1995 TIFA, 1995 GES, 1995 FARS

Weather, road, and light condition

Almost 80% of all U.S. truck involvements in 1995 occurred with no adverse weather conditions (table III-3). Rain was the most common type of adverse weather, accounting for 13.8% of all truck crash involvements. Snow fell in only 5.3% of the involvements and was somewhat more likely for towaway (5.6%) or injury (5.1%) than for fatal (3.9%) involvements. For fatal involvements, the proportion of weather problems was actually lower than for injury and towaway involvements. There were no adverse conditions in 83.5% of all fatal involvements and rain was coded for only 9.8%. This may indicate that drivers generally operate their vehicles more carefully and slowly in bad weather, so that if a crash occurs, it is less likely to be serious.

Table III-3 Weather Condition by Crash Severity

	Fatal		Injury		Towaway		All	
Weather	N	%	N	%	N	%	N	%
No adverse	3,868	83.5	41,000	79.8	57,000	79.1	102,000	79.5
Rain	452	9.8	7,000	14.2	10,000	13.9	18,000	13.8
Snow	181	3.9	3,000	5.1	4,000	5.6	7,000	5.3
Fog	99	2.1	*	0.5	*	0.6	1,000	0.6
Other	24	0.5	*	0.4	1,000	0.9	1,000	0.7
Total	4,631	100.0	51,000	100.0	73,000	100.0	129,000	100.0

Note: Includes 7 fatal involvements with unknown weather conditions.
* GES estimate less than 500
Sources: 1995 TIFA, 1995 GES

Table III-4 shows road conditions by crash severity for truck crash involvements in 1995. Naturally, the distribution of road conditions is quite similar to that of weather conditions. Most truck crash involvements occurred on dry roads. The proportion of fatal involvements on dry roads was higher than for injury or towaway involvements. Though it was snowing or sleeting in 5.3% of all involvements, roads were snowy or icy in 7.9% of all involvements.

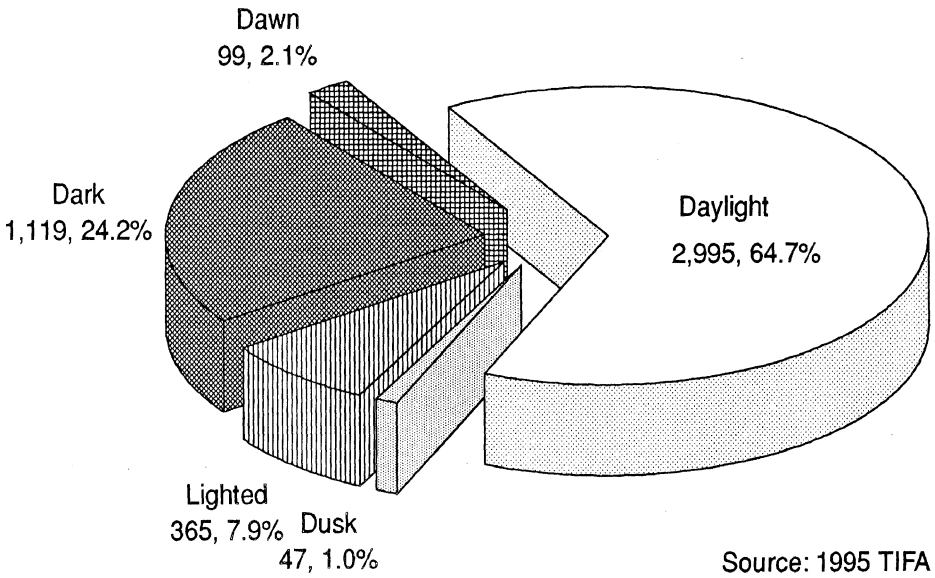
Table III-4 Road Condition by Crash Severity

Road	Fatal		Injury		Towaway		All	
condition	N	%	N	%	N	%	N	%
Dry	3,670	79.2	37,000	71.8	53,000	72.5	93,000	72.5
Wet	693	15.0	11,000	20.9	13,000	18.4	25,000	19.3
Snow/slush	100	2.2	1,000	1.8	2,000	3.0	3,000	2.5
Ice	155	3.3	2,000	4.8	4,000	5.9	7,000	5.4
Total	4,631	100.0	51,000	100.0	73,000	100.0	129,000	100.0

Note: Includes 13 TIFA cases and fewer than 1000
GES cases with other or unknown road conditions.
Sources: 1995 TIFA, 1995 GES

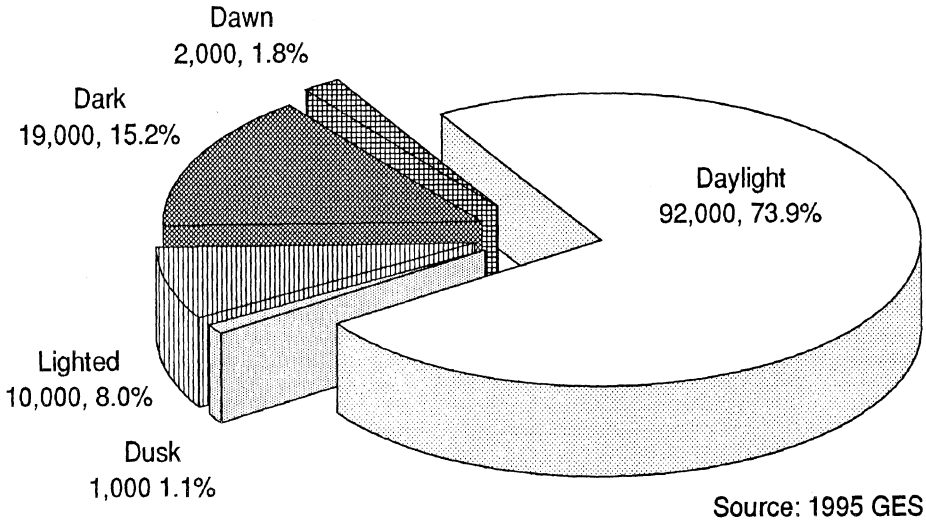
Figures III-4 and III-5 show light condition for fatal and nonfatal (injury and towaway) involvements in 1995. Most involvements, both fatal and nonfatal, occurred either during daylight or on lighted roads. However, fatal involvements had a higher proportion of "dark" conditions, while nonfatal involvements were much more likely to occur in daylight. In fact, 24.2% of truck involvements in a fatal crash occurred in the dark, compared with only 15.2% of truck involvements in a nonfatal crash. This is consistent with the time of day distribution shown in figure III-3. Truck travel at night is more likely to consist of long-haul trips on roads where travel speeds are high. The distribution of fatal involvements of passenger vehicles is similar to fatal truck involvements, though with a lower proportion of daylight crashes (53.2%) and a higher proportion of dark (27.4%) and of dark but lighted (15.0%).

Figure III-4 Light Condition for Fatal Truck Crashes



Source: 1995 TIFA

Figure III-5 Light Condition for Nonfatal Truck Crashes



Source: 1995 GES

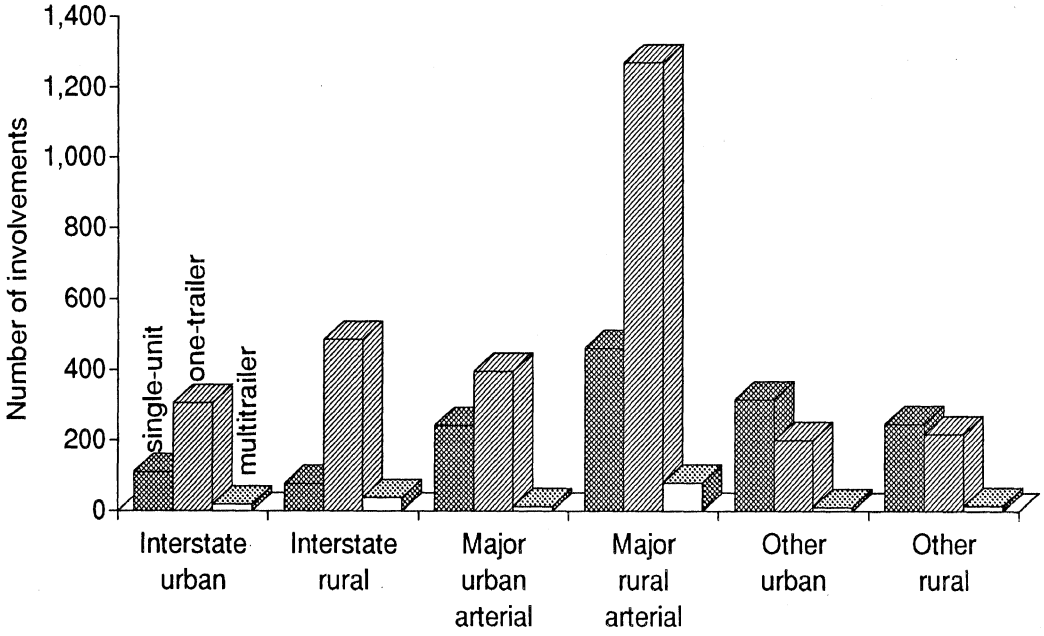
Road type and area type

Road type and area type capture important features of a truck's operating environment. Roads in urban areas typically have denser traffic and lower speeds than comparable road classes in rural areas. Interstate highways provide one-way traffic streams (which reduce the opportunity for head-on collisions), high design standards, and controlled access. Major arterials, as defined here, are U.S. and State numbered routes that are not Interstate highways and so typically incorporate fewer safety features.

Note: Only trucks involved in fatal crashes are included in this section, since a detailed road type variable is available only in the TIFA and FARS files.

Figure III-6 shows involvement frequencies of different truck configurations in fatal crashes in 1995. Fatal involvements of one-trailer trucks were concentrated on major arterial roads in rural areas, though Interstate highways in both rural and urban areas also accounted for a substantial number. The number of one-trailer involvements on rural major arterials is striking. Travel speeds on such roads are typically high, since they are in rural areas, but they are not as safe as Interstate highways. Single-unit truck involvements, primarily straight trucks, also were relatively concentrated on rural major arterials. In addition, single-unit trucks had substantial numbers of involvements on "other" roads (i.e., not Interstate or major arterial). The involvements of multitrailer trucks occurred primarily on rural and urban limited-access roads and rural major arterials.

Figure III-6 Road and Area Type by Combination Type
Fatal Truck Involvements Only



Source: 1995 TIFA

Compared with the other combination types, single-unit fatal involvements were more uniformly distributed across the road and area types. Summing the appropriate categories in table III-5, about 38% of single-unit involvements occurred on "other" roads, including both urban and rural areas, compared with 14.2% for one-trailer combinations and 14.8% for multitrailer combinations. Fatal involvements of one-trailer combinations occurred primarily on Interstate highways and major arterials, with 26.9% on all Interstate roads and an additional 56.4% on major arterials. The fatal involvements of multitrailer combinations were concentrated on rural major arterial roads, with 44.3%, with an additional 20.8% on rural Interstate highways.

Considering area type, overall about 53% of single-unit fatal involvements occurred on rural roads, compared with almost 67% for one-trailer combinations and over 73% for multitrailer combinations. Single-unit trucks had a significantly lower proportion of rural Interstate involvements than combination trucks and a much higher proportion of involvements on "other" rural roads.

As is the case for all other tables and figures in this publication, in the absence of exposure data, causal inferences cannot be drawn from these distributions. For example, the small frequency and proportion of multitrailer fatal involvements on urban "other" roads does not indicate that multitrailer combinations operate more safely on such roads. Multitrailer combinations, primarily tractors pulling two trailers and some triples, are used mainly on Interstate highways between cities and not on smaller urban roads.

Table III-5 Fatal Involvements by Road Class/Area Type and Truck Configuration

Road class/ area type	Single-Unit		One-Trailer		Multitrailer		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%
Interstate/urban	110	7.4	306	10.4	19	10.4	0	0.0	435	9.4
Interstate/rural	78	5.2	486	16.5	38	20.8	0	0.0	602	13.0
Major arterial/urban	243	16.3	395	13.4	13	7.1	1	33.3	652	14.1
Major arterial/rural	460	30.8	1,268	43.0	81	44.3	1	33.3	1,810	39.1
Other/urban	315	21.1	201	6.8	12	6.6	1	33.3	529	11.4
Other/rural	246	16.5	217	7.4	15	8.2	0	0.0	478	10.3
Unknown	43	2.9	77	2.6	5	2.7	0	0.0	125	2.7
Total	1,495	100.0	2,950	100.0	183	100.0	3	100.0	4,631	100.0

Source: 1995 TIFA

Manner of collision and first harmful event

A higher proportion of fatal involvements resulted from head-on collisions, compared with injury and towaway involvements (table III-6, figure III-7). Head-on collisions accounted for 23.1% of fatal truck involvements, compared with only 2.2% of injury and 1.4% of towaway crashes. In contrast, 27.7% of injury and 26.4% of towaway involvements were in rear-end collisions, compared with 16.9% of fatals. Sideswipes were also less serious, accounting for 4.4% of truck fatal involvements, but 11.3% of towaway involvements. An angle impact was the major collision type for all crash severities, coded for 33.3% of fatal involvements, 42.6% of injury involvements, and 33.9% of towaway involvements. The "single-vehicle" category includes cases where there was no collision with another vehicle.

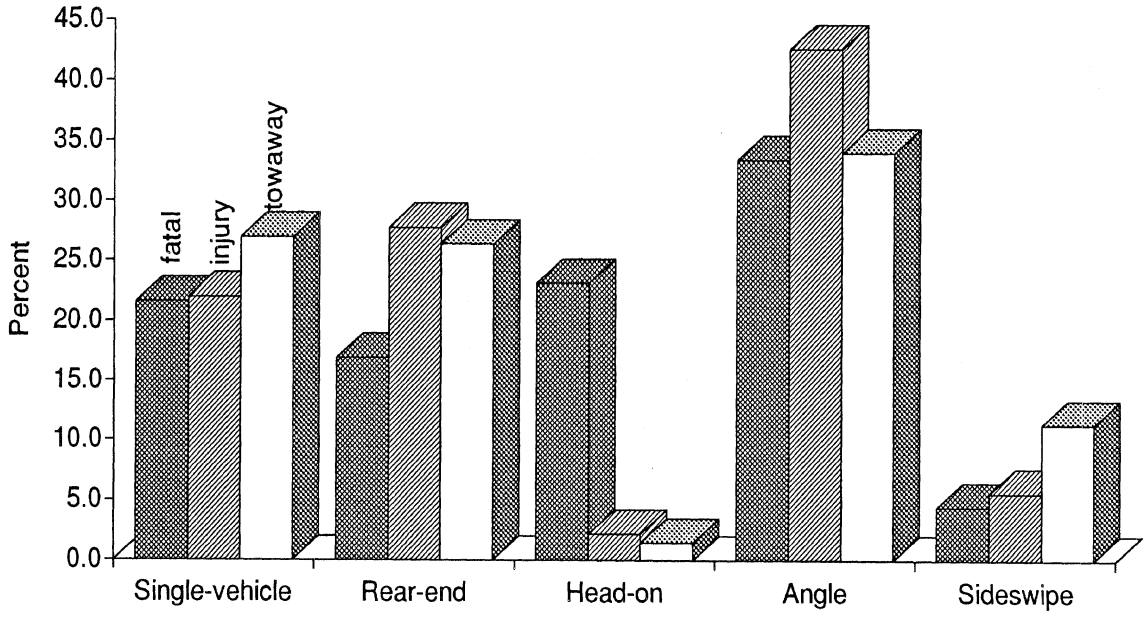
Table III-6 Manner of Collision by Crash Severity

Collision	Fatal		Injury		Towaway		All	
type	N	%	N	%	N	%	N	%
Single-vehicle	1,001	21.6	11,000	22.0	20,000	26.9	32,000	24.8
Rear-end	782	16.9	14,000	27.7	19,000	26.4	34,000	26.6
Head-on	1,071	23.1	1,000	2.2	1,000	1.4	3,000	2.5
Angle	1,544	33.3	22,000	42.6	25,000	33.9	48,000	37.4
Sideswipe	205	4.4	3,000	5.6	8,000	11.3	11,000	8.8
Other	0	0.0	*	*	*	*	*	*
Unknown	28	0.6	*	*	*	*	*	*
Total	4,631	100.0	51,000	100.0	73,000	100.0	129,000	100.0

* GES estimate less than 500 or less than 0.05

Sources: 1995 TIFA, 1995 GES

Figure III-7 Manner of Collision by Crash Severity



Sources: 1995 TIFA, 1995 GES

First harmful event and crash severity

First harmful event records the first property-damaging or injury-producing event. For all crash severities, the first harmful event was a collision with another vehicle in transport in over three-fourths of the involvements. Collisions with fixed and non-fixed objects occurred in 12.1% and 1.5% of involvements, respectively. Non-fixed objects include railroad trains, animals, and parked motor vehicles. Fixed objects include bridges, guardrails, impact attenuators, road signs, and other features of the roadway, as well as trees, ditches, embankments, and the like. Rollover occurred as the first harmful event in 5.4% of involvements and an "other noncollision" event was coded for 4.8%. Rollover includes any number of quarter-turns, including the vehicle simply turning onto its side. Noncollision events include a fire or explosion, immersion, gas inhalation, and falling from a vehicle.

Overall, the distribution of first harmful event is similar for each crash severity, with a notable exception. Very few towaway involvements are coded "pedestrian/bicyclist," since the pedestrian or bicyclist is typically injured, and very few would require a motor vehicle to be towed.

Table III-7 First Harmful Event by Crash Severity

	Fatal		Injury		Towaway		All	
First harmful event	N	%	N	%	N	%	N	%
Collision:								
Vehicle in transport	3,628	78.3	40,000	78.0	53,000	73.1	97,000	75.2
Pedestrian/bicyclist	361	7.8	1,000	1.5	*	*	1,000	0.9
Non-fixed object	101	2.2	1,000	1.6	1,000	1.5	2,000	1.5
Fixed object	313	6.8	5,000	9.7	10,000	14.1	16,000	12.1
Noncollision								
Rollover	177	3.8	3,000	6.4	4,000	4.9	7,000	5.4
Other noncollision	51	1.1	1,000	2.8	5,000	6.5	6,000	4.8
Total	4,631	100.0	51,000	100.0	73,000	100.0	129,000	100.0

* GES estimate less than 500 or less than 0.05

Sources: 1995 TIFA, 1995 GES

IV. Vehicles: Trucks

This section presents statistics on the types of trucks involved in traffic crashes. The focus is primarily on **single-unit** (no trailers), **one-trailer**, and **multitrailer** (more than one trailer) trucks. **Combination** trucks are also considered in one table, where they are defined as a truck-tractor or straight truck with any number of trailers.

Most of the tables and figures in this section are limited to fatal crashes because data about weights, lengths, cargo body type, and other details are available only for trucks involved in fatal crashes. Additional detail about trucks in nonfatal crashes will become available when the MCMIS crash file contains complete records for all reportable crashes.

Highlights of the *Vehicles* section for 1995:

- 129,000 trucks were involved in traffic crashes
- 38.4% of trucks in traffic crashes were single-unit and 60.7% pulled at least one trailer
- 4,631 trucks were involved in a crash in which a fatality occurred
- 63.8% of trucks in fatal crashes were operated in interstate commerce
- 11.8% of single-unit trucks in fatal crashes were operated by interstate for-hire carriers, while 59.8% of one-trailer trucks and 66.1% of multitrailer trucks were interstate for-hire
- 12.3% of trucks in fatal crashes rolled over, compared with 9.9% of trucks in injury crashes, and 7.9% in towaway crashes
- There were 183 trucks carrying hazardous materials involved in fatal crashes in 1995, down from 212 in 1994
- There were spills of hazardous materials from 44 of the 4,631 trucks involved in fatal crashes in 1995 (1.0%)

Vehicle totals

An estimated 129,000 trucks were involved in MCMIS crash file-reportable traffic crashes in the U.S. in 1995, compared with 4,698,000 passenger vehicles in traffic crashes with a comparable reporting threshold (table IV-1). Over 4,600 trucks were involved in a crash in which at least one fatality occurred, 51,000 where the most serious harm was a nonfatal injury transported from the scene for medical attention, and an additional 73,000 where at least one vehicle was towed.

The number of passenger vehicles involved in traffic crashes dwarfs the number of trucks, but truck crashes tend to be more serious. Fatal crashes accounted for 3.6% of all truck involvements, but only 1.0% of passenger vehicle crash involvements. There was one truck for every 36 passenger vehicles involved in a crash, but one truck for every 10 passenger vehicles involved in a fatal crashes. Differences in mass help explain this disparity. Trucks can weigh up to 80,000 pounds when loaded, and more with permits or in certain States. Trucks greatly outweigh most other vehicles in a crash, increasing the probability of a fatality.

Table IV-1 Trucks and Passenger Vehicles by Crash Severity

Crash	Truck		Passenger vehicle	
severity	N	%	N	%
Fatal	4,631	3.6	47,984	1.0
Injury	51,000	39.5	1,946,000	41.4
Towaway	73,000	56.6	2,704,000	57.6
Total	129,000	100.0	4,698,000	100.0

Sources: 1995 TIFA, 1995 GES, 1995 FARS

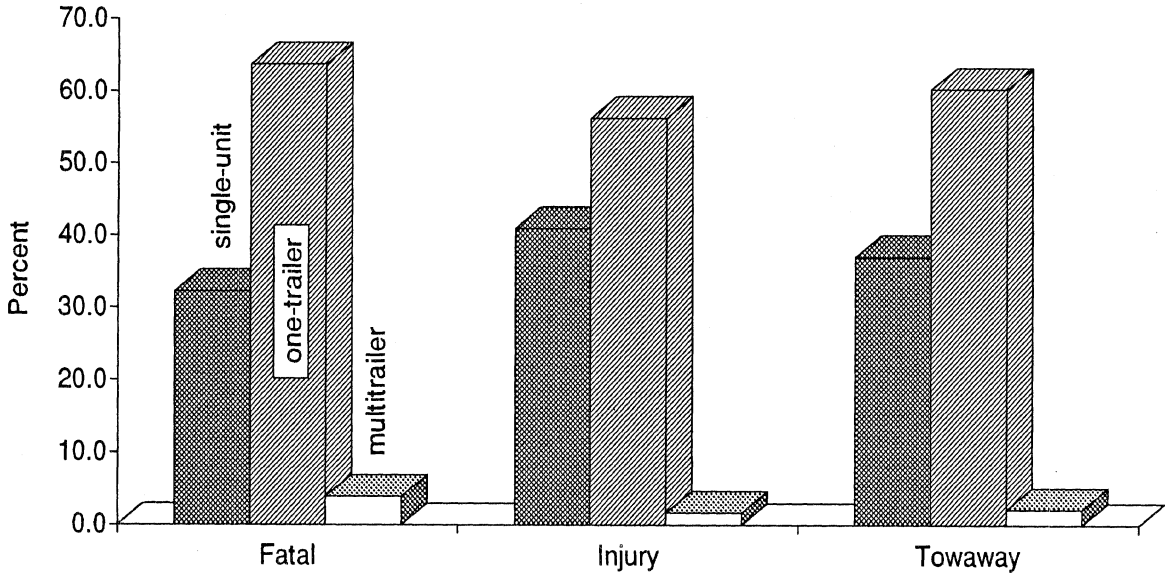
Table IV-2 shows the number of single-unit, one-trailer and multi-trailer trucks involved in a crash in 1995 by crash severity. Overall, 38.4% of the trucks involved in crashes were single-unit, 58.7% were trucks with a single trailer, and an additional 2.0% were pulling multiple trailers. These proportions are about the same for injury crashes and for towaway crashes. About 64% of trucks in fatal crashes were one-trailer trucks and 4.0% were multitrailer combinations. About 32% were single-unit trucks (figure IV-1). The overrepresentation of trucks with trailers in fatal crashes could be due to the areas in which trucks operate, since single-unit trucks often work in urban areas where travel speeds are lower, while combination trucks, typically a tractor pulling a semitrailer, travel more often in rural areas at higher speeds. Combination trucks have more fatal involvements on rural major arterial roads (see table III-5), where traffic speeds are generally high.

Table IV-2 Truck Configuration by Crash Severity

Crash	Single-Unit		One-Trailer		Multitrailer		Unknown		All	
severity	N	%	N	%	N	%	N	%	N	%
Fatal	1,495	32.3	2,950	63.7	183	4.0	3	0.1	4,631	100.0
Injury	21,000	41.0	29,000	56.2	1,000	1.7	1,000	1.1	51,000	100.0
Towaway	27,000	37.0	44,000	60.1	2,000	2.1	1,000	0.8	73,000	100.0
Total	49,000	38.4	76,000	58.7	3,000	2.0	1,000	0.9	129,000	100.0

Sources: 1995 TIFA, 1995 GES

Figure IV-1 Distribution of Truck Configuration by Crash Severity



Sources: 1995 TIFA, 1995 GES

Company type

Table IV-3 tabulates fatal truck involvements by company type for single-unit, one-trailer, and multitrailer combinations. The table is limited to fatal involvements because carrier information is available only for trucks involved in fatal crashes. Company type is categorized by whether the trucks operate in interstate commerce or only within a single State; within that classification, companies are classified as either private or for-hire. Government trucks are usually operated by a municipality or other local government. Daily rentals are typically operated by individuals for private use.

Almost 45% of all trucks in fatal crashes were operated by interstate for-hire carriers. With the addition of the 19.3% of trucks operated by interstate private carriers, 63.8% of trucks in fatal crashes were operated by interstate carriers. Most of the intrastate trucks were operated by private carriers; intrastate for-hire carriers account for only 8.8% of all truck fatal involvements. Private carriers accounted for 15.3% of the multitrailer trucks and 28.5% of the one-trailer trucks, but 63.0% of the single-unit trucks involved in fatal crashes.

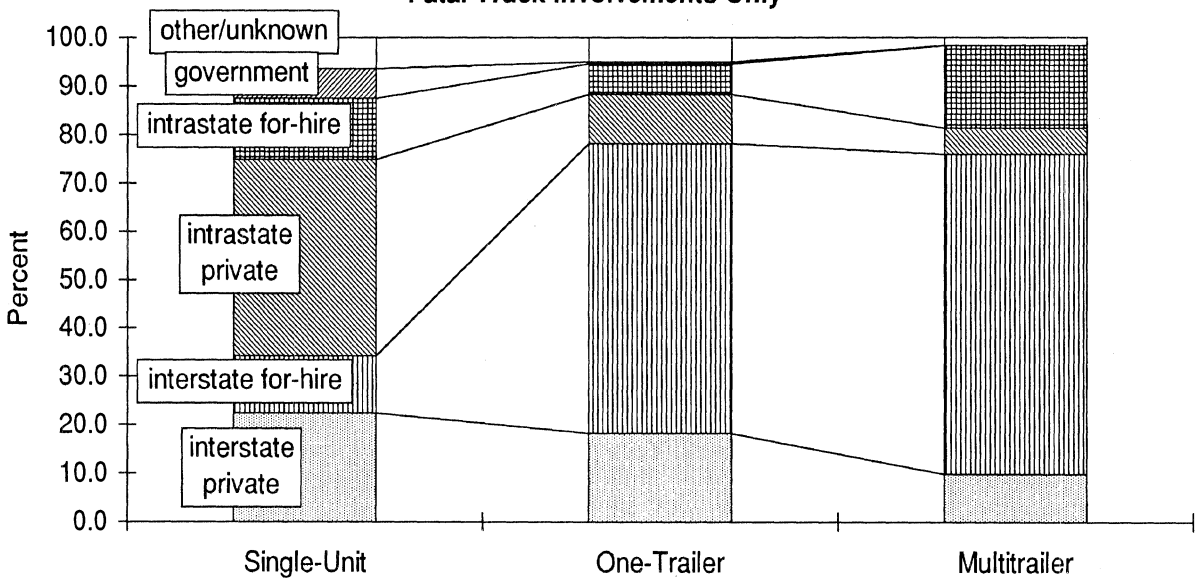
Table IV-3 Company Type by Truck Configuration
Fatal Truck Involvements Only

Company type	Single-Unit		One-Trailer		Multitrailer		Unknown		All	
	N	%	N	%	N	%	N	%	N	%
Interstate:										
Private	335	22.4	539	18.3	18	9.8	0	0.0	892	19.3
For-hire:	176	11.8	1,765	59.8	121	66.1	0	0.0	2,062	44.5
Intrastate:										
Private	607	40.6	301	10.2	10	5.5	0	0.0	918	19.8
For-hire	190	12.7	185	6.3	31	16.9	0	0.0	406	8.8
Government	91	6.1	11	0.4	0	0.0	0	0.0	102	2.2
Daily rental	36	2.4	11	0.4	0	0.0	0	0.0	47	1.0
Unknown	60	4.0	138	4.7	3	1.6	3	100.0	204	4.4
Total	1,495	100.0	2,950	100.0	183	100.0	3	100.0	4,631	100.0

Source: 1995 TIFA

Figure IV-2 illustrates the differences in the distribution of company type by truck configuration among trucks involved in fatal crashes in 1995. Single-unit trucks, which are mainly straight trucks, were predominantly operated by intrastate private carriers (e.g., farmers or construction firms). The second largest fraction of single-unit trucks was operated by interstate private carriers. Note also that almost all the government-owned trucks fell into the single-unit category. In contrast with single-unit trucks, one-trailer combinations (and even more so multitrailer combinations) involved in fatal crashes were predominantly operated by companies that haul freight for-hire across State lines. Almost 60% of one-trailer trucks in fatal crashes were interstate-for-hire; the proportion of interstate for-hire rose to 66.1% for multitrailer trucks. The proportion of intrastate for-hire trucks also was higher for multitrailer trucks than for one-trailer trucks, 16.9% to 6.3%. Some States permit certain longer combination vehicles (LCVs), which has led to the development of specialized hauling services that operate entirely within those States.

Figure IV-2 Distribution of Company Type by Truck Configuration
Fatal Truck Involvements Only

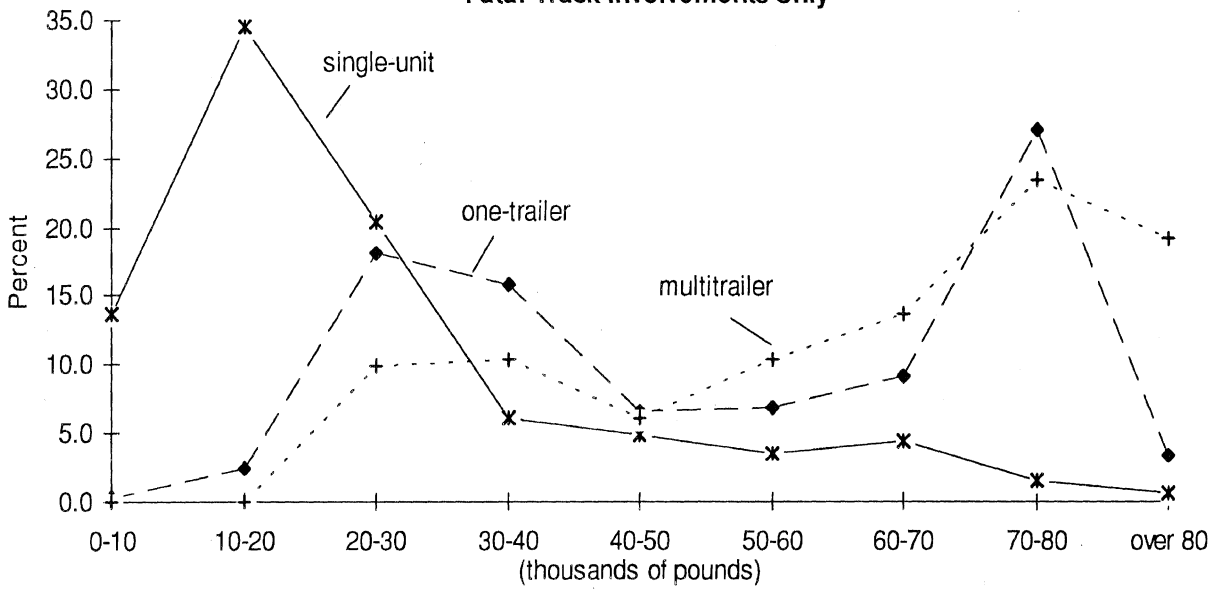


Source: 1995 TIFA

Weights and lengths

Figure IV-3 shows the distribution of the gross combination weight (GCW) of single-unit, one-trailer, and multitrailer trucks involved in fatal crashes in 1995. (The gross combination weight of a truck is the total weight of the vehicle and any cargo.) About 14% of single-unit trucks involved in a fatal crash weighed under 10,000 pounds. Many of these were empty—an empty single-unit truck meeting the MCMIS crash file reporting threshold (two axles, six tires, and equipped to carry cargo) can weigh as little as 6,000 pounds. The proportion of single-unit trucks rose to a peak at 10,000 to 20,000 pounds and then declined sharply to the 30,000-to-40,000 pound category. Almost half the single-unit trucks had GCWs less than 20,000 pounds. Only a small number of single-unit trucks in fatal crashes weighed over 50,000 pounds, though some were found with weights up to 80,000 pounds.

Figure IV-3 Gross Combination Weight by Truck Configuration
Fatal Truck Involvements Only

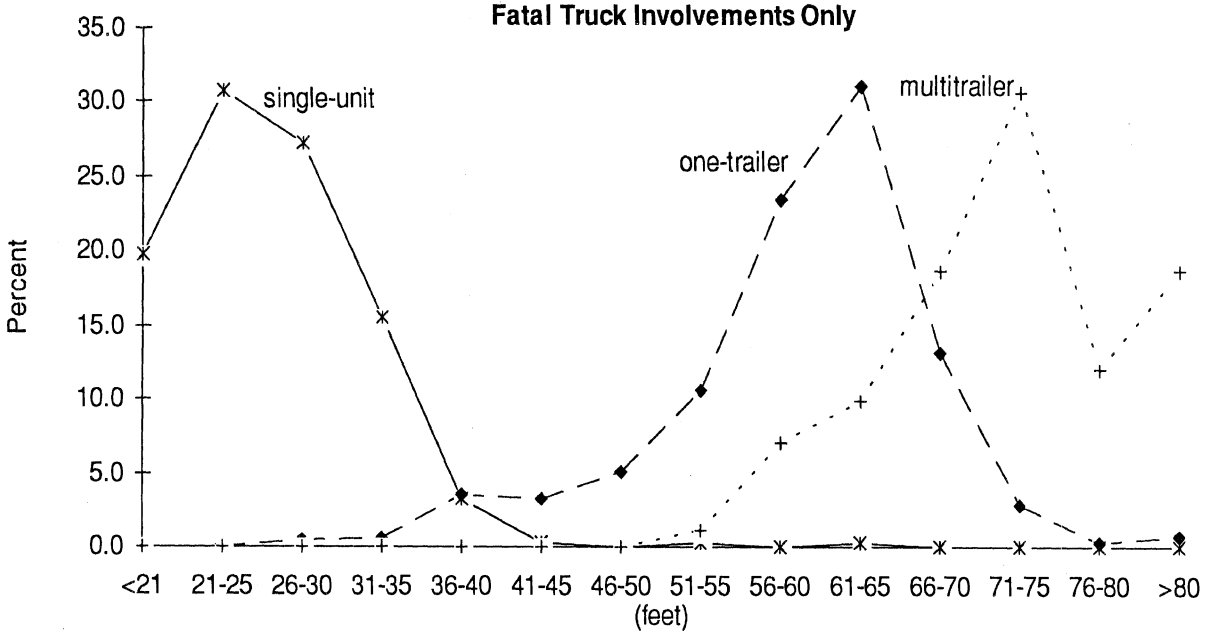


Source: 1995 TIFA

The distributions of GCW for one-trailer and multitrailer trucks involved in fatal crashes show that generally the trucks were either fully loaded or nearly empty at the time of the crash. The distribution for one-trailer trucks shows one peak in the 20,000 to 40,000 pound range; multitrailer trucks also show a peak at 20,000 to 40,000 pounds. Both distributions had a second peak at 70,000 to 80,000 pounds. The peaks at the lighter GCWs are near the empty or unloaded weight for each configuration. A typical empty weight for a tractor-semitrailer (the most common one-trailer combination) is 25,000 to 30,000 pounds. For a multitrailer combination, a typical empty weight is in the 30,000 to 35,000 pound range. Trucks in the second peak were at or near the legal GCW limit. Federal law caps GCW at 80,000 pounds, though greater weights are possible with special permits or other exemptions. Note that a much greater proportion of multitrailer combinations than one-trailer or single-unit trucks fell into the over-80,000 pound category.

Figure IV-4 shows the distribution of overall length for trucks involved in fatal crashes in 1995. Nearly all single-unit trucks in fatal crashes were shorter than 36 feet and most were shorter than the shortest one-trailer trucks. One-trailer combinations less than 46 feet long are primarily tractors pulling a short trailer. Most one-trailer combinations were in the 56 to 65 foot range, while 30.6% of multitrailer combinations were 71 to 75 feet long. Over 78% of one-trailer trucks in fatal crashes were between 51 and 70 feet long. Almost 77% of multitrailer trucks were between 61 and 85 feet long. The slight increase for the over-80 foot category in the multitrailer combinations reflects several cases of extreme overall lengths. These vehicles were either a triple trailer combination or some other type of longer combination vehicle (LCV). See Chapter VI, "Special Focus: Longer Combination Vehicles."

Figure IV-4 Overall Length by Truck Configuration
Fatal Truck Involvements Only



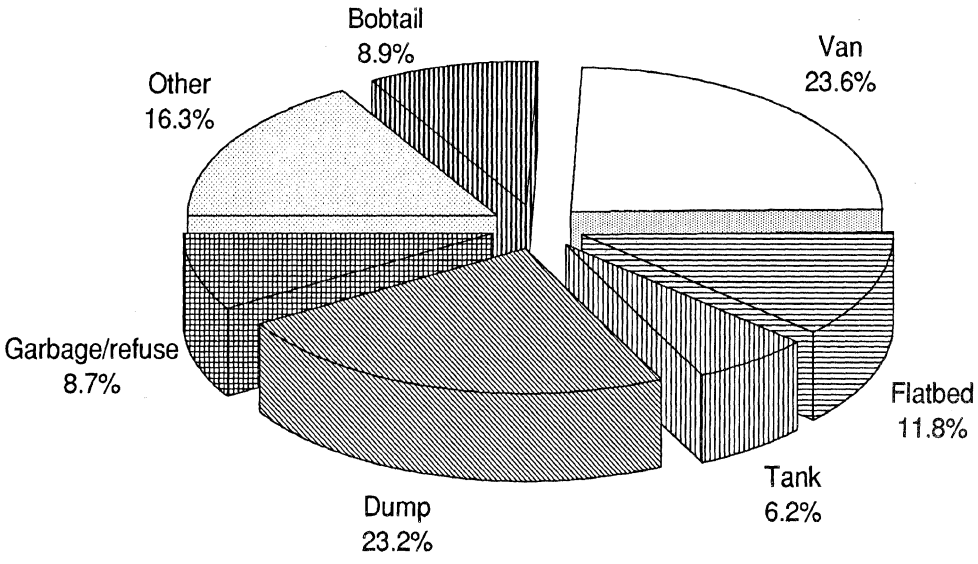
Source: 1995 TIFA

Cargo body and cargo

Figures IV-5, IV-6, and IV-7 show the distribution of cargo body type for single-unit, one-trailer, and multitrailer trucks, respectively, involved in fatal crashes in 1995. The distribution of cargo body styles was different for each truck type. Almost 10% of single-unit trucks (133 out of 1,495) were "bobtails," tractors without a trailer. The high proportion of bobtails among single-unit fatal involvements could be in part because bobtails are designed to be operated pulling a trailer, and handling properties change significantly without a trailer. Vans and dumps each accounted for about one quarter of the single-unit trucks. Almost 9% were refuse trucks, 6.2% were tanks, 11.8% were flatbeds, and 16.3% had some "other" cargo body style. The "other" cargo body type consisted primarily of specialized trucks, such as utility trucks or vehicles with cranes, booms, and similar equipment.

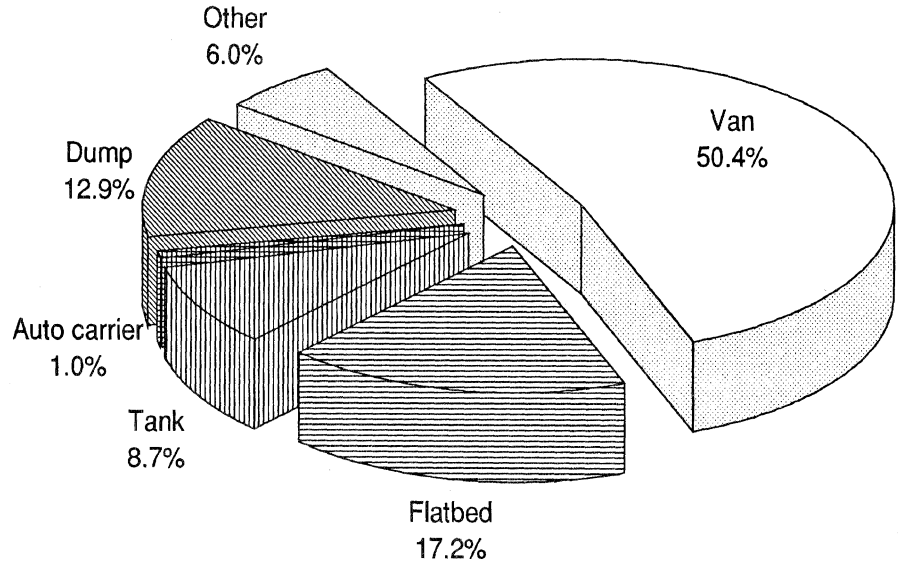
One- and multitrailer trucks had a higher proportion of van and flatbed bodies than did single-unit trucks. Vans accounted for 50.4% of one-trailer trucks and 49.7% of multitrailer trucks. Over 17% of one-trailer trucks were flatbeds, while 18.6% of multitrailer trucks were flatbeds. Though these are distributions of trucks in fatal crashes, they clearly reflect the typical usage of each truck type. One- and multitrailer trucks are most often employed to haul large quantities of general freight long distances. Single-unit trucks are used for a variety of tasks in urban and farming communities.

Figure IV-5 Cargo Body Type for Single-Unit Trucks
Fatal Truck Involvements Only



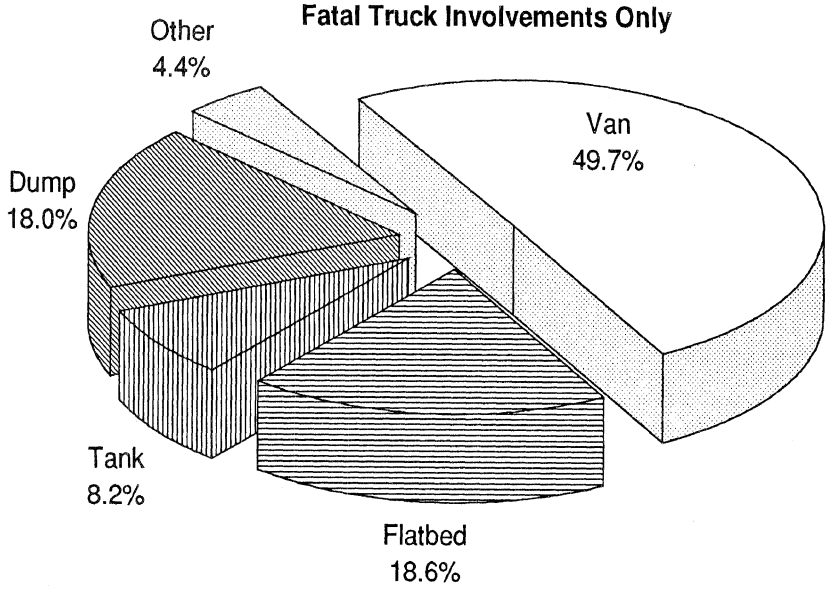
Source: 1995 TIFA

Figure IV-6 Cargo Body Type for One-Trailer Trucks
Fatal Truck Involvements Only



Source: 1995 TIFA

Figure IV-7 Cargo Body Type for Multitrailer Trucks
Fatal Truck Involvements Only



Source: 1995 TIFA

The most common cargo carried by single-unit trucks involved in a fatal crash was solids in bulk with 21.7% (table IV-4). This is consistent with their relatively high proportion of dump cargo bodies (figure IV-5). Single-unit trucks were empty 28.3% of the time and carried general freight in 12.1% of their fatal involvements. General freight was the most frequent cargo of one-trailer trucks involved in a fatal crash (23.8%), followed by solids in bulk (9.9%) and refrigerated food (8.4%). Multitrailer trucks carried general freight in 41.0% of their fatal involvements. Other common cargoes for multitrailer trucks were solids in bulk (15.8%), farm products (6.0%), and large objects (4.9%).

Table IV-4 Cargo Type by Truck Configuration
Fatal Truck Involvements Only

	Single-Unit		One-Trailer		Multitrailer		Unknown		All	
Cargo type	N	%	N	%	N	%	N	%	N	%
Empty	423	28.3	835	28.3	37	20.2	0	0.0	1,295	28.0
General freight	181	12.1	702	23.8	75	41.0	0	0.0	958	20.7
Household goods	18	1.2	23	0.8	0	0.0	0	0.0	41	0.9
Building materials	21	1.4	42	1.4	0	0.0	0	0.0	63	1.4
Metal	10	0.7	92	3.1	3	1.6	0	0.0	105	2.3
Heavy machinery	9	0.6	44	1.5	1	0.5	0	0.0	54	1.2
Large objects	23	1.5	59	2.0	9	4.9	0	0.0	91	2.0
Motor vehicles	5	0.3	15	0.5	1	0.5	0	0.0	21	0.5
Driveaway/towaway	24	1.6	0	0.0	0	0.0	0	0.0	24	0.5
Gases in bulk	10	0.7	16	0.5	0	0.0	0	0.0	26	0.6
Solids in bulk	324	21.7	292	9.9	29	15.8	0	0.0	645	13.9
Liquids in bulk	65	4.3	145	4.9	6	3.3	0	0.0	216	4.7
Explosives	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Lumber	26	1.7	141	4.8	3	1.6	0	0.0	170	3.7
Refrigerated food	68	4.5	249	8.4	2	1.1	0	0.0	319	6.9
Mobile home	0	0.0	20	0.7	0	0.0	0	0.0	20	0.4
Farm products	29	1.9	71	2.4	11	6.0	0	0.0	111	2.4
Live animals	1	0.1	28	0.9	0	0.0	0	0.0	29	0.6
Other	102	6.8	31	1.1	2	1.1	0	0.0	135	2.9
N/A (bobtail)	120	8.0	0	0.0	0	0.0	0	0.0	120	2.6
Unknown	36	2.4	145	4.9	4	2.2	3	100.0	188	4.1
Total	1,495	100.0	2,950	100.0	183	100.0	3	100.0	4,631	100.0

Source: 1995 TIFA

Jackknife, rollover, and fire

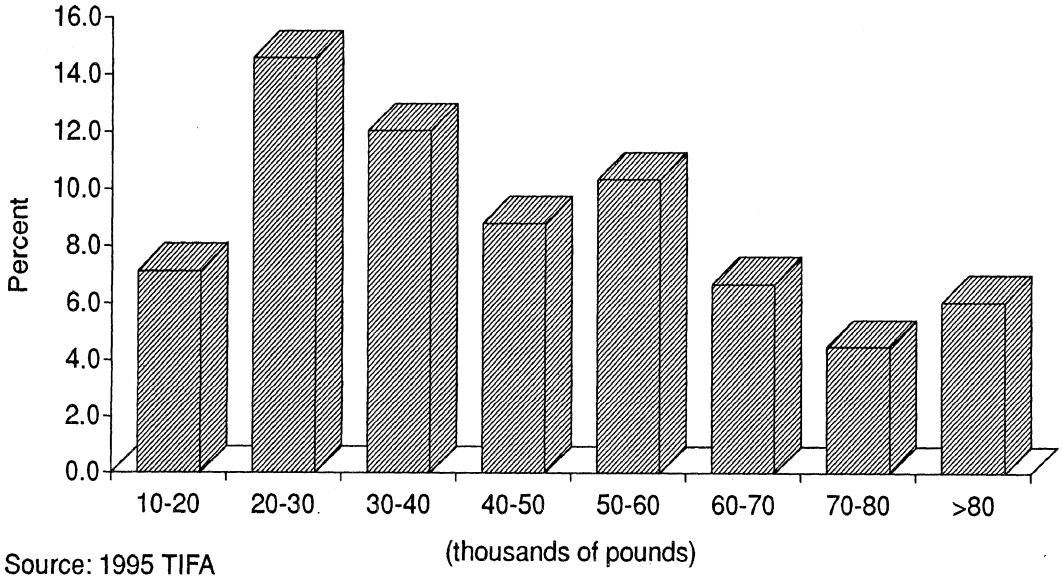
Jackknife occurs when a trailer yaws in an uncontrolled fashion with respect to the unit pulling it, often so far that the trailer and tractor make contact. Overall, jackknife occurred in an estimated 6.1% of all combination trucks involved in a crash (table IV-5). The proportion of jackknifed trucks differed by crash severity, but not as much as might be expected. About 8.7% of combination trucks in fatal crashes jackknifed, compared with 5.1% for injury crashes and 6.5% for towaways. Jackknife occurs most often when the brakes on the rear axles of a tractor "lock" during sudden braking. Brake lock is more likely if the trailer is unloaded or lightly loaded. Figure IV-8 illustrates that jackknife is related to GCW. Almost 15% of one-trailer trucks weighing 20-30,000 pounds jackknifed, compared with about 4.5% of one-trailer trucks weighing 70-80,000 pounds.

Table IV-5 Jackknife by Crash Severity (trucks with trailers only)

Jackknife	Fatal	Injury	Towaway	All
		(frequency)		
No	2,860	28,000	42,000	74,000
Yes	273	2,000	3,000	5,000
Total	3,133	30,000	45,000	78,000
		(row percentage)		
No	3.9	38.5	57.6	100.0
Yes	5.7	32.1	62.1	100.0
Total	4.0	38.1	57.9	100.0
		(column percentage)		
No	91.3	94.9	93.5	93.9
Yes	8.7	5.1	6.5	6.1
Total	100.0	100.0	100.0	100.0

Note: Jackknife is missing for 4 fatal involvements
Sources: 1995 TIFA, 1995 GES

Figure IV-8 Percentage of One-Trailer Trucks Jackknifing by Total Weight Fatal Truck Involvements Only



Source: 1995 TIFA

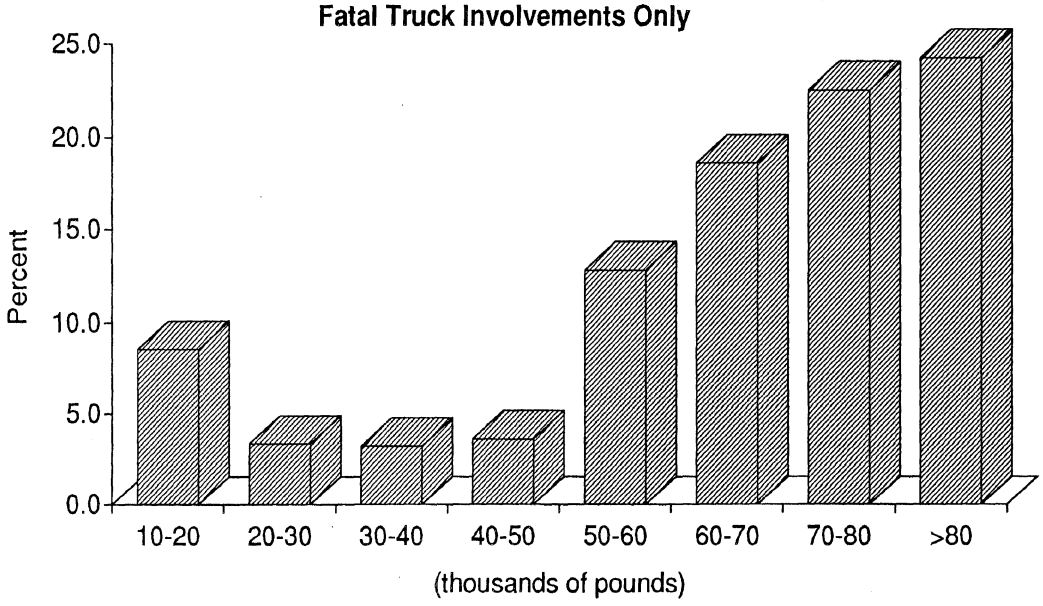
Rollover is associated with more serious crashes. Rollover occurred in 12.3% of fatal truck involvements (table IV-6). The proportion drops to 9.9% for injury crashes and 7.9% for towaways. Similarly, 5.0% of rollover involvements included a fatality, compared with only 3.5% of non-rollover involvements. Rollover is also related to GCW, though the relationship is the inverse of that in jackknife. Loaded vehicles tend to roll over more frequently than unloaded vehicles, because the center of gravity of a loaded vehicle is higher than when unloaded. Only 3.4% of one-trailer trucks weighing 20-30,000 pounds rolled over, compared with 24.2% of one-trailer trucks with a GCW of over 80,000 pounds (figure IV-9).

Table IV-6 Rollover by Crash Severity

Rollover	Fatal	Injury	Towaway	All
		(frequency)		
No	4,061	46,000	67,000	117,000
Yes	570	5,000	6,000	11,000
Total	4,631	51,000	73,000	129,000
		(row percentage)		
No	3.5	39.5	57.0	100.0
Yes	5.0	44.5	50.5	100.0
Total	3.6	40.0	56.4	100.0
		(column percentage)		
No	87.7	90.1	92.1	91.1
Yes	12.3	9.9	7.9	8.9
Total	100.0	100.0	100.0	100.0

Sources: 1995 TIFA, 1995 GES

Figure IV-9 Percentage of One-Trailer Trucks Rolling Over by Total Weight
Fatal Truck Involvements Only



Sources: 1995 TIFA

Considering crashes of all severities, the occurrence of a fire on the truck is a rare event (table IV-7). A crash-involved truck experienced a fire less than one percent of the time in 1995, although 4.5% of fatal involvements included a fire. Fire is associated with the more serious crashes. Of the trucks that experienced a fire, 39.5% were involved in fatal crashes and 14.8% in injury crashes. Of crash involvements with no fire, 3.5% were involved in a fatal crash and 40.1% in injury crashes.

Table IV-7 Truck Fire by Crash Severity

Fire	Fatal	Injury	Towaway	All
		(frequency)		
No	4,424	51,000	72,000	128,000
Yes	207	*	*	1,000
Total	4,631	51,000	73,000	129,000
		(row percentage)		
No	3.5	40.1	56.5	100.0
Yes	39.5	14.8	45.8	100.0
Total	3.6	40.0	56.4	100.0
		(column percentage)		
No	95.5	99.8	99.7	99.6
Yes	4.5	0.2	0.3	0.4
Total	100.0	100.0	100.0	100.0

* GES estimate < 500

Note: Fire is missing for 2 fatal involvements

Sources: 1995 TIFA, 1995 GES

Hazardous materials

Of the 4,631 trucks involved in a fatal crash in 1995, 183 (4.0%) were transporting hazardous commodities (table IV-8). Tanks were the most common cargo body type among these involvements, accounting for 73.2% (134) of the 183 trucks involved. Vans were the second-most common cargo body, with 34 vehicles. Hazardous commodities in vans are typically packaged goods, such as drums of paint or chemicals. In tanks, the most common hazardous material is gasoline.

Table IV-8 Trucks Transporting Hazardous Materials
Cargo Body Type by Truck Configuration
Fatal Truck Involvements Only

Cargo	Single-Unit		One-Trailer		Multitrailer		All	
body	N	%	N	%	N	%	N	%
Van	9	19.6	15	12.1	10	76.9	34	18.6
Flatbed	4	8.7	3	2.4	0	0.0	7	3.8
Tank	26	56.5	105	84.7	3	23.1	134	73.2
Dump	0	0.0	0	0.0	0	0.0	0	0.0
Other	7	15.2	1	0.8	0	0.0	8	4.4
Total	46	100.0	124	100.0	13	100.0	183	100.0

Source: 1995 TIFA

There was a total of 44 hazardous materials spills as a consequence of fatal truck crashes in 1995 (1.0% of all fatal truck involvements). Spillage of cargo was more likely from a multitrailer truck than from either a one-trailer or a single-unit truck, though there were only thirteen multitrailer trucks with hazardous cargo involved in a fatal crash. Four of thirteen multitrailer trucks transporting hazardous materials in a fatal crash spilled some of their cargo, compared with 32 of 124 one-trailer trucks and 8 of 46 single-unit trucks.

Table IV-9 Trucks Transporting Hazardous Materials
Cargo Spillage by Truck Configuration
Fatal Truck Involvements Only

Cargo	Single-Unit		One-Trailer		Multitrailer		All	
spillage	N	%	N	%	N	%	N	%
Yes	8	17.4	32	25.8	4	30.8	44	24.0
No	38	82.6	91	73.4	9	69.2	138	75.4
Unknown	0	0.0	1	0.8	0	0.0	1	0.5
Total	46	100.0	124	100.0	13	100.0	183	100.0

Source: 1995 TIFA

Gross vehicle weight rating

The GVWR (gross vehicle weight rating) applies only to the power unit. GVWR indicates the rated weight capacity of the axles of the truck or tractor. Classes 3 to 6 include vehicles rated between 10,001 pounds and 26,000 pounds; class 7 vehicles are rated between 26,001 and 33,000 pounds; and class 8 is over 33,000 pounds.

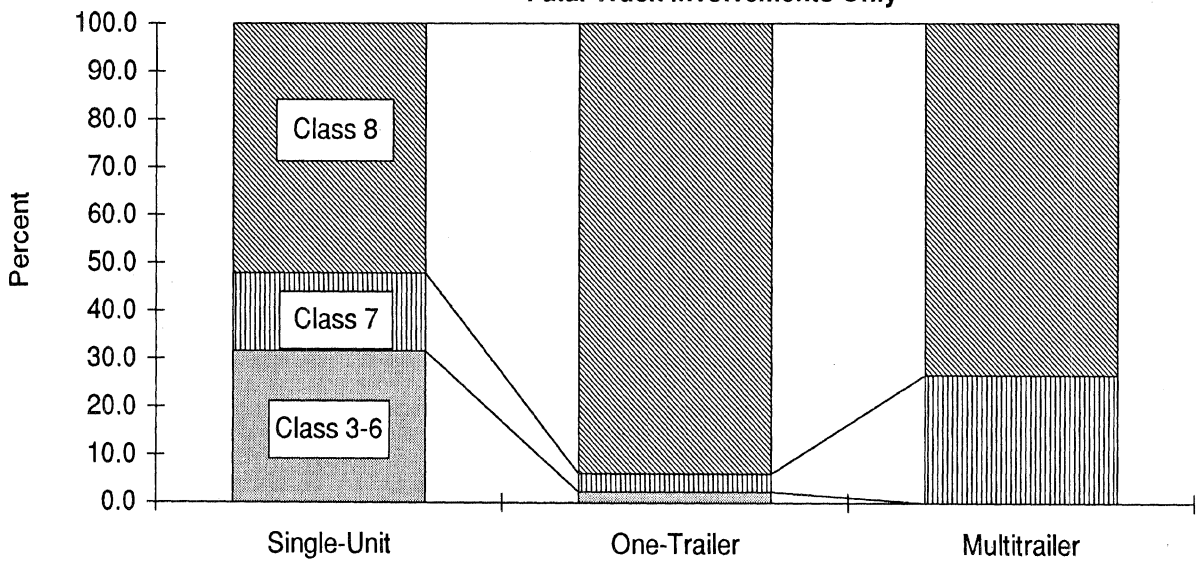
Almost three-fourths of the trucks involved in fatal crashes in 1995 were class 8 (table IV-10) and over 76% of these vehicles were pulling a single trailer. About 24% of the multitrailer combinations had class 7 power units (figure IV-10). The majority of these were doubles with two-axle tractors and two short trailers. Power units with a weight rating over 33,000 pounds (class 8) were the most common in all three truck configurations.

Table IV-10 Gross Vehicle Weight Rating by Truck Configuration
Fatal Involvements Only

	Single-Unit		One-Trailer		Multitrailer		Unknown		Total	
GVWR	N	%	N	%	N	%	N	%	N	%
Class 3-6	420	28.1	63	2.1	0	0.0	0	0.0	483	10.4
Class 7	219	14.6	108	3.7	44	24.0	0	0.0	371	8.0
Class 8	695	46.5	2,627	89.1	121	66.1	0	0.0	3,443	74.3
Unknown	161	10.8	152	5.2	18	9.8	3	100.0	334	7.2
Total	1,495	100.0	2,950	100.0	183	100.0	3	100.0	4,631	100.0

Source: 1995 TIFA

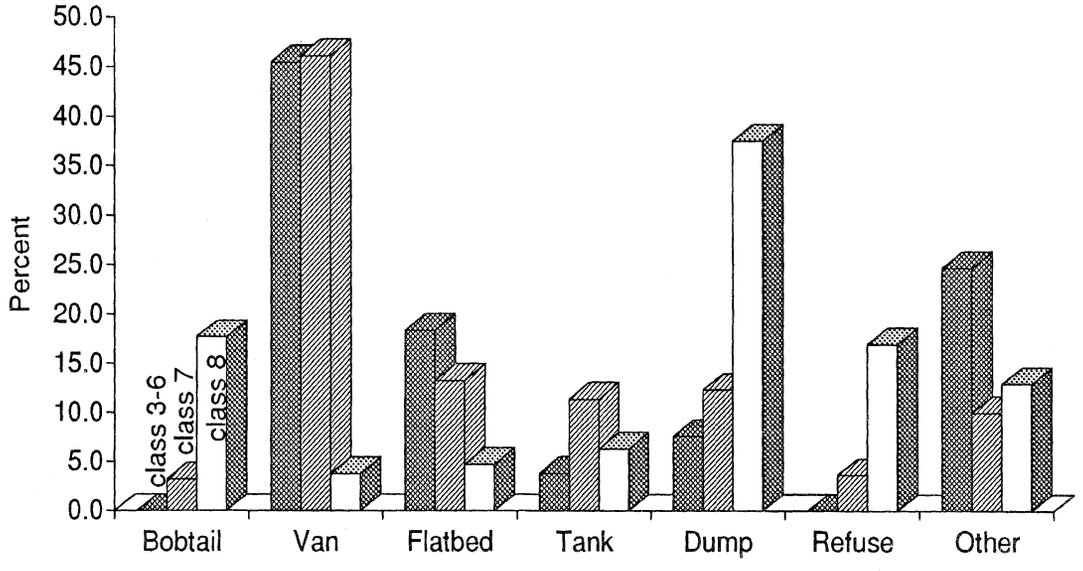
Figure IV-10 Distribution of GVWR by Truck Configuration
Fatal Truck Involvements Only



Source: 1995 TIFA

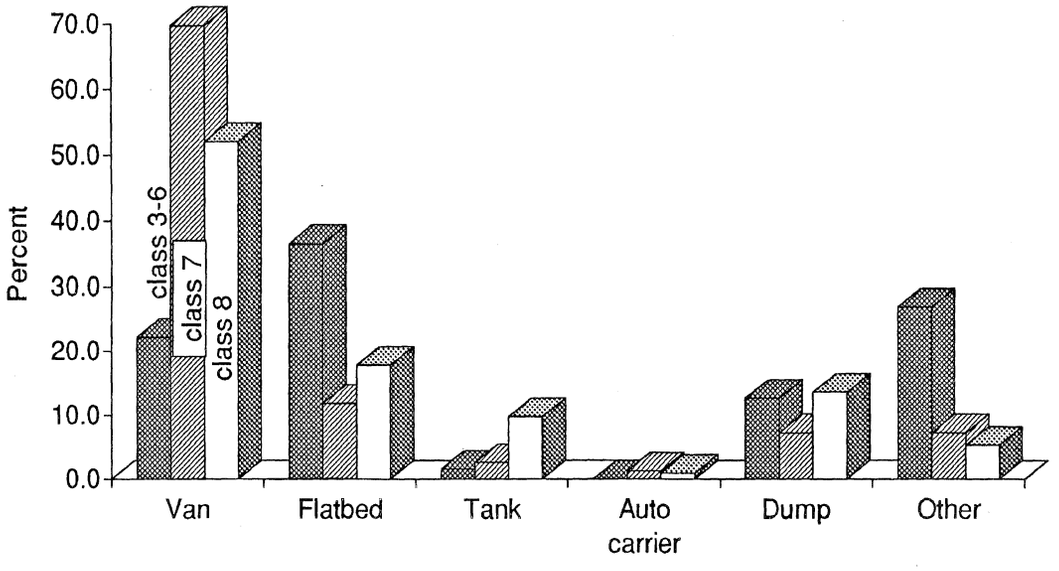
Figures IV-11 and IV-12 show cargo body by GVWR class for single-unit and combination trucks, respectively. Among single-unit trucks, van cargo bodies were the most common for class 3-6 and 7 vehicles with 45.5% and 46.1% respectively, while dumps accounted for 37.6% of class 8 single-unit trucks involved in fatal crashes in 1995. The 24.8% of "other" cargo bodies for class 3-6 trucks are primarily working bodies, like those on utility and other service trucks. The distribution is quite different for combination vehicles. Of class 3-6 trucks, 36.5% were flatbeds and 27.0% were "other" cargo bodies. These vehicles are mainly straight trucks pulling a trailer. Vans were the most common cargo bodies for class 7 and 8 combination trucks.

Figure IV-11 Single-Unit Trucks: Cargo Body Type by GVWR
Fatal Truck Involvements Only



Source: 1995 TIFA

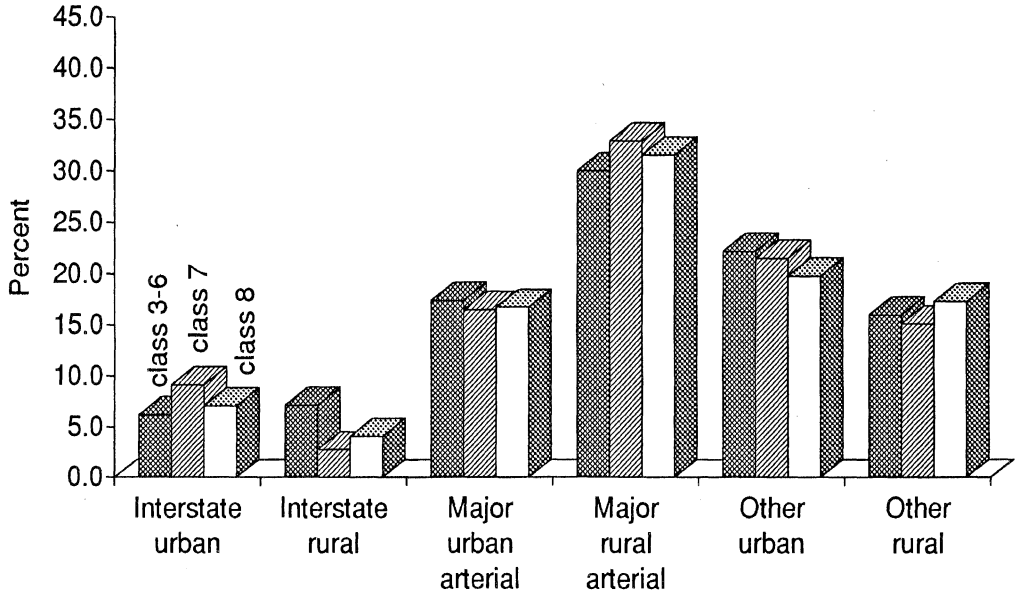
Figure IV-12 Combination Trucks: Cargo Body Type by GVWR
Fatal Truck Involvements Only



Source: 1995 TIFA

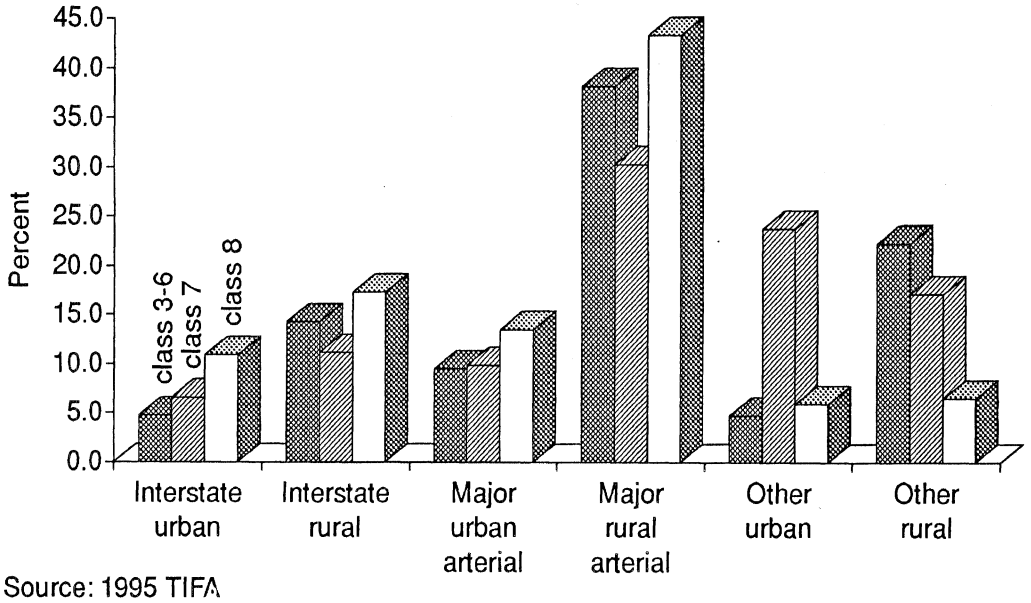
Figures IV-13 and IV-14 show road and area type of fatal crash involvements by GVWR for single-unit and combination trucks, respectively. Differences between GVWR classes across road and area type are not as striking as they were for cargo bodies, as displayed in the previous figures. Considering single-unit trucks, major arterials in rural areas were the most common sites for fatal involvements of all GVWR classes, followed by other urban and major urban. Major arterials in rural areas also were the most common areas for combination trucks of all classes.

Figure IV-13 Single-Unit Trucks: Road and Area Type by GVWR
Fatal Truck Involvements Only



Source: 1995 TIFA

Figure IV-14 Combination Trucks: Road and Area Type by GVWR
Fatal Truck Involvements Only



Source: 1995 TIFA

Table IV-11 shows fatal involvements by company type for GVWR class 3-6, class 7, and class 8. A greater proportion of class 3-6 and class 7 trucks was operated by private carriers, while over half of the class 8 trucks were operated by interstate for-hire companies. Class 8 was the most common truck weight class for all company types, except daily rentals.

Table IV-11 Company Type by Gross Vehicle Weight Rating
Fatal Truck Involvements Only

Company type	Class 3-6 N	Class 3-6 %	Class 7 N	Class 7 %	Class 8 N	Class 8 %	Unknown N	Unknown %	Total N	Total %
Interstate:										
Private	126	26.1	99	26.7	631	18.3	36	10.8	892	19.3
For-hire:	37	7.7	100	27.0	1,884	54.7	41	12.3	2,062	44.5
Intrastate:										
Private	236	48.9	114	30.7	489	14.2	79	23.7	918	19.8
For-hire	25	5.2	28	7.5	322	9.4	31	9.3	406	8.8
Government	8	1.7	20	5.4	64	1.9	10	3.0	102	2.2
Daily rental	37	7.7	5	1.3	4	0.1	1	0.3	47	1.0
Unknown	14	2.9	5	1.3	49	1.4	136	40.7	204	4.4
Total	483	100.0	371	100.0	3,443	100.0	334	100.0	4,631	100.0

Source: 1995 TIFA

Table IV-12 shows the number of fatalities in crashes by GVWR class. The total in this table is the actual number of truck crash fatalities rather than the sum of the column. (If a fatal crash involved both class 7 and class 8 trucks, for example, the number killed in that crash would be counted for both class 7 and class 8 trucks in the table below, but only counted once for the total of all truck crashes.) None of the weight classes was overrepresented when compared with the number of vehicles in each class that were involved in fatal crashes in 1995. Class 8 trucks comprised 74.3% of the involvements (Table IV-10) and 72.2% of the fatalities; the differences between the other two weight classes were similar.

Table IV-12
Gross Vehicle Weight Rating
by Number of Fatalities

GVWR	N	%
Class 3-6	656	12.9
Class 7	479	9.4
Class 8	3,674	72.2
Unknown	416	8.2
Total	5,091	100.0

Source: 1995 TIFA

V. Drivers: Trucks

This section presents statistics on the drivers of trucks involved in traffic crashes in the United States in 1995. Highlights of this section:

- 127,000 truck drivers were involved in traffic crashes in 1995
- 571 truck drivers died in traffic crashes
- While all crash-involved truck drivers had a lower probability of nonfatal injury than all crash-involved passenger vehicle drivers (whether involved in a collision with a truck or not), the probability of fatal injury was the about same for each: 0.4% for truck drivers and 0.5% for passenger vehicle drivers
- 0.6% of truck drivers involved in all crashes had been using alcohol, compared with 5.7% of crash-involved passenger vehicle drivers
- 12.2% of the drivers of single-unit trucks in crashes were under 25 years old, compared with 6.3% of one-trailer truck drivers and 4.3% of multitrailer truck drivers
- The probability of injury to the truck driver was significantly higher in head-on and single-vehicle crashes than in other collision types
- Rollover and ejection are both strongly associated with fatal and other serious injuries

Note: The estimated number of drivers involved in traffic crashes is lower than the estimated number of trucks because some trucks were driverless at the time of the crash. This can occur when the truck is stopped on or partially on the road, e.g., due to mechanical problems or for some other reason, and the driver is away from the truck.

Driver injury

Of the 127,000 truck drivers involved in traffic crashes in 1995, an estimated 10,000 received C injuries, 8,000 sustained B injuries, 3,000 suffered A injuries, and 571 were killed (table V-1). A injuries are incapacitating, though not fatal; B injuries are evident (e.g., a laceration), but not incapacitating; C injuries involve a complaint of pain but are not evident to observers at the scene of the crash. (See *injury severity* in the Glossary for an explanation of injury severity classifications.)

Truck drivers involved in traffic crashes were less likely to be injured than passenger vehicle drivers. (Passenger vehicles include not only automobiles but also minivans and light trucks such as pickups which are used increasingly for personal transportation.) Overall, 82.3% of the truck drivers were not injured, while 64.7% of passenger vehicle drivers involved in traffic crashes were uninjured. Higher proportions of passenger vehicle drivers sustained injury for each injury severity level. Note, however, that the proportion suffering fatal injuries was about the same for both passenger vehicle and truck drivers. Given involvement in a traffic crash, 0.4% of truck drivers and 0.5% of passenger vehicle drivers were killed. (The passenger vehicle traffic crashes reported in the table include all traffic crashes that conform to the MCMIS crash file reporting threshold [fatality, injury transported for treatment, or at least one vehicle towed due to damage], not just truck/car collisions.)

Table V-1 Driver Injury Severity for Trucks and Passenger Vehicles

Injury severity	Truck drivers: truck accidents N	%	Passenger vehicle drivers: all accidents N	%
Fatal	571	0.4	21,000	0.5
A injury	3,000	2.6	238,000	5.1
B injury	8,000	6.0	461,000	9.9
C injury	10,000	8.0	899,000	19.2
No injury	105,000	82.3	3,028,000	64.7
Severity unknown	1,000	0.5	29,000	0.6
Died prior	*	*	*	*
Unknown	*	*	*	*
Total	127,000	100.0	4,677,000	100.0

* GES estimate less than 500 or less than 0.05%

Sources: 1995 TIFA, 1995 GES

A total of 5,091 people were killed in truck crashes in 1995 (table V-2). A large majority of the fatalities, 3,981 (78.2%), occurred in the other, non-truck vehicles involved, primarily passenger vehicles. Six hundred and seventy-one (13.2%) were truck occupants, either the driver (571) or a passenger (100). Non-motorists accounted for the remaining 439 fatalities, 8.6% of the total. Most of the non-motorists were pedestrians and 89 were bicylists.

The overrepresentation of passenger vehicle and other non-truck occupants among the fatalities is largely due to differences in mass and vehicle design. Trucks have much greater mass than almost all other motor vehicles. Accordingly, in a collision with a truck, a smaller vehicle experiences a much larger change in velocity and therefore much more damage.

Table V-2 Road User Type of Fatalities in Truck Crashes

	N	%
Trucks:		
Driver	571	11.2
Passenger	100	2.0
Truck total	671	13.2
Non-trucks		
Drivers	2,851	56.0
Passengers	1,130	22.2
Non-truck total	3,981	78.2
Non-motorists		
In parked vehicle	11	0.2
Pedestrian	339	6.7
Bicyclist	79	1.6
Other/unknown	10	0.2
Non-motorist total	439	8.6
Total	5,091	100.0

Source: 1995 TIFA, 1995 FARS

Driver age and sex

Over 97% of truck drivers involved in traffic crashes were male (table V-3). Over 97% of all drivers of one-trailer trucks were males. Females drove 3.2% of the single-unit trucks involved in traffic crashes, 2.5% of one-trailer trucks, and 1.6% of multitrailer trucks. Among crash-involved passenger vehicle drivers, 59.3% are male and 40.7% are female.

Table V-3 Driver Sex by Configuration Type

	Single-Unit		One-Trailer		Multitrailer		Unknown		Total	
Driver sex	N	%	N	%	N	%	N	%	N	%
Male	47,000	96.8	73,000	97.4	3,000	98.4	1,000	98.4	124,000	97.2
Female	2,000	3.2	2,000	2.5	*	1.6	*	1.4	3,000	2.7
Total	49,000	100.0	75,000	100.0	3,000	100.0	1,000	100.0	127,000	100.0

* GES estimate less than 500

Note: Total includes fewer than 500 with unknown sex.

Sources: 1995 TIFA, 1995 GES

Table V-4 shows the distribution of driver age for different truck combinations in traffic crashes. The distributions for one-trailer and multitrailer trucks indicate that in 1995 drivers of crash-involved multitrailer combinations tended to be older (see figure V-1). For all configurations, almost 90% of the drivers were between 25 and 64 years of age. An estimated 6.3% of one-trailer truck drivers were under 25 and only 4.3% of multitrailer truck drivers were under 25. An estimated 12.2% of single-unit drivers were under 25. Crash-involved passenger vehicle drivers were typically younger than truck drivers. About 31% were under 25, 43.3% were 25 to 44, and 17.7% were between 45 and 64. However, 7.7% of crash-involved passenger vehicle drivers were over 65.

Table V-4 Driver Age by Configuration Type

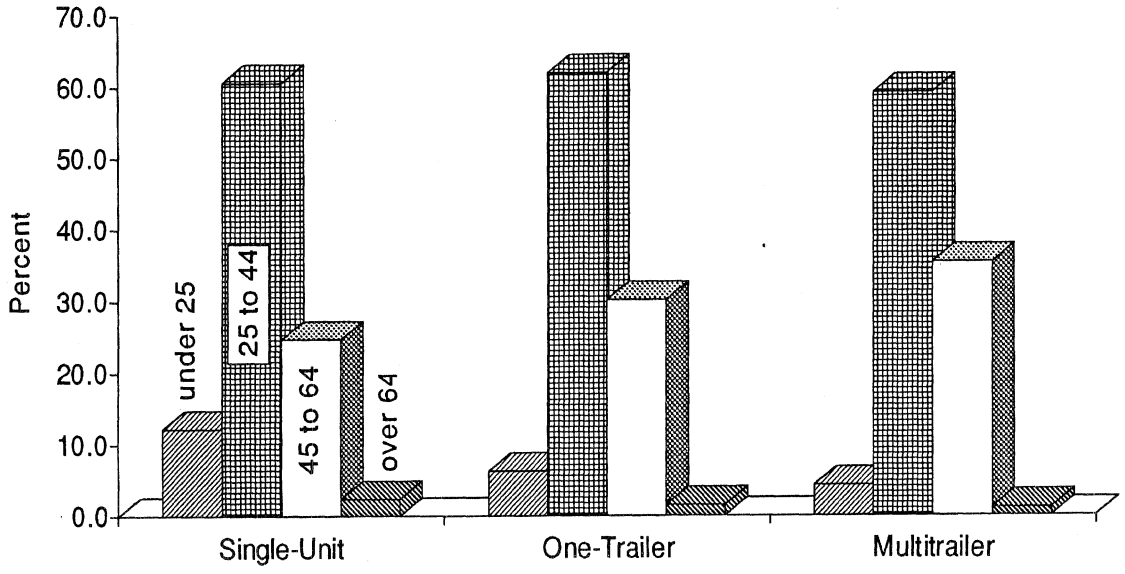
	Single-Unit		One-Trailer		Multitrailer		Unknown		Total	
Driver age	N	%	N	%	N	%	N	%	N	%
under 25	6,000	12.2	5,000	6.3	*	4.3	*	23.4	11,000	8.6
25 to 44	29,000	60.6	47,000	61.9	2,000	59.1	1,000	61.3	78,000	61.4
45 to 64	12,000	24.7	23,000	30.2	1,000	35.4	*	13.9	36,000	28.1
over 64	1,000	2.5	1,000	1.5	*	1.2	*	1.2	2,000	1.9
Total	49,000	100.0	75,000	100.0	3,000	100.0	1,000	100.0	127,000	100.0

* GES estimate less than 500

Note: Total includes fewer than 500 with unknown age.

Sources: 1995 TIFA, 1995 GES

Figure V-1 Driver Age by Configuration Type



Sources: 1995 TIFA, 1995 GES

Configuration type

Table V-5 shows the distribution of driver injuries by configuration type for drivers involved in traffic crashes in 1995. Overall, the distributions are similar, with about 80% of the drivers uninjured in each configuration type. The proportion of multitrailer drivers fatally injured is higher than the other two configurations, though the number of multitrailer drivers who were killed is much smaller than for the other two. In 1995, 365 drivers of one-trailer trucks were killed in traffic crashes, compared with 175 single-unit drivers, and 30 multitrailer drivers.

Table V-5 Driver Injury Severity by Configuration Type

Injury	Single-Unit		One-Trailer		Multitrailer		Unknown		Total	
severity	N	%	N	%	N	%	N	%	N	%
Fatal	175	0.4	365	0.5	30	1.2	1	0.1	571	0.4
A injury	1,000	1.6	2,000	3.3	*	2.8	*	2.0	3,000	2.6
B injury	3,000	6.8	4,000	5.6	*	5.0	*	1.2	8,000	6.0
C injury	5,000	9.4	5,000	7.0	*	12.3	*	10.4	10,000	8.0
None	39,000	80.9	63,000	83.3	2,000	78.8	1,000	86.1	105,000	82.3
Total	49,000	100.0	75,000	100.0	3,000	100.0	1,000	100.0	127,000	100.0

* GES estimate less than 500

Note: Total includes fewer than 500 with unknown injury severity.

Sources: 1995 TIFA, 1995 GES

Alcohol use

Table V-6 shows alcohol use as reported by the police for drivers of trucks involved in traffic crashes in 1995. Overall, police-reported alcohol use was low for truck drivers, at 0.6%. The rates are low for all configurations.

Reported alcohol use for drivers of passenger vehicles was significantly higher than for truck drivers (table V-7). Alcohol use was reported for 5.7% of passenger vehicle drivers involved in a crash, a proportion that is much higher than for truck drivers. One difference between truck and passenger vehicle drivers is that trucks are typically used for work and business purposes, while passenger vehicles are used more often for recreation, where alcohol consumption is more likely.

The reader is cautioned that the rates reported here are for alcohol use as recorded by the reporting police officer. Many researchers believe that actual rates of alcohol use are higher. However, even if true alcohol use rates are higher, the ratio between truck and passenger vehicle driver use rates would likely remain roughly the same.

Table V-6 Driver Alcohol Use by Configuration Type

Alcohol use	Single-Unit		One-Trailer		Multitrailer		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%
No	48,000	98.6	74,000	98.4	3,000	97.4	1,000	99.8	125,000	98.5
Yes	*	0.7	*	0.5	*	0.7	*	*	1,000	0.6
Not reported	*	0.5	1,000	0.7	*	1.3	*	0.1	1,000	0.6
Total	49,000	100.0	75,000	100.0	3,000	100.0	1,000	100.0	127,000	100.0

* GES estimate less than 500

Note: Total includes fewer than 500 drivers with unknown alcohol use.

Sources: 1995 TIFA, 1995 GES

Table V-7 Driver Alcohol Use for Passenger Vehicles

Alcohol use	Passenger vehicle	
	N	%
No	4,405,000	94.3
Yes	268,000	5.7
Total	4,673,000	100.0

Source: 1995 GES

Manner of collision and first harmful event

Table V-8 and figure V-2 show the distribution of driver injury severity for different collision types. (The figure omits the "no injury" category to better show detail among injury types.) Rear-end, angle, and sideswipe collisions were the least likely to result in injury to truck drivers. For each of those collision types, about 90% of involved truck drivers escaped with no injury at all. Head-on collisions and single-vehicle crashes, in contrast, produced much higher rates of driver injury. Single-vehicle crashes were clearly the most serious crash type for truck drivers. Three hundred and ninety drivers were killed in single-vehicle truck crashes, accounting for 68% of the 571 truck drivers killed in traffic crashes 1995. An additional estimated 2,000 drivers received A injuries and 4,000 received B injuries in single-vehicle crashes.

Table V-8 Driver Injury Severity by Manner of Collision

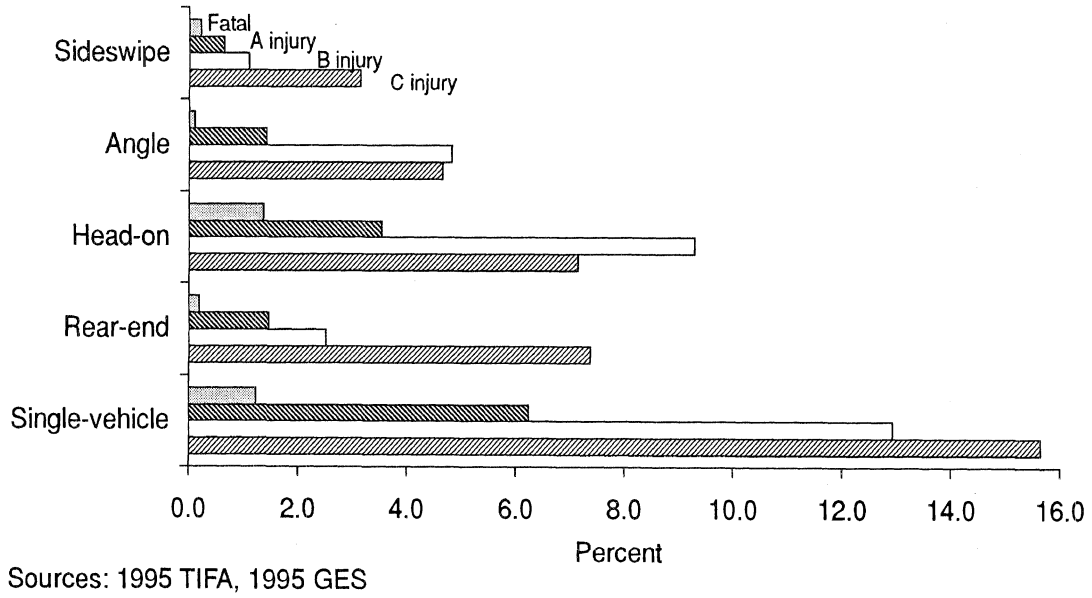
Injury severity	Noncollision Single-vehicle N	%	Collision Rear-end N	%	Head-on N	%	Angle N	%	Sideswipe N	%	Other/unknown N	%	Total N	%
Fatal	390	1.2	64	0.2	44	1.4	48	0.1	24	0.2	1	3.2	571	0.4
A injury	2,000	6.2	*	1.5	*	3.5	1,000	1.4	*	0.6	*	6.4	3,000	2.6
B injury	4,000	12.9	1,000	2.5	*	9.3	2,000	4.8	*	1.1	*	12.8	8,000	6.0
C injury	5,000	15.6	2,000	7.4	*	7.2	2,000	4.6	*	3.1	*	3.2	10,000	8.0
No injury	20,000	62.8	29,000	88.0	3,000	78.7	42,000	88.7	11,000	94.9	*	74.4	105,000	82.3
Total	32,000	100.0	33,000	100.0	3,000	100.0	48,000	100.0	11,000	100.0	*	100.0	127,000	100.0

* GES estimate less than 500

Note: Total includes fewer than 500 drivers with unknown injury severity.

Sources: 1995 TIFA, 1995 GES

Figure V-2 Driver Injury by Manner of Collision



Sources: 1995 TIFA, 1995 GES

Table V-9 and figure V-3 show the distribution of driver injury by the first harmful event in the traffic crash. (The figure omits the "no injury" category to better show detail among injury types. Percentages sum to 100 for each first harmful event.) A large majority of driver fatalities and serious injuries were associated with rollover, collisions with fixed objects, and collisions with other motor vehicles. Where the collision was with another motor vehicle, table V-8 showed that most serious driver injuries occurred in head-on, angle, and rearend collisions. Rollover and collisions with fixed and non-fixed objects, which are frequently single-vehicle crashes, were the most serious first harmful events in terms of the proportion of drivers injured or killed. Where the first harmful event was rollover, 17.1% of drivers were either killed or received A injuries. Only about 42% of such drivers were uninjured, compared with 82.3% uninjured among all crash-involved truck drivers in 1995. Where the first harmful event was a collision with a fixed object, such as a guardrail or utility pole, 5.6% received fatal or A injuries.

Table V-9 Driver Injury by First Harmful Event

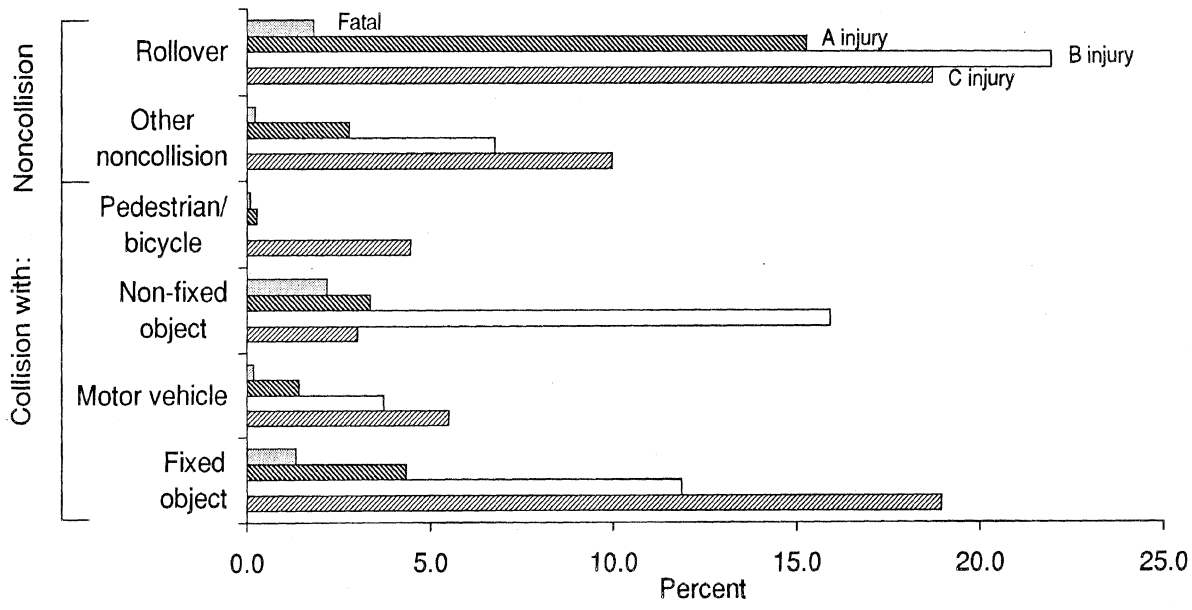
Injury	Noncollision				Collision with:								Total	
	Rollover		Other		Motor vehicle		Pedestrian/bike		Non-fixed object		Fixed object			
severity	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Fatal	127	1.8	13	0.2	181	0.2	1	0.1	43	2.2	206	1.3	571	0.4
A injury	1,000	15.3	*	2.8	1,000	1.4	*	0.3	*	3.4	1,000	4.3	3,000	2.6
B injury	2,000	21.9	*	6.8	4,000	3.7	*	*	*	15.9	2,000	11.9	8,000	6.0
C injury	1,000	18.7	1,000	10.0	5,000	5.5	*	4.4	*	3.0	3,000	19.0	10,000	8.0
No injury	3,000	42.3	5,000	80.3	85,000	88.8	1,000	95.0	1,000	61.6	10,000	62.9	105,000	82.3
Total	7,000	100.0	6,000	100.0	95,000	100.0	1,000	100.0	2,000	100.0	15,000	100.0	127,000	100.0

* GES estimate less than 500

Note: Total includes fewer than 500 drivers with unknown injury severity.

Sources: 1995 TIFA, 1995 GES

Figure V-3 Driver Injury by First Harmful Event



Sources: 1995 TIFA, 1995 GES

Restraint use

Table V-10 shows restraint use by driver injury. The top section of the table tabulates estimated frequencies, the middle section shows the distribution of restraint use for each injury severity, and the bottom section reports the injury distribution for each restraint use. Almost 61% (348 of 571) of truck drivers killed in traffic crashes used no restraints, while only 21.0% were belted. In contrast, 46.9% of drivers who sustained no injuries used 3-point safety belts, and an additional 29.0% used either a lap belt alone or a shoulder belt alone, for a total of 75.9% using some sort of safety belt. Similarly, 67.9% of truck drivers sustaining only C injuries used some sort of safety belt restraint. The reader is cautioned, however, that safety belt use for all but the most seriously injured is primarily self-reported, since the occupants are typically out of the vehicles by the time the police arrive. Consequently, the amount of safety belt use by the uninjured and lightly injured may be exaggerated. Note also the high proportion of cases, 14.6% overall, for which restraint use is unknown.

Table V-10 Driver Injury Severity by Restraint Use

Injury severity	None	3-point belt	Other	Unknown	Total
		(frequencies)			
Fatal	348	79	41	103	571
A injury	1,000	1,000	1,000	0	3,000
B injury	2,000	3,000	2,000	*	8,000
C injury	2,000	4,000	3,000	1,000	10,000
None	9,000	49,000	30,000	16,000	105,000
Total	15,000	58,000	36,000	19,000	127,000
		(row percentages)			
Fatal	60.9	13.8	7.2	18.0	100.0
A injury	29.0	39.6	25.5	6.0	100.0
B injury	28.7	43.0	22.2	6.1	100.0
C injury	23.0	36.6	31.3	9.0	100.0
None	8.4	46.9	29.0	15.6	100.0
Total	11.7	45.2	28.5	14.6	100.0
		(column percentages)			
Fatal	2.3	0.1	0.1	0.6	0.4
A injury	6.5	2.3	2.3	1.1	2.6
B injury	14.8	5.7	4.7	2.5	6.0
C injury	15.9	6.5	8.8	5.0	8.0
None	59.6	85.3	84.0	88.0	82.3
Total	100.0	100.0	100.0	100.0	100.0

* GES estimate less than 500

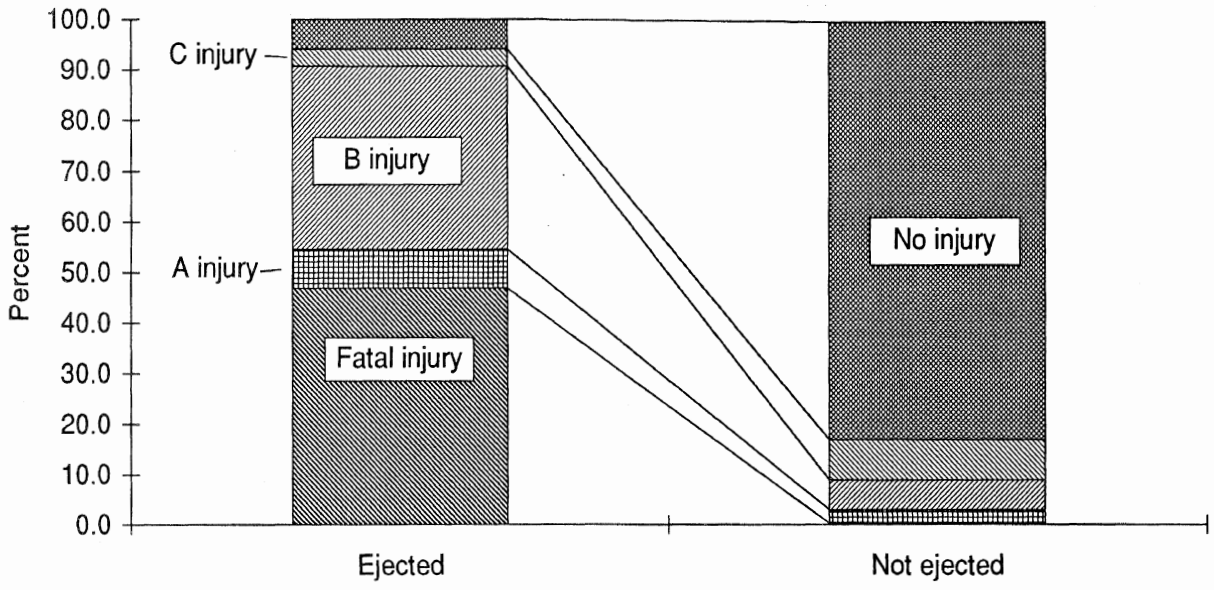
Note: Total includes fewer than 500 drivers with unknown injury severity.

Sources: 1995 TIFA, 1995 GES

Ejection and rollover

Ejection is strongly associated with serious driver injuries. There were fewer than an estimated 500 ejections of truck drivers in traffic crashes in 1995. Nevertheless, the probability of serious injury is high when ejection occurs. Figure V-4 shows the injury distribution for ejection and no ejection. Only 5.9% of ejected drivers were uninjured, almost 47% were killed, and an additional 43.8% sustained A or B injuries. Among drivers who stayed in the cab, only 0.3% were killed and 8.5% sustained A or B injuries.

Figure V-4 Driver Injury by Ejection



Sources: 1995 TIFA, 1995 GES

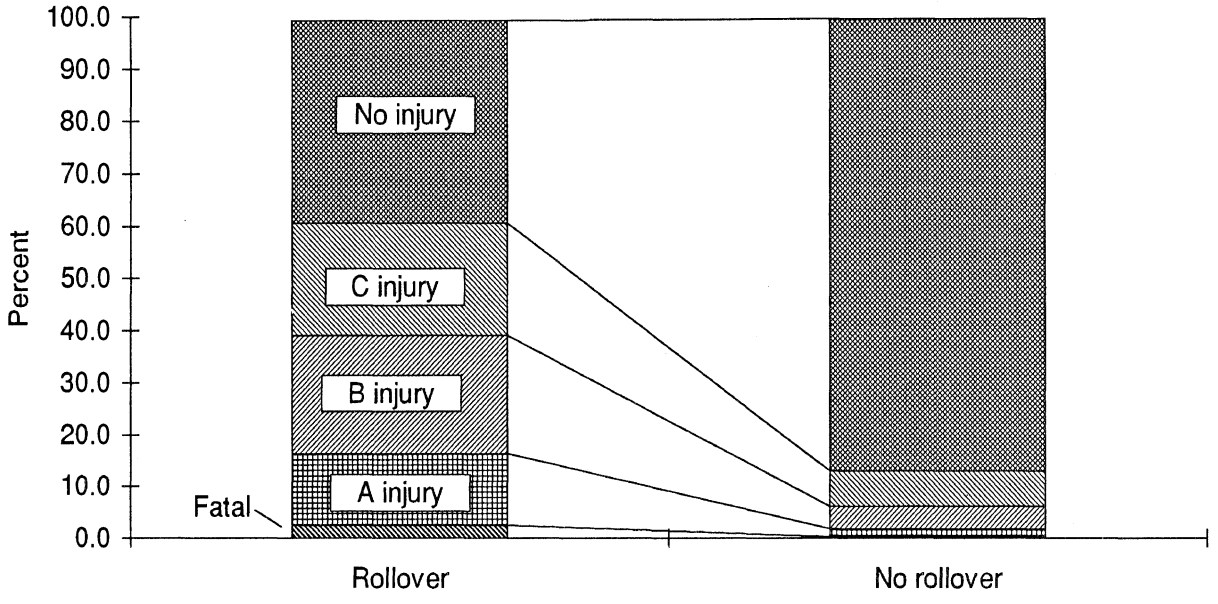
Table V-9 tabulated rollover when it was the first harmful event. Table V-11 shows all rollovers, regardless of when the rollover occurred in the crash sequence. Rollover is associated with serious driver injuries, though not as strongly as ejection. An estimated 11,000 drivers were involved in a rollover. Of these, 284 (2.5%) were killed and an estimated 2,000 (13.8%) received A injuries. Only 38.6% of the drivers were uninjured. In contrast, 86.6% of the drivers of trucks that did not roll over were uninjured. Only about 9% of all crash-involved truck drivers experienced rollover, but 50% of driver fatalities and about 47% of drivers with A injuries occurred in trucks that rolled over. Figure V-5 illustrates the injury distributions for trucks that rolled over and those that remained on their wheels.

Table V-11 Driver Injury by Rollover

Injury	Rollover		No rollover		Total	
severity	N	%	N	%	N	%
Fatal	284	2.5	287	0.2	571	0.4
A injury	2,000	13.8	2,000	1.5	3,000	2.6
B injury	3,000	22.8	5,000	4.4	8,000	6.0
C injury	2,000	21.5	8,000	6.7	10,000	8.0
None	4,000	38.6	100,000	86.6	105,000	82.3
Total	11,000	100.0	116,000	100.0	127,000	100.0

Note: Total includes fewer than 500 drivers with unknown injury severity
Sources: 1995 TIFA, 1995 GES

Figure V-5 Driver Injury by Rollover



Sources: 1995 TIFA, 1995 GES

VI. Special Focus: Longer Combination Vehicles

There is no common, uniform definition of a *longer combination vehicle.* Each State exercises primary responsibility for setting truck weight and length limits within its borders, consistent with Federal regulations. The Surface Transportation Assistance Act of 1982 (STAA) required States to permit tractors with two trailers, each up to 28.5 feet long, on Interstate highways and other routes designated by the Federal Highway Administration. In addition, the Act prohibited States from establishing a maximum gross combination weight (GCW) limit of less than 80,000 pounds. In 1991, the Intermodal Surface Transportation Efficiency Act (ISTEA) froze State weight and length limits by providing that no State could permit multitrailer trucks longer or heavier than those operating under existing State laws as of June 1, 1991. Accordingly, in this section, a longer combination vehicle is defined as a combination vehicle with more than one trailer that exceeds the minimum weight and length standards set by the STAA of 1982. An LCV, therefore, is:

- a truck-tractor with at least two trailers capable of carrying cargo;
- and at least one trailer 29 feet long or longer;

or,

- a truck-tractor with at least two trailers capable of carrying cargo;
- and a gross combination weight greater than 80,000 pounds;

or,

- a truck-tractor with three trailers capable of carrying cargo.

Overlength LCVs have at least one cargo-carrying trailer longer than 28.5 feet. **Overweight** LCVs exceed the weight standard only (i.e., both trailers are within the length standard but the gross combination weight [GCW] of the vehicle exceeds 80,000 pounds). LCVs categorized as **both** exceed both the weight and length standards. Triples are LCVs with three cargo-carrying trailers. A truck-tractor, two-trailer combination that falls within the limits established by the STAA of 1982 will be termed an **STAA double**.

Data presented in this section are drawn entirely from the Trucks Involved in Fatal Accidents (TIFA) file; accordingly only LCVs involved in fatal crashes are included. Currently, only the TIFA file includes the data on individual trailer lengths and GCW necessary to identify LCVs.

Five-year trends

Table VI-1 shows the number of LCVs involved in fatal crashes, 1991-1995. Also shown for comparison is the number of "STAA doubles" and doubles combinations for which weight or trailer-length information is not available to make a classification. The grand total for the table includes all tractors with multiple trailers and the proportions calculated are of all tractors with multiple trailers (doubles and triples).

Table VI-1 Fatal Involvements of LCVs and "STAA Doubles," 1991-1995

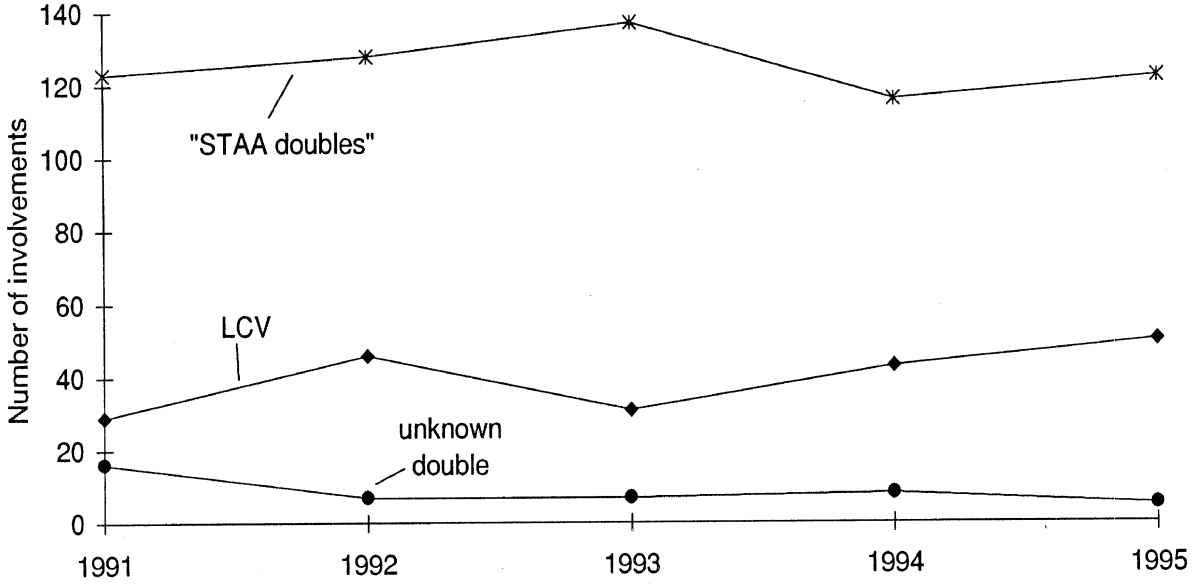
	1991		1992		1993		1994		1995	
Year	N	%	N	%	N	%	N	%	N	%
Longer Combination Vehicles										
Overlength	20	12	17	9	15	9	10	6	19	11
Overweight	2	1	12	7	6	3	18	11	10	6
Both	7	4	14	8	9	5	13	8	20	11
Triple	0	0	3	2	1	1	2	1	1	1
Subtotal	29	17	46	25	31	18	43	26	50	28
Non-LCV Tractor and Two Trailers										
"STAA double"	123	73	128	71	137	78	116	69	122	69
Unknown double	16	10	7	4	7	4	8	5	5	3
Grand total	168	100	181	100	175	100	167	100	177	100

Source: 1991-1995 TIFA

The sum of all LCV types—overlength, overweight, both overweight and overlength, and triples—varied from a low of 29 in 1991 to a high of 50 in 1995. Similarly, the total of "STAA doubles" and other doubles of unknown type ranged from 168 in 1991 to 181 in 1992. The number of LCVs and non-LCV doubles has remained relatively constant over the five-year period.

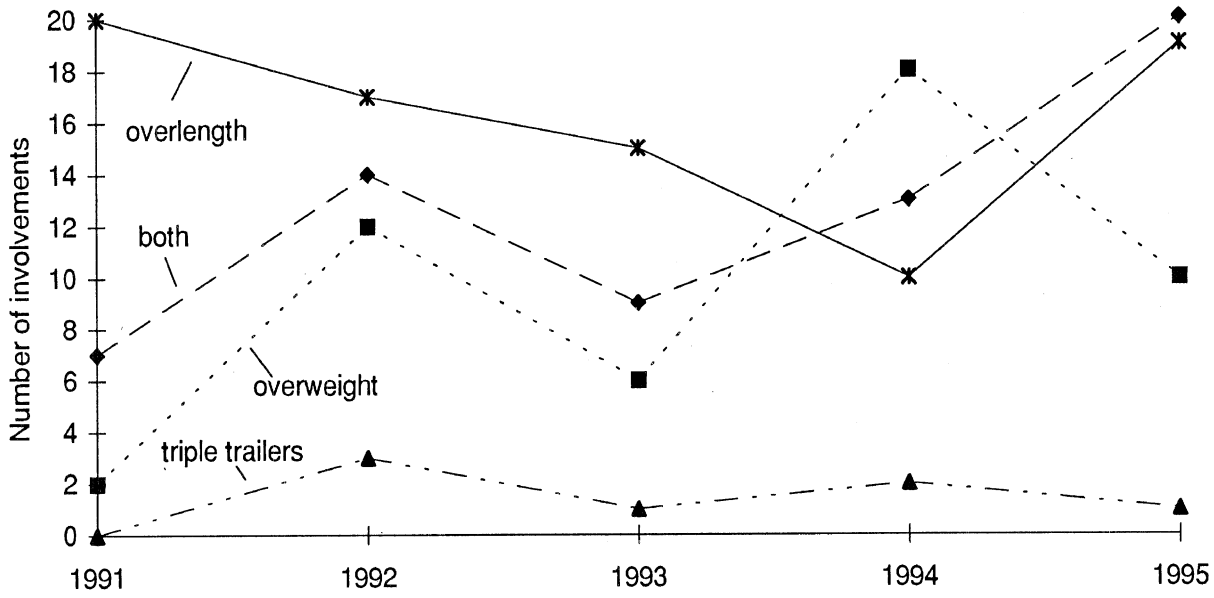
Figure VI-2 shows the detail underlying the LCV line in figure VI-1. Overlength LCVs are the most common type, triples the least common. There were no triples involved in a fatal crash in 1991, three in 1992, one in 1993 and 1995, and two in 1994. The number of involvements is so small that there does not appear to be any meaningful trend.

Figure VI-1 Fatal Involvements of LCVs and "STAA Doubles," 1991-1995



Source: 1991-1995 TIFA

Figure VI-2 Fatal Involvements of LCV Types, 1991-1995



Source: 1991-1995 TIFA

Common LCV types

Two LCV types have common names in the trucking industry. Turnpike doubles consist of two trailers of the same length, each 40 to 48 feet long. Rocky Mountain doubles have a 40-foot first trailer and a short, typically 28-foot, second trailer. As table VI-2 shows, most LCVs do not fall into either category. The definition of Rocky Mountain doubles was broadened for table VI-2 to include any combination with a first trailer over 40 feet and a second trailer between 20 and 30 feet long. Even using this expanded definition, 50% of the LCVs involved in fatal crashes in 1995 ("other LCV" in the table) did not fall into any of the standard types. There were only 14 Rocky Mountain doubles, one triple, and no turnpike doubles involved in a fatal crash in 1995.

Table VI-2 Common LCV Types
Fatal Involvements Only

	N	%
Rocky Mountain double	14	28
Turnpike double	0	0
Other LCV	25	50
Overweight	10	20
Triple	1	2
Total	50	100

Source: 1995 TIFA

Table VI-3 compares the number of fatal involvements, fatalities, and deaths per involvement for LCVs, other tractors with two trailers, and tractor-semitrailers. There were almost 2,700 tractor-semitrailers involved in a fatal crash in 1995, with 3,127 deaths and a rate of 1.17 deaths per involvement. The death rate for all LCVs was comparable, 1.12. The death rate for overweight LCVs was 1.10, for overlength LCVs 1.26, and for triples 1.00. The reader is cautioned that, since there are so few LCV fatal involvements, one crash with a large number of deaths can skew the results.

Table VI-3 Fatal Involvements and Deaths
for Selected Combination Types

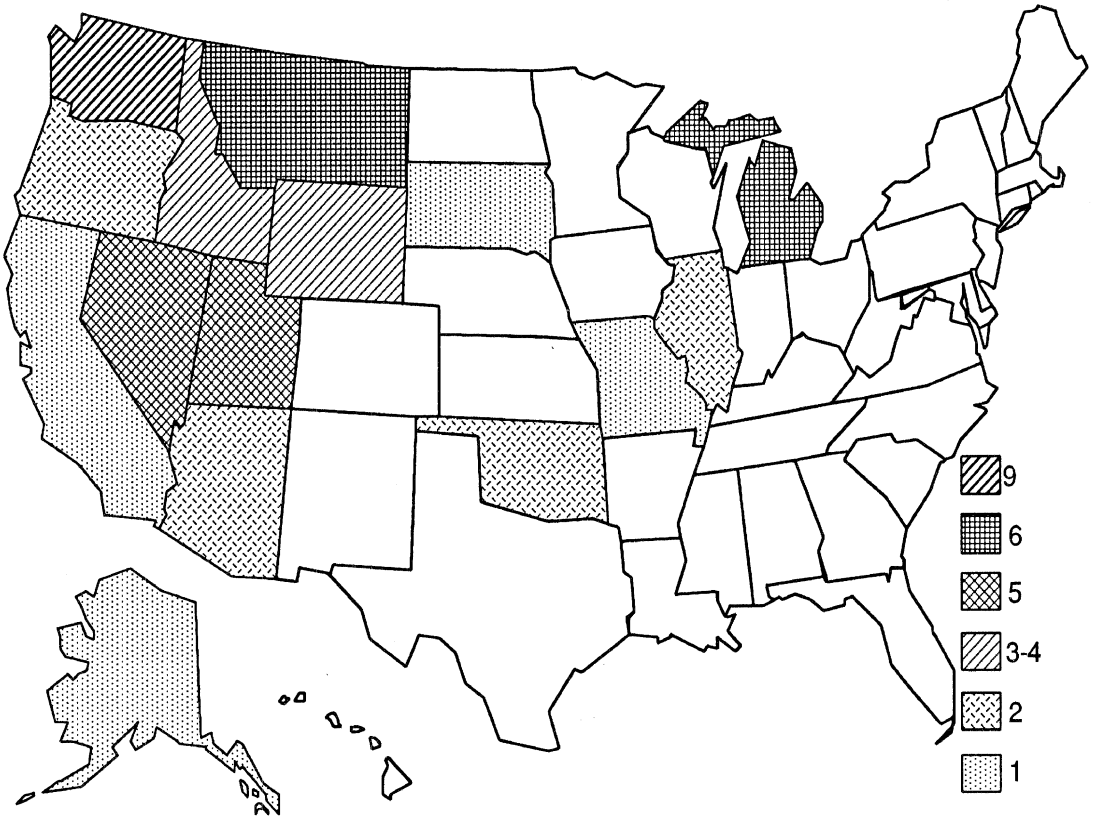
Combination type	Involvements	Total deaths	Deaths per involvement
Longer Combination Vehicles			
Overlength	19	24	1.26
Overweight	10	11	1.10
Both	20	20	1.00
Triple	1	1	1.00
Subtotal	50	56	1.12
Non-LCV tractor and two trailers			
"STAA double"	122	159	1.30
Unknown double	5	5	1.00
Subtotal	127	164	1.29
Other tractor combination			
Tractor-semitrailer	2,667	3,127	1.17

Source: 1995 TIFA

LCV fatal involvements by State

Figure VI-3 shows the distribution of LCV fatal involvements across the United States in 1995. Thirty-seven of the 50 LCV involvements occurred in nine contiguous western States, with Washington having the highest number of fatal involvements with nine. Michigan and Montana tied for the second highest number with six each. Utah and Nevada each had five and Idaho had four. The western States have historically permitted longer truck combinations than the East, in part because of the great distances between population centers. Michigan's weight laws allow gross combination weights (GCW) up to 164,000 pounds. Trucks with gross weights over 80,000 pounds accounted for all of Michigan's six LCV involvements.

Figure VI-3 Fatal LCV Involvements by State



Source: 1995 TIFA

Table VI-4 shows the States in which fatal crashes involving LCVs occurred, broken down by LCV type. In 1995, there was one triple-trailer combination involved in a fatal crash, in Nevada. Michigan had six overweight-only LCV involvements. Nevada and Washington each had four involvements that were both overweight and overlength.

(Fatal LCV involvements are listed for some States that do not ordinarily permit LCVs. These vehicles were operating either under special permits, exemptions, or illegally.)

Table VI-4 State by LCV Type
Fatal Involvements Only

	Overlength		Overweight		Both		Triple		Total	
State	N	%	N	%	N	%	N	%	N	%
Alaska	0	0	1	10	0	0	0	0	1	2
Arizona	0	0	0	0	2	10	0	0	2	4
California	1	5	0	0	0	0	0	0	1	2
Idaho	2	11	0	0	2	10	0	0	4	8
Illinois	0	0	0	0	2	10	0	0	2	4
Michigan	0	0	6	60	0	0	0	0	6	12
Missouri	1	5	0	0	0	0	0	0	1	2
Montana	3	16	1	10	2	10	0	0	6	12
Nevada	0	0	0	0	4	20	1	100	5	10
Oklahoma	2	11	0	0	0	0	0	0	2	4
Oregon	2	11	0	0	0	0	0	0	2	4
South Dakota	0	0	0	0	1	5	0	0	1	2
Utah	2	11	0	0	3	15	0	0	5	10
Washington	3	16	2	20	4	20	0	0	9	18
Wyoming	3	16	0	0	0	0	0	0	3	6
Total	19	100	10	100	20	100	1	100	50	100

Source: 1995 TIFA

Total length

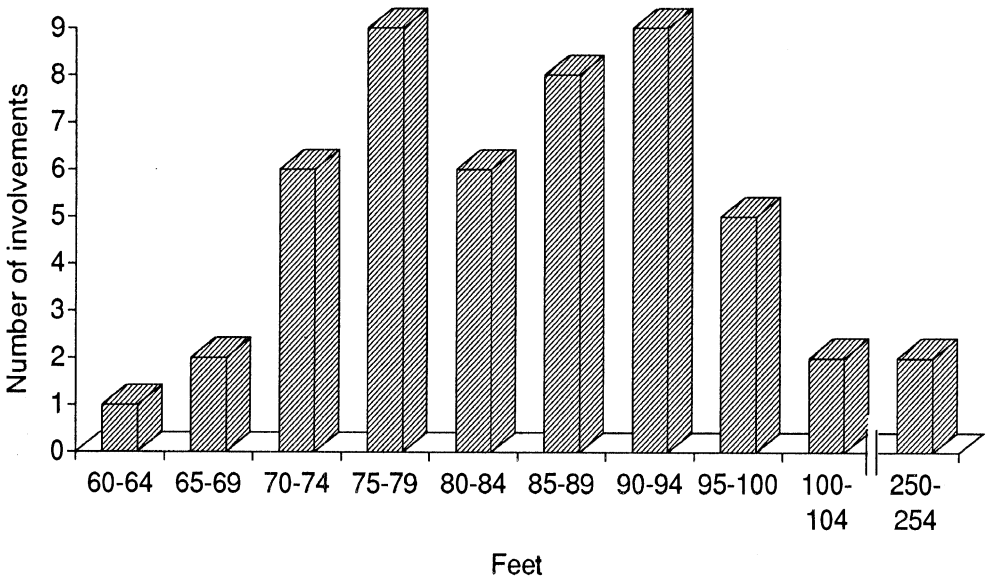
Table VI-5 tabulates total length for each type of LCV while figure VI-4 shows the distribution for all LCVs. Overall, LCVs involved in fatal crashes ranged from 63 to 250 feet long. It is possible for LCVs to qualify as "overlength" with relatively short total lengths, since trailer length is a criterion for an LCV while overall length is not. One of the "overlength" LCVs was only 70 feet long. Most LCVs that met the length criterion ranged from 75 to 98 feet long, while the triple combination was 104 feet long. Extreme lengths were objects like bridge beams carried under special permits.

Table VI-5 LCV Type by Total Length
Fatal Involvements Only

Length	Overlength		Overweight		Both		Triple		Total	
in feet	N	%	N	%	N	%	N	%	N	%
60-64	0	0	1	10	0	0	0	0	1	2
65-69	0	0	2	20	0	0	0	0	2	4
70-74	1	5	5	50	0	0	0	0	6	12
75-79	5	26	2	20	2	10	0	0	9	18
80-84	4	21	0	0	2	10	0	0	6	12
85-89	4	21	0	0	4	20	0	0	8	16
90-94	2	11	0	0	7	35	0	0	9	18
95-100	3	16	0	0	2	10	0	0	5	10
100-104	0	0	0	0	1	5	1	100	2	4
250-254	0	0	0	0	2	10	0	0	2	4
Total	19	100	10	100	20	100	1	100	50	100

Source: 1995 TIFA

Figure VI-4 Overall Length of LCVs Involved in Fatal Accidents



Source: 1995 TIFA

Gross combination weight

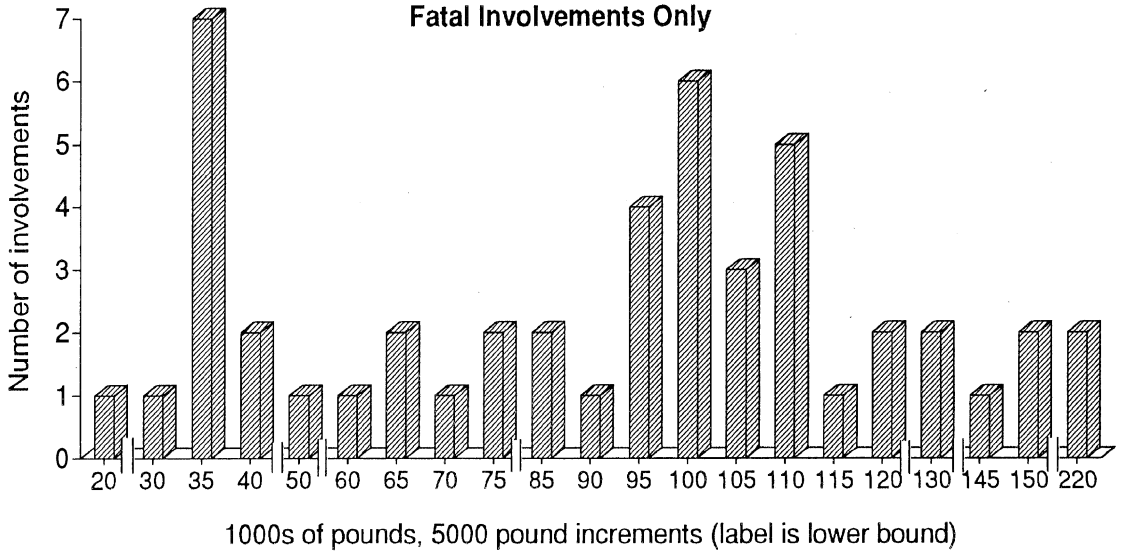
LCVs involved in fatal crashes in 1995 ranged in gross combination weight (GCW) from 22,500 pounds to 225,000 pounds (table VI-6). Thirty-one of the 50 LCVs weighed over 80,000 pounds; 24 weighed over 100,000 pounds. Figure VI-5 shows the distribution of GCW for all LCVs. The peak at 35,000 pounds corresponds to empty or near-empty vehicles. Trucks heavier than 80,000 pounds were likely fully loaded.

Table VI-6 LCV Type by Gross Combination Weight (GCW)
Fatal Involvements Only

	Overlength		Overweight		Both		Triple		Total	
GCW	N	%	N	%	N	%	N	%	N	%
20,001-25,000	1	5	0	0	0	0	0	0	1	2
30,001-35,000	1	5	0	0	0	0	0	0	1	2
35,001-40,000	7	37	0	0	0	0	0	0	7	14
40,001-45,000	2	11	0	0	0	0	0	0	2	4
50,001-55,000	1	5	0	0	0	0	0	0	1	2
60,001-65,000	1	5	0	0	0	0	0	0	1	2
65,001-70,000	2	11	0	0	0	0	0	0	2	4
70,001-75,000	1	5	0	0	0	0	0	0	1	2
75,001-80,000	2	11	0	0	0	0	0	0	2	4
85,001-90,000	0	0	0	0	1	5	1	100	2	4
90,001-95,000	0	0	1	10	0	0	0	0	1	2
95,001-100,000	0	0	0	0	4	20	0	0	4	8
100,001-105,000	0	0	2	20	4	20	0	0	6	12
105,001-110,000	0	0	1	10	2	10	0	0	3	6
110,001-115,000	0	0	1	10	4	20	0	0	5	10
115,001-120,000	0	0	1	10	0	0	0	0	1	2
120,001-125,00	0	0	1	10	1	5	0	0	2	4
130,001-135,000	0	0	0	0	2	10	0	0	2	4
145,001-150,000	0	0	1	10	0	0	0	0	1	2
150,001-155,000	0	0	2	20	0	0	0	0	2	4
220,001-225,000	0	0	0	0	2	10	0	0	2	4
Unknown	1	5	0	0	0	0	0	0	1	2
Total	19	100	10	100	20	100	1	100	50	100

Source: 1995 TIFA

Figure VI-5 Gross Combination Weight of LCVs
Fatal Involvements Only



Source: 1995 TIFA

Cargo body style and cargo

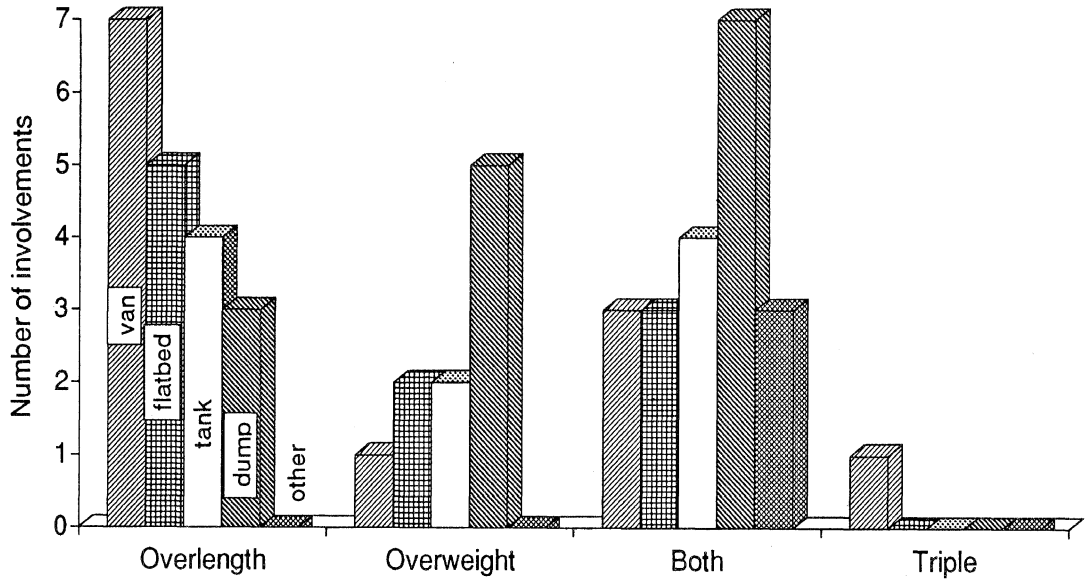
Table VI-7 shows the cargo body type of LCVs involved in fatal crashes. The triple-trailer LCV pulled van trailers. This reflects the common usage of triples in long-haul general freight carriage. The diversity of trailer cargo body types is striking. Eight of the 39 LCVs that met the length criterion ("overlength" and "both") had flatbed trailers, but there were also ten dumps, ten vans, and eight tank trailer combinations. Similarly, though LCVs with GCWs over 80,000 pounds ("overweight" and "both") included twelve dump and six tank combinations, there were also five flatbeds and four van combinations. Without exposure data, it is impossible to know if these distributions reflect the diversity of LCVs or differential risk associated with particular cargo bodies.

Table VI-7 Cargo Body Style by LCV Type
Fatal Involvements Only

Cargo body	Overlength		Overweight		Both		Triple		Total	
	N	%	N	%	N	%	N	%	N	%
Van	7	37	1	10	3	15	1	100	12	24
Flatbed	5	26	2	20	3	15	0	0	10	20
Tank	4	21	2	20	4	20	0	0	10	20
Dump	3	16	5	50	7	35	0	0	15	30
Other	0	0	0	0	3	15	0	0	3	6
Total	19	100	10	100	20	100	1	100	50	100

Source: 1995 TIFA

Figure VI-6 Cargo Body Style by LCV Type
Fatal Involvements Only



Source: 1995 TIFA

Only eleven of the 50 LCVs were empty at the time of the crash; the remaining 39 carried a variety of cargoes, as the diversity of cargo bodies indicated in table VI-7 would suggest. Of the 30 LCVs that met the weight criterion ("overweight" and "both"), fourteen were loaded with solids in bulk (e.g., gravel, wood chips, coal), five hauled farm products, three carried metal objects (e.g., coils of steel or steel beams) or lumber, two were loaded with large objects, and one transported general freight. LCVs that were overlength only were primarily either empty (eleven) or carried general freight (four). Three of the LCVs included hazardous materials in their cargo and one experienced cargo spillage.

This table illustrates one aspect of including weight in the LCV definition. Combinations that qualify as overweight when fully loaded are not LCVs when empty. For weight-related LCVs, being an LCV is not an intrinsic quality of the vehicle itself, but an aspect of its use.

Table VI-8 Cargo Carried by LCV Type
Fatal Involvements Only

	Overlength		Overweight		Both		Triple		Total	
Cargo type	N	%	N	%	N	%	N	%	N	%
Empty	11	58	0	0	0	10	0	0	13	26
General freight	4	21	1	10	0	0	1	100	6	12
Metal	0	0	0	0	1	5	0	0	1	2
Large objects	1	5	0	0	2	0	0	0	1	2
Automobiles	0	0	0	0	1	5	0	0	1	2
Solids in bulk	1	5	7	70	7	35	0	0	15	30
Liquids in bulk	1	5	0	0	4	20	0	0	5	10
Lumber	0	0	1	10	1	5	0	0	2	4
Refrigerated food	1	5	0	0	0	0	0	0	1	2
Farm products	0	0	1	10	4	20	0	0	5	10
Total	19	100	10	100	20	100	1	100	50	100

Source: 1995 TIFA

Road type

Twenty-eight fatal LCV involvements (56%) occurred on rural major arterials. Seven of the 50 LCV fatal involvements (14%) occurred on Interstate highways, including the triple involvement. Taken together, these proportions are similar to those for all truck fatal involvements (table III-5), though since LCV involvements are few, a small number of cases can have a large effect on proportions.

Table VI-9 Road Class/Area Type by LCV Type
Fatal Involvements Only

Road class/ area type	Overlength N	%	Overweight N	%	Both N	%	Triple N	%	Total N	%
Interstate/Urban	0	0	0	0	1	5	0	0	1	2
Interstate/Rural	2	11	0	0	3	15	1	100	6	12
Major arterial/Urban	1	5	2	20	2	10	0	0	5	10
Major arterial/Rural	11	58	6	60	11	55	0	0	28	56
Other/Urban	1	5	0	0	0	0	0	0	1	2
Other/Rural	2	11	2	20	1	5	0	0	5	10
Unknown	2	11	0	0	2	10	0	0	4	8
Total	19	100	10	100	20	100	1	100	50	100

Source: 1995 TIFA

Company type

Interstate for-hire carriers operated 38 of the 50 LCVs involved in fatal crashes in 1995 (table VI-10). Together with the two LCVs operated by private interstate carriers, 80% of the LCVs involved in fatal crashes were interstate. Note that LCVs meeting only the weight criterion ("overweight") were somewhat more likely to be intrastate for-hire vehicles, that is, trucks operated only within a single State's boundaries. Several of these vehicles operated in Michigan, which permits very heavy combinations.

Table VI-10 Company Type by LCV Type
Fatal Involvements Only

Company type	Overlength N	%	Overweight N	%	Both N	%	Triple N	%	Total N	%
Interstate:										
Private	5	26	2	20	0	0	0	0	7	14
For-hire	14	74	5	50	18	90	1	100	38	76
Intrastate:										
Private	0	0	1	10	1	5	0	0	2	4
For-hire	0	0	2	20	1	5	0	0	3	6
Total	19	100	10	100	20	100	1	100	50	100

Source: 1995 TIFA

First harmful event

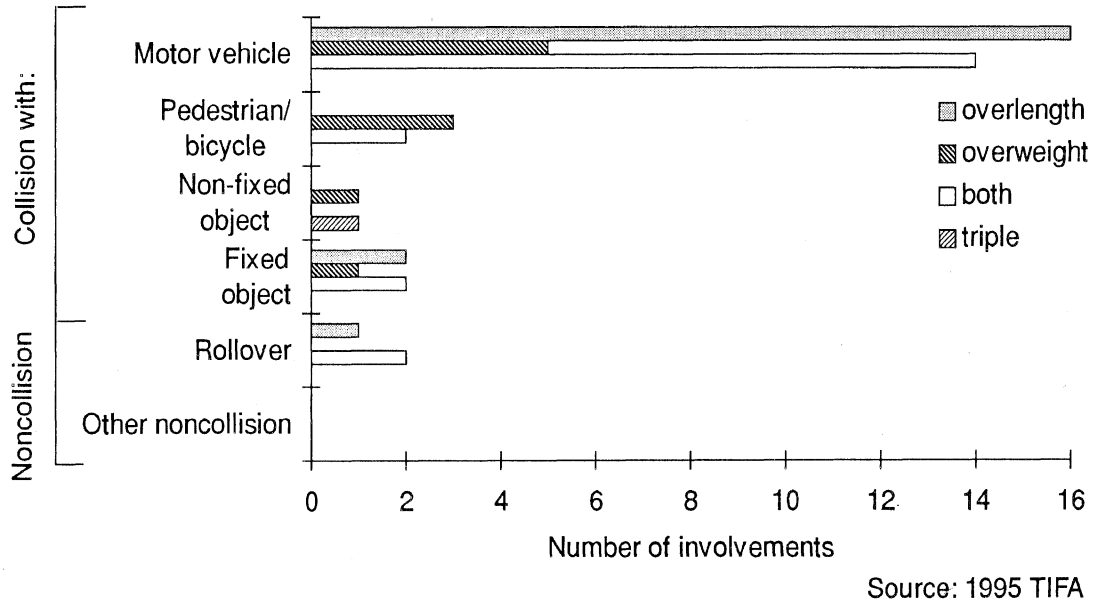
Table VI-11 shows the first harmful event in fatal crashes involving LCVs in 1995. Figure VI-7 displays the same data in graphical form. As with all trucks (table III-7) a collision with a motor vehicle in transport was the most frequent first harmful event, accounting for 35 of 50 involvements. Collisions with fixed and non-fixed objects accounted for seven of the remaining 15 cases in 1995. With so few cases, however, it is impossible to infer any association.

Table VI-11 First Harmful Event by LCV Type
Fatal Involvements Only

First harmful event	Overlength		Overweight		Both		Triple		Total	
	N	%	N	%	N	%	N	%	N	%
Collision:										
Motor vehicle	16	84	5	50	14	70	0	0	35	70
Pedestrian/bicyclist	0	0	3	30	2	10	0	0	5	10
Non-fixed object	0	0	1	10	0	0	1	100	2	4
Fixed object	2	11	1	10	2	10	0	0	5	10
Noncollision										
Rollover	1	5	0	0	2	10	0	0	3	6
Other noncollision	0	0	0	0	0	0	0	0	0	0
Total	19	100	10	100	20	100	1	100	50	100

Source: 1995 TIFA

Figure VI-7 First Harmful Event by LCV Type
Fatal Involvements Only



Source: 1995 TIFA

VII. Bus Crashes

This section presents statistics on the involvement of buses in traffic crashes in 1995. All traffic crash statistics in the section are taken from the 1995 FARS file or the 1995 GES file. The GES file has a relatively small sample of bus cases, which limits the amount of detail that can be shown in the tables. The MCMIS crash file, when all States are fully reporting, will provide a census of all bus crashes and, consequently, a much improved description of them.

A **bus** is defined as a vehicle designed to carry at least sixteen people including the driver. Two types of buses are distinguished. A **school bus** is the familiar yellow-and-black vehicle commonly used to transport children to school. The **other bus** category includes transit (intracity) buses and cross-country (intercity) buses.

Note: All figures for involvements in fatal crashes and fatalities are taken from the FARS file. When the number is taken from FARS, it is shown exactly. Estimates based solely on GES or that combine information from FARS and GES are rounded to the nearest thousand.

Trends and overview of bus traffic crashes

In 1995, over 685,000 buses were registered to operate on U.S. roads (table VII-1). Together, they accumulated almost 6.4 billion miles, each bus travelling an average of 9,311 miles per year. Buses were involved in an estimated 16,000 traffic crashes, with a total of 16,000 buses involved. An estimated 8,000 of these were school buses and 8,000 were some other bus type.

Table VII-1 Bus Statistics, 1995

	School Bus	Other Bus	Unknown	Total
Vehicles				
Registrations	**	**	**	685,504
Miles traveled (millions)	**	**	**	6,383
Average travel	**	**	**	9,311
Crashes				
Number	7,000	8,000	1,000	16,000
Number of buses involved	8,000	8,000	1,000	16,000
Bus Involvements by Crash Severity				
Fatal	122	150	16	288
Injury	3,000	4,000	*	8,000
Towaway	4,000	3,000	1,000	8,000
Total	8,000	8,000	1,000	16,000

** Not available

* GES estimate less than 500

Sources: *Highway Statistics 1995*; 1995 FARS; 1995 GES

The number of buses involved in traffic crashes was stable at about 16,000 involvements per year from 1991 to 1995. The greatest estimated number of crashes occurred in 1993 with 17,000 bus involvements (table VII-2). The number of buses in fatal crashes also has fluctuated within a narrow range, from a low of 266 in 1994 to a high of 288 in 1995. Counts of fatal involvements are taken from the FARS file, a census file of all fatal traffic crashes, so they are expected to be precise. Estimates of injury and towaway involvements are generated from the GES file. Since the GES file is based on a sample of crashes, each estimate has an associated sampling error. (See the Technical Appendix for more information on sampling errors in GES.) Tests of significance have been calculated for the differences between the annual totals. None of the year-to-year differences in the counts of injury or towaway involvements is statistically significant.

Table VII-2 Bus Involvements by Crash Severity 1991-1995

	Fatal		Injury		Towaway		Total	
Year	N	%	N	%	N	%	N	%
1991	276	1.8	8,000	51.2	7,000	47.1	16,000	100.0
1992	284	1.9	8,000	50.9	7,000	47.2	15,000	100.0
1993	275	1.7	9,000	53.4	7,000	44.9	17,000	100.0
1994	266	1.6	9,000	58.6	6,000	39.8	16,000	100.0
1995	288	1.8	8,000	48.1	8,000	50.1	16,000	100.0

Sources: 1995 FARS, 1995 GES

Table VII-3 shows the number of fatalities and injuries in bus-involved crashes, 1991-1995. The greatest number of deaths occurred in 1995 (335), while 1991 had the highest estimated number of injuries (26,000). The number of injuries has remained quite stable over the period 1991-1995. None of the year-to-year differences is statistically significant, in part because GES includes only a relatively small sample of bus involvements.

Table VII-3 Total Fatalities and Injuries in Bus Crashes, 1991-1995

Year	Fatalities	Injuries	Total
1991	306	26,000	26,000
1992	315	25,000	25,000
1993	308	25,000	25,000
1994	289	24,000	25,000
1995	335	24,000	25,000
Annual average	311	25,000	25,000

Sources: 1995 FARS, 1995 GES

Bus type and crash severity

Table VII-4 shows bus involvements by bus type and crash severity in 1995. An estimated 8,000 of the 16,000 buses involved in traffic crashes were school buses. School buses accounted for 47.3% of all bus involvements; they were 42.4% of bus involvements in fatal crashes and 41.5% of bus involvements in injury crashes. School buses may have had a lower proportion of fatal and injury involvements because school buses commonly operate in residential areas where traffic speeds are low.

Table VII-4 Bus Involvements by Bus Type and Crash Severity

	Fatal		Injury		Towaway		Total	
Bus type	N	%	N	%	N	%	N	%
School	122	42.4	3,000	41.5	4,000	53.1	8,000	47.3
Other bus	150	52.1	4,000	57.0	3,000	39.6	8,000	48.2
Unknown	16	5.6	*	1.5	1,000	7.3	1,000	4.5
Total	288	100.0	8,000	100.0	8,000	100.0	16,000	100.0

* GES estimate less than 500
Sources: 1995 FARS, 1995 GES

A total of 335 persons died in crashes involving buses in 1995 (table VII-5). Over 42% (142) of the fatalities occurred in crashes in which a school bus was involved, and 52.2% (175) occurred in crashes involving an other type of bus. These fatalities include all deaths as a consequence of the crash, whether the fatality was in a bus or not. An estimated 24,000 persons were injured in traffic crashes involving buses, including 11,000 in school bus crashes and 13,000 in other bus crashes. (The totals in this table are calculated separately, rather than by summing the columns. If a crash involved both a school and an other bus, killed and injured persons in such a crash would be included in both the school and the other bus categories. Summing the columns would double-count such cases.)

Table VII-5 Total Fatalities and Injuries by Bus Type

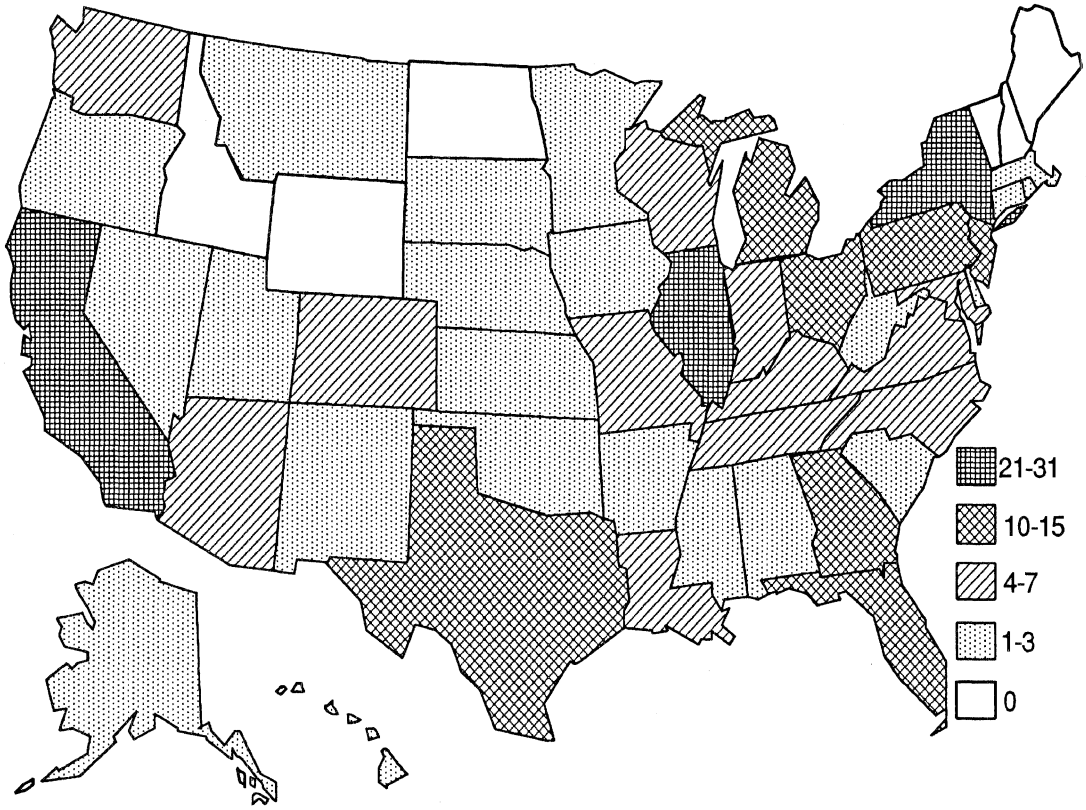
	Fatalities		Injuries		Total	
Bus type	N	%	N	%	N	%
School	142	42.4	11,000	44.2	11,000	44.2
Other bus	175	52.2	13,000	53.1	13,000	53.1
Unknown	18	5.4	1,000	2.7	1,000	2.7
Total	335	100.0	24,000	100.0	25,000	100.0

* GES estimate less than 500
Sources: 1995 FARS, 1995 GES

Fatal bus involvements by State

Figure VII-1 shows the distribution of bus involvements across the U.S. in 1995. Only fatal bus involvements are shown, because only the FARS file identifies the State where the crash took place. (The State location of crashes of all severities will be available once the MCMIS crash file is complete.) New York, California, and Illinois had the greatest number of bus involvements; they are also among the most populous States. Maine, New Hampshire, Vermont, North Dakota, Idaho, and Wyoming all had no fatal bus involvements in 1995. Table VII-6 shows the number of fatal involvements of school buses, other buses, and unknown bus types separately for each State.

Figure VII-1 Fatal Bus Involvements, 1995



Source: 1995 FARS

Table VII-6 Fatal Bus Involvements by State and Bus Type, 1995

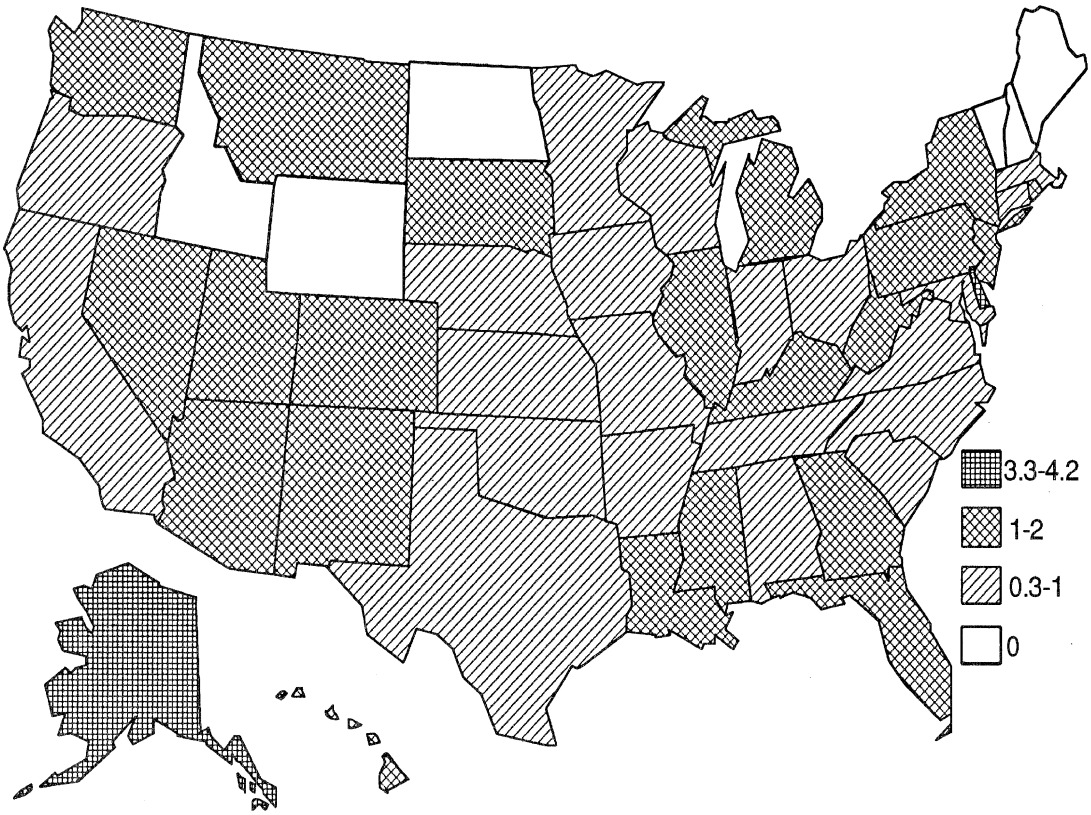
State	School		Other bus		Unknown		Total	
	N	%	N	%	N	%	N	%
Alabama	1	0.8	1	0.7	0	0.0	2	0.7
Alaska	1	0.8	1	0.7	0	0.0	2	0.7
Arizona	3	2.5	4	2.7	0	0.0	7	2.4
Arkansas	1	0.8	0	0.0	0	0.0	1	0.3
California	6	4.9	24	16.0	0	0.0	30	10.4
Colorado	1	0.8	5	3.3	0	0.0	6	2.1
Connecticut	1	0.8	2	1.3	0	0.0	3	1.0
Delaware	2	1.6	1	0.7	0	0.0	3	1.0
D.C.	0	0.0	3	2.0	0	0.0	3	1.0
Florida	9	7.4	3	2.0	3	18.8	15	5.2
Georgia	6	4.9	6	4.0	0	0.0	12	4.2
Hawaii	0	0.0	2	1.3	0	0.0	2	0.7
Idaho	0	0.0	0	0.0	0	0.0	0	0.0
Illinois	7	5.7	14	9.3	0	0.0	21	7.3
Indiana	1	0.8	4	2.7	0	0.0	5	1.7
Iowa	1	0.8	1	0.7	0	0.0	2	0.7
Kansas	0	0.0	2	1.3	0	0.0	2	0.7
Kentucky	4	3.3	0	0.0	0	0.0	4	1.4
Louisiana	5	4.1	1	0.7	0	0.0	6	2.1
Maine	0	0.0	0	0.0	0	0.0	0	0.0
Maryland	1	0.8	3	2.0	1	6.3	5	1.7
Massachusetts	0	0.0	1	0.7	1	6.3	2	0.7
Michigan	10	8.2	4	2.7	0	0.0	14	4.9
Minnesota	3	2.5	0	0.0	0	0.0	3	1.0
Mississippi	1	0.8	2	1.3	0	0.0	3	1.0
Missouri	1	0.8	3	2.0	0	0.0	4	1.4
Montana	0	0.0	0	0.0	1	6.3	1	0.3
Nebraska	0	0.0	1	0.7	0	0.0	1	0.3
Nevada	2	1.6	0	0.0	0	0.0	2	0.7
New Hampshire	0	0.0	0	0.0	0	0.0	0	0.0
New Jersey	0	0.0	10	6.7	0	0.0	10	3.5
New Mexico	2	1.6	1	0.7	0	0.0	3	1.0
New York	14	11.5	14	9.3	3	18.8	31	10.8
N.Carolina	3	2.5	3	2.0	1	6.3	7	2.4
N.Dakota	0	0.0	0	0.0	0	0.0	0	0.0
Ohio	6	4.9	4	2.7	0	0.0	10	3.5
Oklahoma	3	2.5	0	0.0	0	0.0	3	1.0
Oregon	1	0.8	1	0.7	1	6.3	3	1.0
Pennsylvania	8	6.6	6	4.0	0	0.0	14	4.9
Rhode Island	0	0.0	1	0.7	0	0.0	1	0.3
S.Carolina	2	1.6	1	0.7	0	0.0	3	1.0
S.Dakota	1	0.8	0	0.0	0	0.0	1	0.3
Tennessee	3	2.5	2	1.3	0	0.0	5	1.7
Texas	4	3.3	8	5.3	2	12.5	14	4.9
Utah	1	0.8	2	1.3	0	0.0	3	1.0
Vermont	0	0.0	0	0.0	0	0.0	0	0.0
Virginia	3	2.5	1	0.7	2	12.5	6	2.1
Washington	0	0.0	6	4.0	1	6.3	7	2.4
W.Virginia	2	1.6	0	0.0	0	0.0	2	0.7
Wisconsin	2	1.6	2	1.3	0	0.0	4	1.4
Wyoming	0	0.0	0	0.0	0	0.0	0	0.0
Total	122	100.0	150	100.0	16	100.0	288	100.0

Source: 1995 FARS

Fatal bus involvements per capita

Figure VII-2 provides a context for interpreting figure VII-1. Figure VII-2 shows fatal bus involvements per million population in each of the fifty States. Note that most of the States with the greatest number of fatal bus involvements (i.e., California, New York, and Illinois) have only average involvements per million population. Moreover, the range of fatal involvement rates is relatively narrow, from zero in States with no fatal involvements to 3.3 involvements per million in Alaska and 4.2 in Delaware. The narrow range suggests that State-to-State differences are not large, particularly since the rates themselves are relatively low. Since there are so few fatal bus involvements, a change of one or two involvements in a small State can make a large difference in the involvement rate per capita for that State.

Figure VII-2 Fatal Bus Involvements per Million Population, 1995

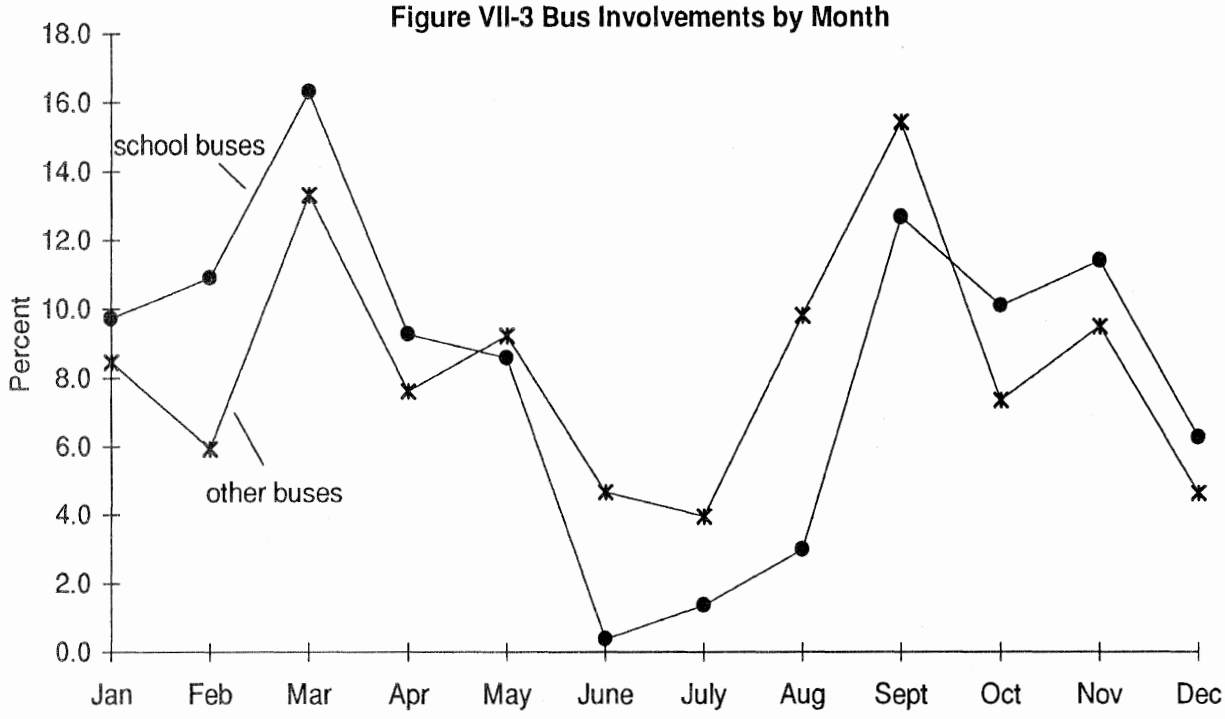


Source: 1995 FARS,
Statistical Abstract, 1995

Bus involvements by month, day of week, and time of day

Bus crash involvements show interesting variations by month (figure VII-3). School bus involvements were lowest during the summer months but fluctuate in a wide range during the school year, peaking in March with over 16% of all school bus involvements. Other buses showed a similar pattern, although a higher proportion of involvements occurred in the summer travel season. The distribution of bus crash involvements varies much more widely by month than does the distribution of truck involvements (figure III-1). The GES file includes only a limited number of bus cases. The MCMIS crash file, which will include all bus involvements, should clarify the picture.

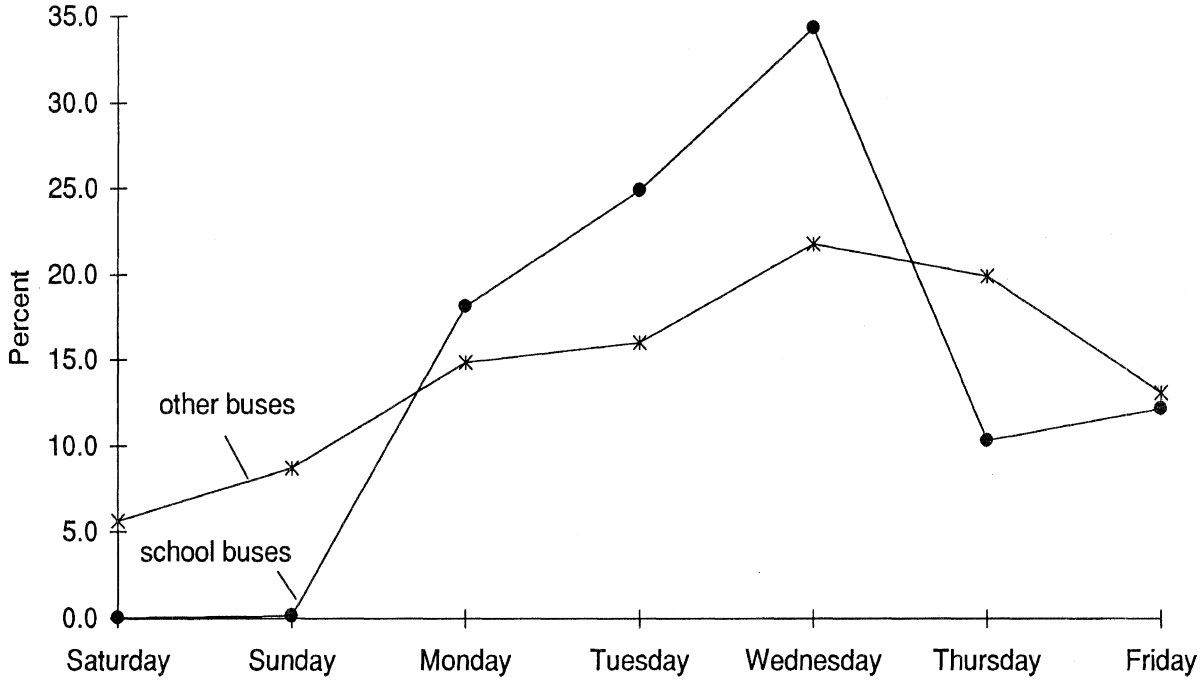
Figure VII-3 Bus Involvements by Month



Sources: 1995 FARS, 1995 GES

School bus crash involvements in 1995 occurred primarily during the week (figure VII-4). Only a handful occurred over the weekend. Wednesday had the highest proportion of involvements with 34.3%, while the lowest percentage of weekday involvements (10.3%) occurred on Thursdays. Involvements of other buses also showed a definite pattern through the week. Other buses include both intracity transit buses and intercity cross-country buses. Involvements were low over the weekend and rose to a peak on Wednesday when 21.8% of all other bus crash involvements occurred. For the remainder of the work week proportions of other bus involvements were between 13% and 19%. The pattern of other bus crash-involvement is similar to that of trucks (figure III-2).

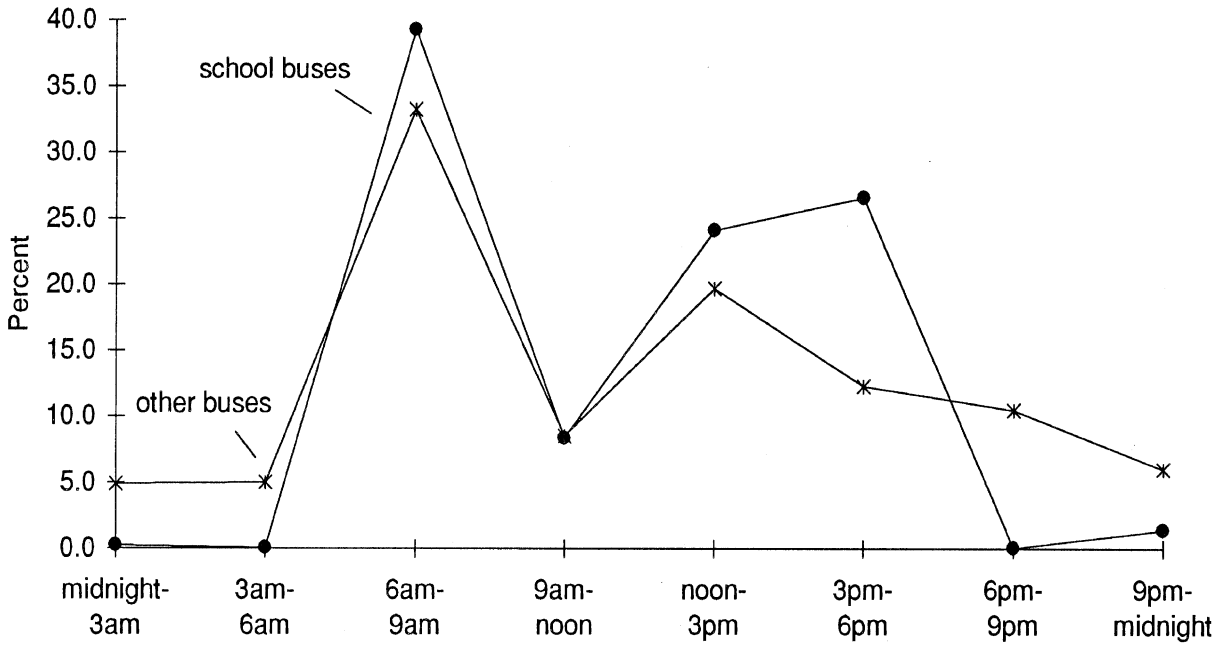
Figure VII-4 Bus Involvements by Day of Week



Sources: 1995 FARS, 1995 GES

Figure VII-5 shows the distribution of school bus and other bus involvements in 1995 by time of day in three-hour increments. The patterns of involvement over the course of the day clearly followed the typical usage of both school and other buses. School bus involvements had two major peaks, from 6 a.m. to 9 a.m. and from noon to 6 p.m., corresponding to the periods of travel to and from school. Other buses show similar, though less dramatic, peaks that encompass morning and afternoon rush hours in most cities. School buses had few involvements between 6 p.m. and 6 a.m. Other buses, which include city transit buses as well as passenger buses between cities, had significant numbers of involvements until about 9 p.m. The distribution of truck involvements by time of day do not show an effect of rush hour traffic (figure III-3).

Figure VII-5 Bus Involvements by Time of Day



Sources: 1995 FARS, 1995 GES

Manner of collision

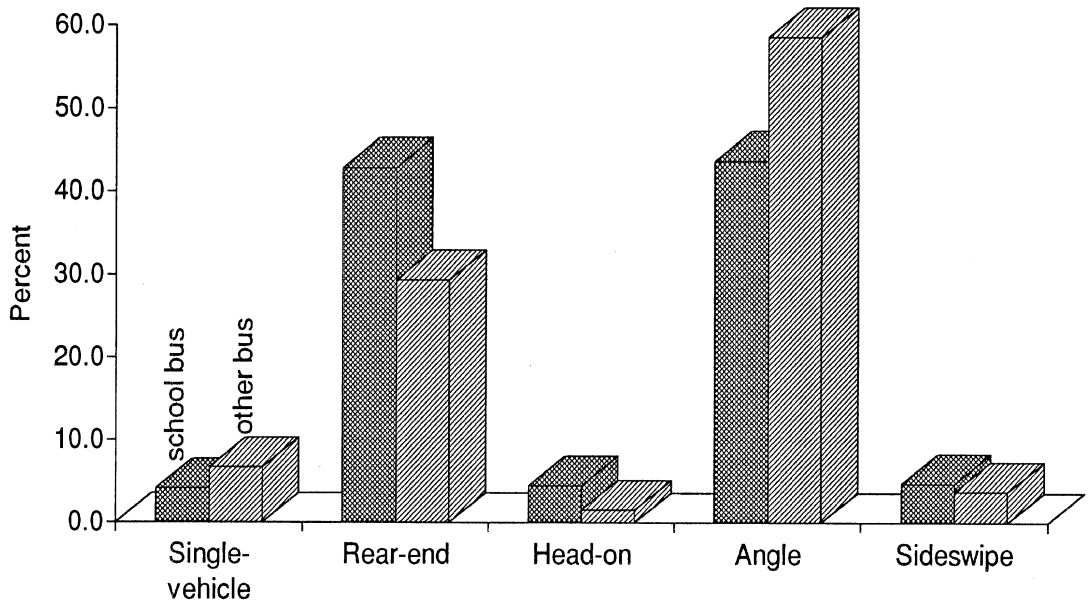
School buses had a lower proportion of single-vehicle and angle involvements than other buses, while they had a higher proportion of rear-end, head-on, and sideswipe collisions (table VII-7). These differences are not statistically significant due to small sample sizes, though they may be real nevertheless. Overall, the distribution of manner of collision for buses is similar to the distribution for trucks (table III-6), though buses had a much lower proportion of single-vehicle involvements, while trucks had a much lower proportion of rear-end collisions. Fully 36.5% of school bus involvements were rear-ends, compared with 26.6% for trucks.

Table VII-7 Bus Crash Involvements by Manner of Collision

Collision Type	School bus		Other bus		All	
	N	%	N	%	N	%
Single-vehicle	*	4.2	1,000	6.8	1,000	5.3
Rear-end	3,000	42.8	2,000	29.3	6,000	36.5
Head-on	*	4.6	*	1.6	*	2.9
Angle	3,000	43.6	4,000	58.5	8,000	51.2
Sideswipe	*	4.8	*	3.8	1,000	4.1
Total	8,000	100.0	8,000	100.0	16,000	100.0

* GES estimate less than 500 or less than 0.05.
Note: Total includes an estimated 1000 cases with unknown bus type.
Sources: 1995 FARS, 1995 GES

Figure VII-6 Manner of Collision by Bus Type



Sources: 1995 FARS, 1995 GES

Driver age and sex

Table VII-8 shows the age distribution for drivers of school and other buses involved in traffic crashes in 1995. The age distributions of both bus types are similar, and the differences are not large enough to be statistically significant. The table includes a column for the age distribution of crash-involved truck drivers for comparison. Bus drivers in traffic crashes were older than crash-involved truck drivers. About 2.9% of bus drivers were younger than 25, compared with an estimated 8.6% of crash-involved truck drivers. An estimated 37.9% of bus drivers involved in a crash were aged 45-64, compared with 28.1% of truck drivers.

Table VII-8 Bus Crash Involvements by Driver Age

	Bus drivers							
	School bus		Other bus		Total		Truck drivers	
Driver age	N	%	N	%	N	%	N	
<25	*	3.3	*	2.8	*	2.9	11,000	8.6
25-44	4,000	46.8	5,000	61.2	9,000	55.4	78,000	61.4
45-64	3,000	45.5	3,000	32.7	6,000	37.9	36,000	28.1
>64	*	4.5	*	3.1	1,000	3.7	2,000	1.9
Total	8,000	100.0	8,000	100.0	16,000	100.0	127,000	100.0

* GES estimate less than 500 or less than 0.05.
Note: Total includes an estimated 1000 cases with unknown bus type.
Sources: 1995 GES, 1995 TIFA, 1995 FARS

Overall, bus drivers involved in traffic crashes in 1995 were predominantly male, with 66.8% (table VII-9). Females accounted for about half of the drivers of crash-involved school buses, while over 83% of the drivers of other buses in traffic crashes were male. Even so, the share of males among crash-involved truck drivers was much higher than for buses. An estimated 97.2% of crash-involved truck drivers in 1995 were male.

Table VII-9 Bus Crash Involvements by Driver Sex

	Bus drivers							
	School bus		Other bus		Total		Truck drivers	
Driver sex	N	%	N	%	N	%	N	%
Male	4,000	49.5	6,000	83.4	11,000	66.8	124,000	97.2
Female	4,000	50.5	1,000	16.5	5,000	33.2	3,000	2.7
Total	8,000	100.0	8,000	100.0	16,000	100.0	127,000	100.0

Note: Total includes an estimated 1000 cases with unknown bus type.
Sources: 1995 GES, 1995 TIFA, 1995 FARS

VIII. Crash Type and Related Factors

This section presents statistics concerning the configuration of truck crash involvements in 1995, and driver-related factors that contributed to the crash. Crash configuration represents the relative position and movements of the vehicles at the time of the first harmful event in the crash sequence. The first harmful event is the first injury- or damage-producing event in the crash. Driver-related factors presented here are factors that, in the opinion of the reporting police officer or analyst, contributed to the occurrence of the crash. Both crash configuration and driver-related factors can be used to impute "fault" or "causation." The reader is cautioned, however, to make any such inferences with care. Traffic crashes are typically complex series of events in which driver, vehicle, roadway, and environment all can play a role. Highlights of this section:

- In fatal rear-end collisions, the truck is struck about twice as often as it is the striking vehicle

- In two-vehicle fatal crashes involving a truck and another vehicle, a driver-related factor is coded for the other driver alone in 68.6% of the crashes and for the truck driver alone in 18.3% of the crashes

- In two-vehicle fatal crashes, top driver-related factors for the truck driver are failure to keep in lane (10.9%), failure to yield (10.4%), and speeding (10.0%)

- In two-vehicle fatal crashes, top driver-related factors for the other driver were the same as for the truck driver: failure to keep in lane (18.8%), failure to yield (15.0%), and speeding (12.7%)

Crash type

Crash type presents the relative position of vehicles in the first harmful event of a crash. The first harmful event is the first property-damaging or injury producing event. Crash type is divided into six general categories that capture basic vehicle orientation. Within each general class, the levels indicate finer details about the relative motion of the colliding vehicles. The arrow diagrams starting on the next page represent common crash configurations in each general category. Table VIII-1 tabulates crash type by crash severity for truck involvements in 1995. Crash type is shown from the truck's point of view, so "turn across path" indicates that the truck turned across another vehicle's path.

Table VIII-1 Crash Type by Crash Severity

	Fatal		Injury		Towaway		Total	
Crash type	N	%	N	%	N	%	N	%
			1. Single vehicle**					
Ran off road	313	6.8	6,000	10.8	11,000	14.9	17,000	13.0
Hit object in road	437	9.4	1,000	2.7	1,000	2.1	3,000	2.6
			2. Same direction, same trafficway					
Rear-end, truck striking	217	4.7	7,000	13.6	6,000	8.8	14,000	10.6
Rear-end, truck struck	428	9.2	5,000	9.3	8,000	11.2	13,000	10.4
Sideswipe, in other's lane	42	0.9	2,000	4.3	5,000	6.5	7,000	5.4
Sideswipe, in truck's lane	69	1.5	2,000	3.2	4,000	6.1	6,000	4.8
			3. Opposite direction, same trafficway					
Head-on, in other's lane	96	2.1	*	0.3	*	0.2	*	0.3
Head-on, in truck's lane	583	12.6	0	0.8	*	0.4	1,000	1.0
Sideswipe, in other's lane	73	1.6	1,000	2.3	1,000	1.1	2,000	1.6
Sideswipe, in truck's lane	363	7.8	2,000	4.7	2,000	2.9	5,000	3.8
			4. Change traffic way, one vehicle turning					
Truck turn across path	145	3.1	5,000	10.0	6,000	8.3	11,000	8.8
Other turn across path	309	6.7	3,000	6.0	4,000	5.1	7,000	5.5
			5. Intersecting paths					
Straight, into other	521	11.3	3,000	5.3	2,000	2.2	5,000	3.8
Straight, other into	192	4.1	2,000	3.1	2,000	2.6	4,000	2.8
			6. Other					
Back into other	4	0.1	1,000	1.1	3,000	4.1	4,000	2.7
Other back into	2	0.0	*	0.1	*	0.2	*	0.1
Untripped roll	60	1.3	2,000	3.0	1,000	2.0	3,000	2.4
Other	659	14.2	9,000	17.7	12,000	17.2	22,000	17.3
Unknown	118	2.5	1,000	1.5	3,000	4.1	4,000	3.0
Total	4,631	100.0	51,000	100.0	73,000	100.0	129,000	100.0

* GES estimate less than 500.

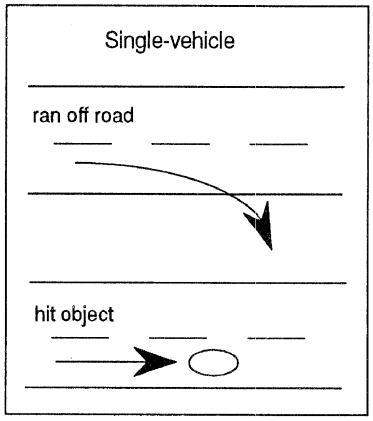
** See "Definitions of crash types" on page 83.

Sources: 1995 TIFA, 1995 GES

The reader is cautioned that these categories do not necessarily imply "fault." The turn-across-path category, for example, does not include information on which vehicle had the right-of-way.

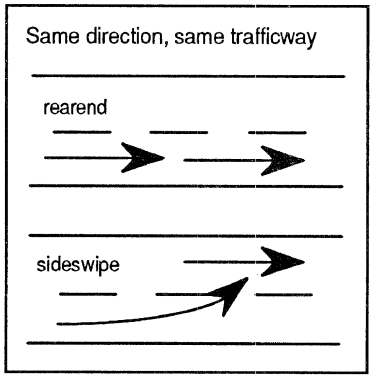
Definitions of crash types

1. Single-vehicle crashes include ran-off-road and collisions with objects in the roadway. Though the arrow diagram shows the ran-off-road departure to the right, both right side and left side roadway departures are included. Objects in the roadway can include legally parked vehicles, animals, bicyclists, pedestrians, and other objects.



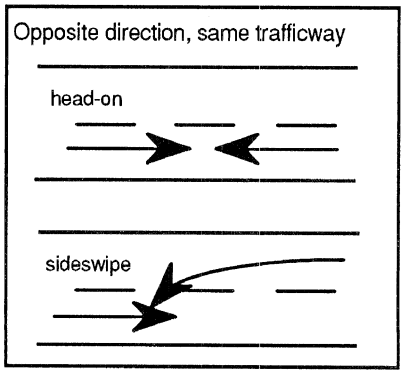
In 1995, a much higher proportion of injury and towaway single-truck crashes were ran-off-road, while fatal truck crashes had a higher proportion of collisions with objects in the road.

2. Same direction, same trafficway involvements include rear-end collisions and sideswipes. Both vehicles were traveling in the same direction and on the same trafficway. For the rear-ends, the lead vehicle may have been stopped, going slower than the following vehicle, or decelerating, and either turning or going straight. In same-direction sideswipes, the sideswipe could have been from either side of the vehicle.

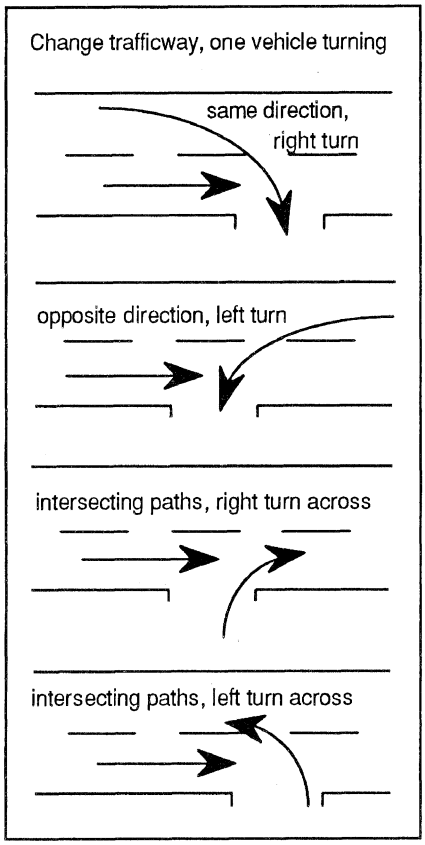


In fatal rear-end collisions in 1995, the truck was the struck vehicle almost twice as often as it was the striking vehicle. The differences for injury and towaway involvements are not statistically significant. Fatal same direction sideswipes occurred about twice as often in the truck's lane (that is, the other vehicle moved into the truck's lane) as in the other vehicle's lane, but injury and towaway same-direction sideswipes occurred more often in the other vehicle's lane. However, again, the differences between injury and towaway involvements are not significant statistically.

3. Opposite-direction, same trafficway involvements include head-on collisions and opposite-direction sideswipes. Both vehicles were traveling in opposite directions on the same trafficway. In head-on collisions, the frontal area of one vehicle impacted the frontal area of the other. In the sideswipes, the vehicles were traveling in opposite directions and the side of one or both vehicles was struck.

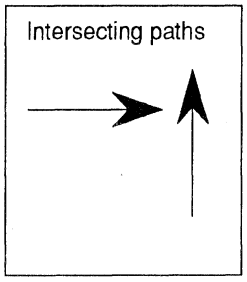


Opposite direction involvements, head-on and sideswipe, occurred most often in the truck's lane for all crash severity levels. The differences are most marked for fatal involvements, where 583 head-on collisions occurred in the truck's lane, compared with 96 in the other vehicle's lane. A higher proportion of fatal involvements (24.1%) falls into the "opposite direction, same trafficway" category than do injury or towaway (8.1% and 4.6% respectively).



4. Change trafficway, one vehicle turning involvements include a number of different configurations. In each case, one vehicle, while turning from one road to another, has turned across the path of another vehicle. This can occur when both vehicles are going in the same direction and one turned either right, from the inside lane, or left, from the outside lane, across the path of the other vehicle. In the case of opposite direction collisions, one vehicle turned left across the path of an oncoming vehicle. The other set of cases included in this group are those in which the vehicles were on different roadways initially and one turned across the path of the other, either to the right or left, to get on the same roadway as the other vehicle.

In injury and towaway collisions, the truck more often was turning across the other vehicle's path, while in fatal involvements, the other vehicle more often turned across the truck's path.



5. Intersecting path involvements are those in which the vehicles were on different but intersecting roadways, each vehicle going straight ahead. The collision occurred at an intersection.

Most fatal intersecting-path crashes involved the truck colliding with the side of the other vehicle. In such a collision, the truck's mass strikes the most vulnerable part of the other vehicle. In injury and towaway intersecting-path collisions, the role of striking vehicle was more evenly divided between the truck and other vehicle.

6. Other involvements include all other crash types. These are primarily crashes in which one or the other vehicle was backing, untripped rollovers, and crash types that could not be classified among the categories above. Most of these collisions were not classifiable.

Driver-related factors in two-vehicle, truck/other crashes

In 1995, 3,007 trucks were involved in a fatal crash with one other vehicle. Up to three driver-related factors are coded for the drivers of each vehicle. Driver-related factors are factors that contributed to the crash. They typically involve driving errors such as speeding, failure to yield, failure to obey traffic controls, and improper turns. The driver-related factors are assigned by a FARS analyst, based on the police report and any other available information. It is important to be aware that while the actions noted may involve violations of traffic ordinances, they do not indicate that any violation was charged to the driver. The factors presented here are simply driver errors recorded by the police officer or the FARS analyst. However, the reader should bear in mind that in fatal crashes, the fatality most often occurs outside of the truck. Some researchers feel that driver-related factors in truck-other vehicle fatal involvements may be biased by the fact that the truck driver more often survives the crash and may influence what the police officer records.

Table VIII-2 shows driver-related factors coded in two-vehicle, truck/other vehicle fatal crashes in 1995. Percentages shown are for the total number of two-vehicle fatal crashes. In over two-thirds of the crashes, a driver-related factor was coded for the other driver but not the truck driver. Factors were coded for the truck driver only in 18.3% of the crashes, and for both the truck driver and the other driver in 9.1% of the crashes. Overall, no factor was coded for over 70% of the truck drivers, while 78.3% of the other drivers had at least one factor coded.

Table VIII-2 Driver-Related Factors Coded for Truck and Other Vehicle Two-Vehicle Fatal Truck Involvements

		Other vehicle							
		None		Factor coded		Unknown		Total	
		N	%	N	%	N	%	N	%
Truck	None	40	1.3	2,064	68.6	20	0.7	2,124	70.6
	Factor coded	550	18.3	273	9.1	19	0.6	842	28.0
	Unknown	4	0.1	16	0.5	21	0.7	41	1.4
	Total	594	19.8	2,353	78.3	60	2.0	3,007	100.0

Source: 1995 TIFA

Tables VIII-3 and VIII-4 show the most common driver-related factors coded for the truck driver and the other vehicle driver involved in a two-vehicle, truck/other vehicle fatal traffic crash in 1995. Up to three factors can be assigned to each driver. The three most common factors were the same for both truck drivers and other drivers. For truck drivers, the three most common factors coded were failure to keep in lane (10.9% of all factors), failure to yield (10.4%), and speeding (10.0%). The other driver was coded with failure to keep in lane (18.8%), failure to yield (15.0%), and speeding (12.7%). Note that the high proportion of failure to keep in lane for the other vehicle is consistent with the results in Table VIII-1 that showed head-on and opposite-direction sideswipes most often occurred

in the truck's lane. Note also that drowsiness or sleepiness is not included among the fifteen most frequently coded factors for truck drivers—though it is the eleventh most common (with 1.9% of all factors) among other vehicle drivers. Many researchers, however, feel that fatigue is underreported in crash data.

Table VIII-3 Driver-Related Factors for the Truck Driver
Two-Vehicle Truck-Other Fatal Involvements

Factor	N	%
Failure to keep in lane	159	10.9
Failure to yield	152	10.4
Speeding	146	10.0
Nontraffic violation	107	7.3
Failure to obey signs	103	7.1
Inattentive (talking, eating, etc.)	84	5.8
Other nonmoving violation	68	4.7
Erratic, reckless, careless	49	3.4
Following improperly	39	2.7
Improper turn	31	2.1
Stopping in roadway	28	1.9
Operating w/o required equipment	28	1.9
Wrong side of road	28	1.9
Improper lane change	26	1.8
Leaving vehicle unattended	24	1.6
Other	265	18.2
Unknown	123	8.4
Total	1,460	100.0

Source: 1995 TIFA

Table VIII-4 Driver-Related Factors for the Other Driver
Two-Vehicle Truck-Other Fatal involvements

Factor	N	%
Failure to keep in lane	717	18.8
Failure to yield	574	15.0
Speeding	487	12.7
Failure to obey signs	362	9.5
Inattentive (talking, eating, etc.)	265	6.9
Erratic, reckless, careless	189	4.9
Wrong side of road	144	3.8
Swerving due to slick road	109	2.9
Following improperly	97	2.5
Improper turn	79	2.1
Drowsy, sleepy	73	1.9
Other nonmoving violation	60	1.6
Improper lane change	55	1.4
Nontraffic violation	42	1.1
Passing with insufficient distance	35	0.9
Other	355	9.3
Unknown	180	4.7
Total	3,823	100.0

Source: 1995 TIFA

IX. A Look at Preliminary MCMIS Crash File Data

All States participating in the Motor Carrier Safety Assistance Program (MCSAP) were required to report qualifying truck and bus crashes to the MCMIS crash file beginning January 1, 1994. All fifty States and the District of Columbia reported truck and bus crashes for 1995. Some of the reporting States did not supply complete data for all records, and other States have not yet achieved full coverage. However, several States reported a substantial number of cases, and for a few, reporting appears to be substantially complete, supplying all NGA data elements on all qualifying crashes.

This section presents statistics on truck crashes derived from the 1995 MCMIS crash file. Data from twenty-four States have been selected to provide a preliminary look at MCMIS crash data. The States include Connecticut, New Hampshire, Vermont, Delaware, West Virginia, North Carolina, Georgia, Pennsylvania, Michigan, Illinois, Kentucky, Wisconsin, Missouri, Iowa, Nebraska, Kansas, Texas, North Dakota, Montana, Idaho, Utah, Wyoming, Oregon, and Hawaii. In these States, it appears that reporting of cases is close to complete. In addition, the selected States also provide broadly representative and geographically diverse coverage of the United States.

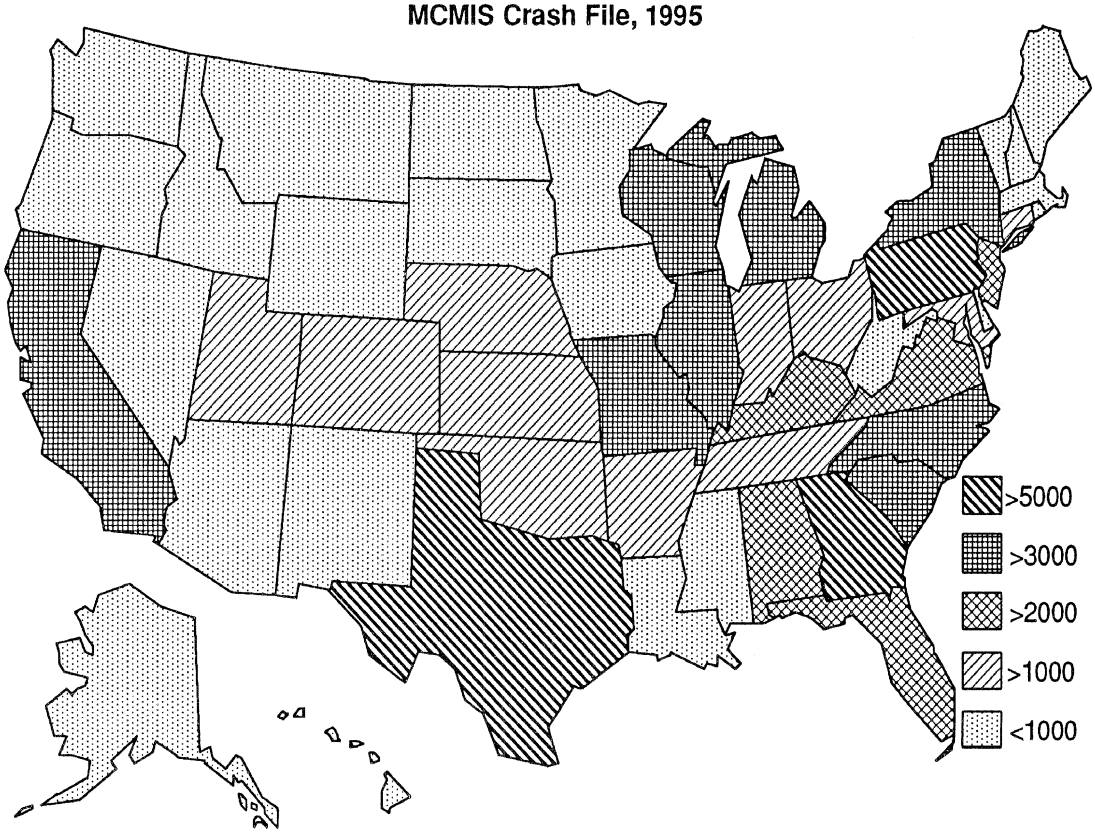
Only percent distributions are presented in this section. Frequencies are omitted so as not to mislead the reader that State crash reporting is currently complete. On the other hand, the States represented in this section account for over forty percent of the total number of cases expected in the MCMIS crash file when full reporting is achieved. They also broadly cover the diversity of the U.S. trucking industry, so it is likely that percentage distributions in the data elements are representative of truck crash involvements generally.

States reporting to MCMIS crash file

All States and the District of Columbia (figure IX-1) reported at least some crash data to the OMC for 1995, the second year of mandatory reporting. The data that States must report through the SAFETYNET reporting system are the National Governors' Association (NGA) crash data elements. These data elements were developed by the NGA in 1987-89. The Intermodal Surface Transportation Assistance Act of 1991 mandated that all States had to begin reporting NGA data elements on all truck and bus crashes to the OMC beginning January 1, 1994. In 1995 States reported a total of 94,864 cases.

Reporting NGA crash data elements by States replaced reporting by carriers to the OMC using the MCS 50-T (truck) and MCS 50-B (bus) forms. State-reported crash data will significantly improve the coverage of truck and bus crashes. The OMC 50-T and 50-B data were subject to the criticism that they were provided by the carriers themselves, and only carriers that operated in interstate commerce were required to report. Thus, coverage was incomplete. The MCMIS crash file includes all truck and bus crashes that meet the crash severity criteria, regardless of whether the vehicle is operated in interstate commerce. In addition, shifting reporting responsibility from carriers to the States will improve the census of truck and bus crashes.

Figure IX-1 Truck and Bus Crash Records
MCMIS Crash File, 1995



Vehicle configuration

The MCMIS crash file provides more detail about vehicle configuration, at least for trucks, than is available in the GES data while minimizing unknown configurations. Straight trucks can be separated from tractors and the bobtail tractor configuration distinguished from single-unit straight trucks. Table IX-1 shows the distribution of configuration type for fatal, injury, and towaway crashes. Note that configuration is unknown for about 10% of all truck involvements. Tractor-semitrailers were the primary configuration in all three crash types. About 62% of the trucks involved in fatal crashes in the selected States were tractor-semitrailers. The proportion was somewhat less for injury and towaway involvements. Straight trucks as a group (2-axle truck, 3-axle truck, and truck with trailer) account for about 30% of all crash involvements, tractors for about 60%, and the configuration is unknown for the remaining 10%. Bear in mind that these data are preliminary.

Table IX-1 Truck Configuration by Crash Severity
Selected States

Configuration	Fatal %	Injury %	Towaway %	All %
2-axle truck	11	13	12	13
3-axle truck	9	10	8	9
Truck with trailer	6	8	7	8
Bobtail tractor	3	3	3	3
Tractor-semitrailer	62	54	56	55
Tractor double trailers	3	2	3	2
Tractor triple trailers	0	0	0	0
Unknown	6	9	10	10
Total	100	100	100	100

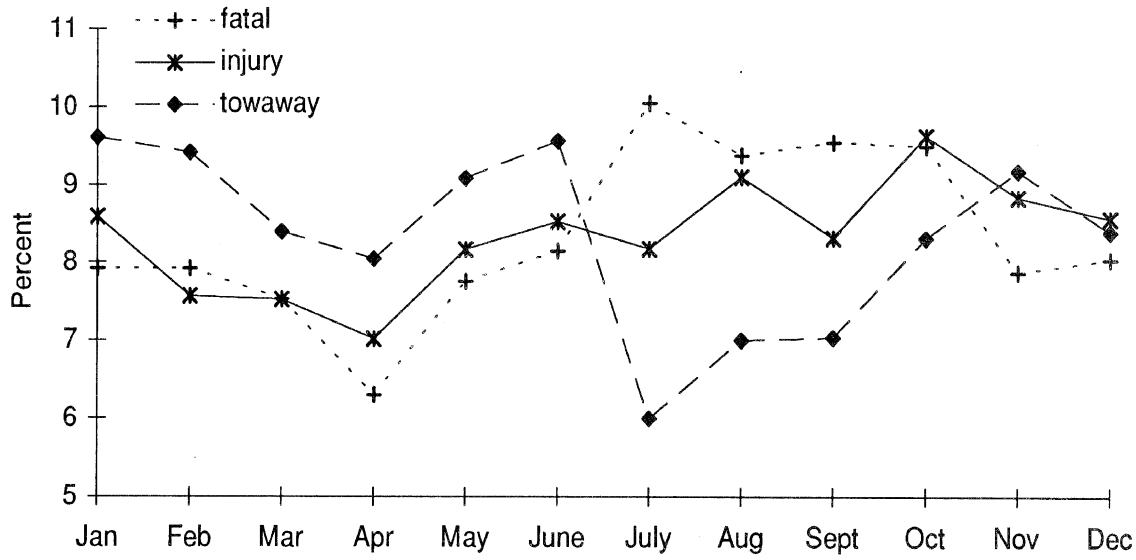
Source: 1995 MCMIS crash file

The MCMIS crash file vehicle type classification currently does not distinguish between school, transit, and intercity buses. In the data of the States selected for this preliminary look, buses accounted for about 9% of all vehicle-involvements reported. About 1% of the bus involvements were in fatal crashes, 65% in injury crashes, and the remaining 34% in towaway crashes. Of the truck crash involvements, about 3% were in fatal crashes, 54% in injury crashes, and 43% in towaway crashes. The remainder of this section deals only with truck involvements.

Truck involvements: Month and time of day

Just as was the case for the graph based on TIFA and GES data (figure III-1), there does not appear to be a strong seasonal pattern to the distribution of injury and towaway truck involvements in the MCMIS crash file data reported by the selected States (figure IX-2). However, there does seem to be some seasonality to the occurrence of fatal involvements, with a lower proportion in the late winter and spring, and a higher proportion in the late summer. This pattern is similar to that found in the TIFA data.

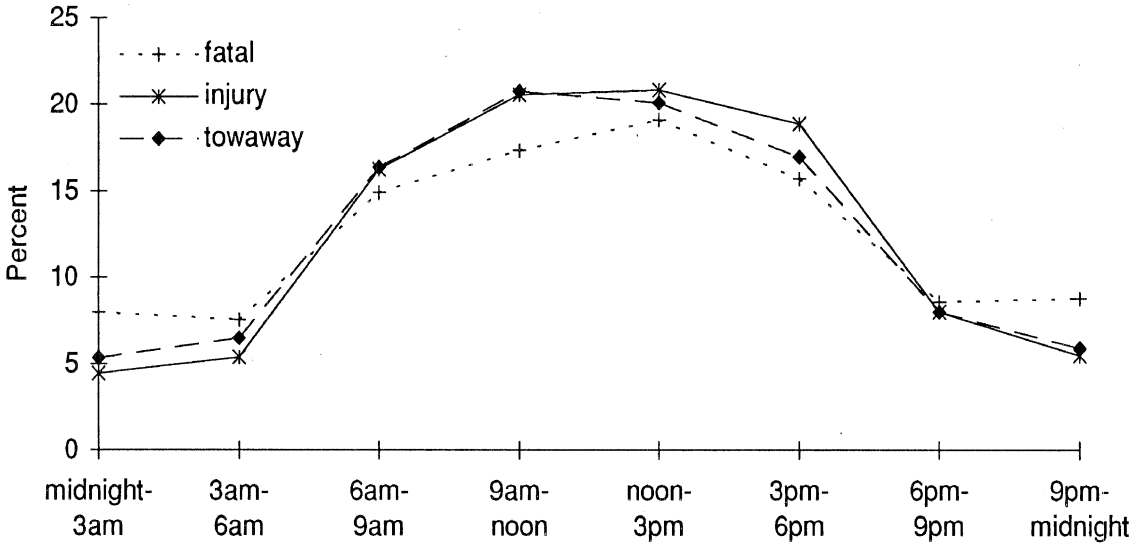
Figure IX-2 Month by Truck Crash Severity Selected States



Source: 1995 MCMIS crash file

The distribution of truck involvements by time of day for the selected States in the MCMIS crash file data is also similar to that for TIFA/GES (figure III-3 and figure IX-3). The proportion of nonfatal involvements (injury and towaway) was relatively low over night and rose during the day so that about 20% of involvements occurred during each succeeding three-hour block of time after 9 a.m. A higher proportion of fatal involvements than injury or towaway occurred over night, with between 8% and 9% of all fatal involvements occurring in each successive three-hour period between 6 p.m. and 6 a.m. The proportion of truck fatal involvements rose during the day, with about 19% of all fatal involvements occurring between noon and 3 p.m.

Figure IX-3 Time of Day by Truck Crash Severity Selected States

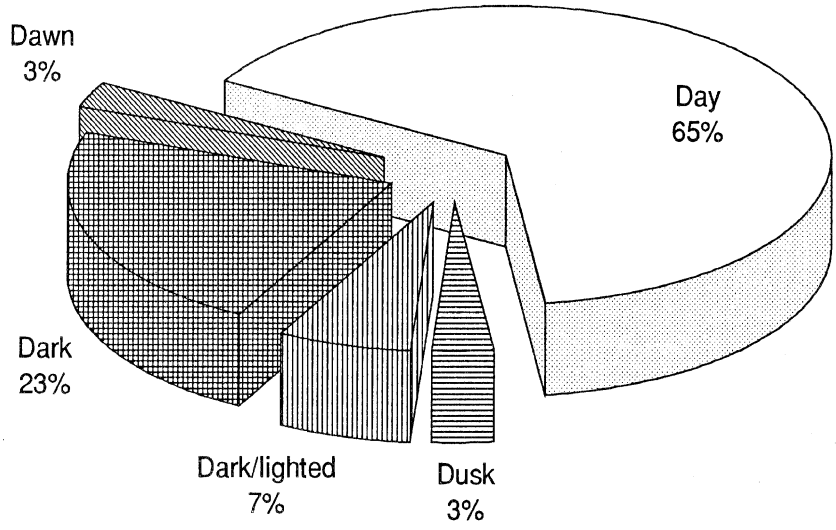


Source: 1995 MCMIS crash file

Light condition, weather, and road condition

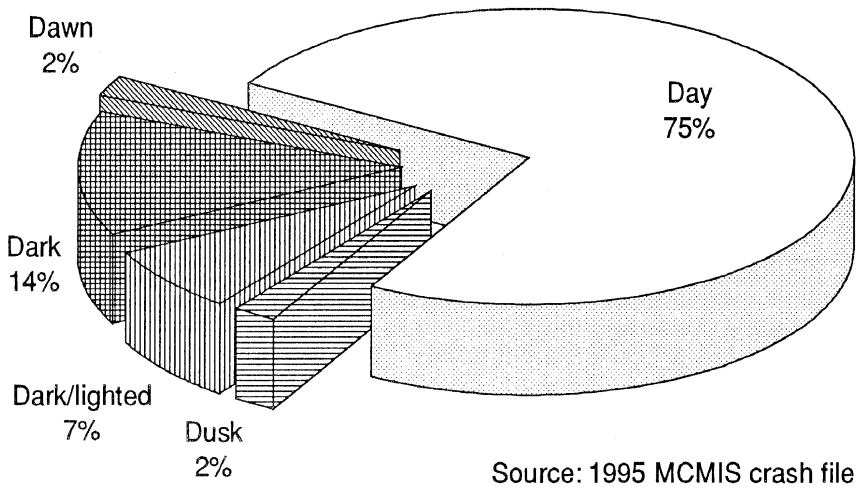
Figures IX-4 and IX-5 show the lighting for fatal and nonfatal truck involvements, as reported in the 1995 MCMIS crash file data for selected States. The proportions reported here are reasonably similar to those reported in figures III-4 and III-5, which are based on TIFA and GES data. Most truck crashes occur during the daylight hours, but a higher proportion of fatals occur during darkness, 23% to 14%. About the same proportion of fatal involvements occur in dark/lighted conditions as nonfatal involvements. These include involvements that occur on lighted urban streets and freeways.

Figure IX-4 Light Condition for Fatal Truck Crashes Selected States



Source: 1995 MCMIS crash file

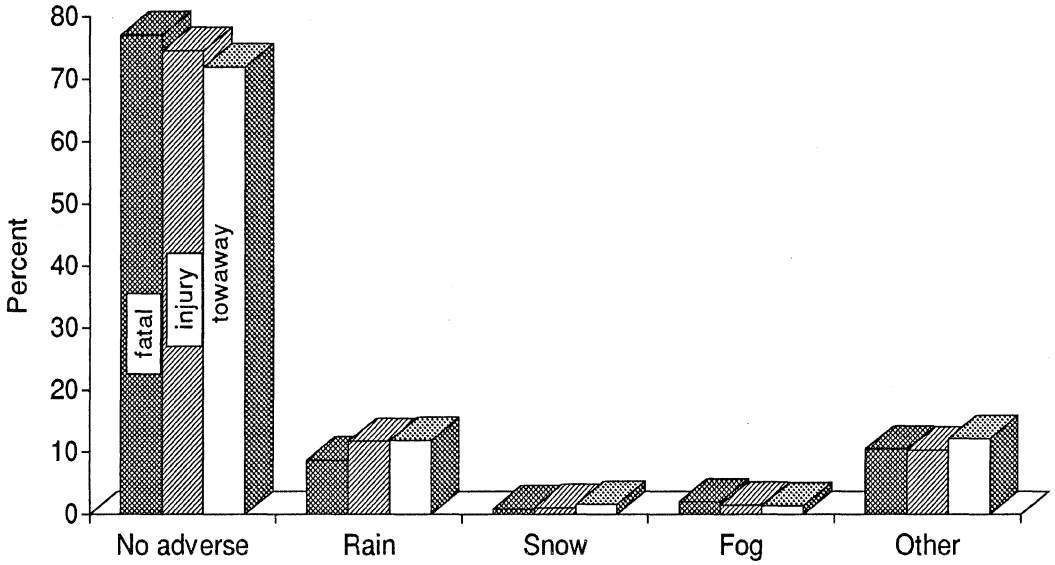
Figure IX-5 Light Condition for Nonfatal Truck Crashes Selected States



Source: 1995 MCMIS crash file

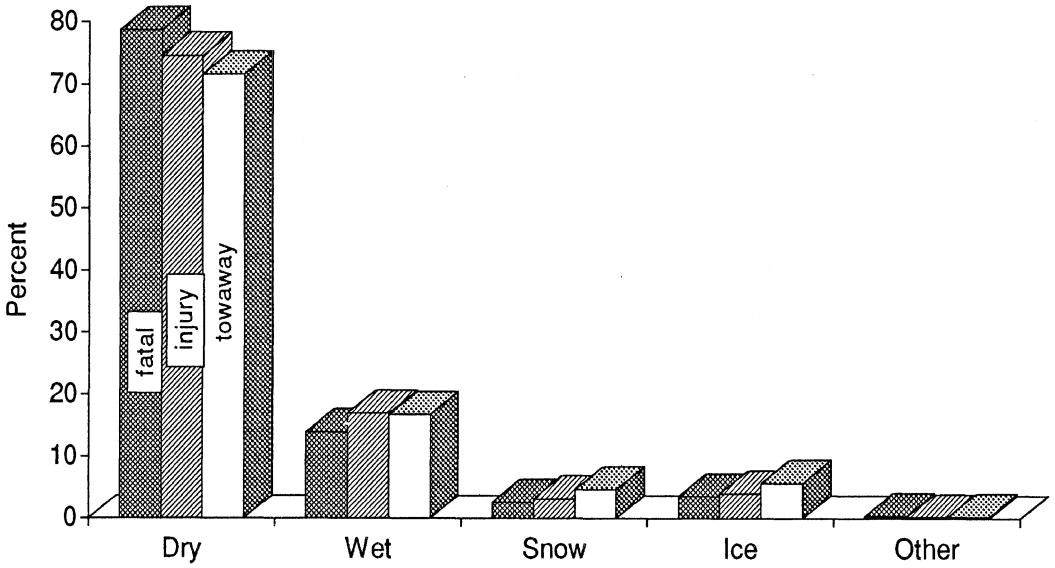
Figures IX-6 and IX-7 show weather and road condition by crash severity using MCMIS crash file data from selected States. These two figures are comparable to Tables III-3 and III-4, which used TIFA and GES data. Most crash involvements occur with no adverse weather conditions on dry roads. Fatal involvements are somewhat more likely to occur on dry roads than the other crash types.

Figure IX-6 Weather Condition by Truck Crash Severity
Selected States



Source: 1995 MCMIS crash file

Figure IX-7 Road Condition by Truck Crash Severity
Selected States



Source: 1995 MCMIS crash file

Glossary

Bobtail: A tractor operating without a trailer.

Bus: A passenger-carrying vehicle designed to seat at least sixteen people, including the driver.

Crash severity: A measure of traffic crash consequences in terms of the most severe injury produced by the event. See *injury severity.*

Crash: See *traffic crash*

Daily rental: Relevant in considering company type, a daily rental truck is one that has been rented for a short period of time, typically by a private individual for personal use.

Double: A combination vehicle consisting of a tractor pulling two trailers.

Ejection: Ejection occurs when a person is completely or partially thrown from the vehicle during the crash.

Fatality Analysis Reporting System (FARS): See page five in the Introduction.

Fatal crash: A crash in which the most serious event is one or more persons killed as a consequence of the crash. This includes any person involved in the crash, including pedestrians and bicyclists, as well as occupants of passenger cars, trucks, and buses.

Fatal involvement: The involvement of a vehicle in a fatal crash. The fatality does not necessarily occur in the vehicle.

For-hire carrier: A company that transports goods for hire. Examples include moving companies, parcel services, and truckload carriers.

General Estimates System (GES): See page five in the Introduction.

Gross combination weight (GCW): The gross combination weight of a vehicle is the sum of the weight of all units of the vehicle (power unit and any trailers) and the weight of any cargo carried.

Gross vehicle weight rating (GVWR): The gross vehicle weight rating is the sum of the rated weight-bearing capacity of the axles of the power unit.

Injury crash: A crash in which the most serious event is one or more persons transported for medical attention to injuries incurred in the crash. This includes any person involved in the crash, including pedestrians and bicyclists, as well as occupants of passenger cars, trucks, and buses. If there is a fatality in the crash, it is classified as a fatal crash, regardless of whether anyone was transported for medical attention.

Injury involvement: The involvement of a vehicle in an injury crash. The injury does not have to occur in the vehicle.

Injury severity: Injuries are classified as either A, B, or C:

A injury An incapacitating injury, other than fatal, that prevents a person from walking, driving, or normally performing the activities the person was capable of before the injury.

B injury A non-incapacitating injury that is visible or evident to observers at the scene of the crash.

C injury A possible injury that is reported or claimed, but which is neither incapacitating nor evident to observers at the scene of the crash.

Interstate carrier: A private or for-hire carrier that transports goods across State lines.

Intrastate carrier: A private or for-hire carrier that operates entirely within one State. An intrastate carrier does not transport goods across State lines.

Jackknife: Jackknife occurs in a multi-unit combination when the trailers rotate on their vertical axes with respect to the tractor in an uncontrolled fashion, often resulting in contact between the units and damage. In the case of a tractor-semitrailer, the combination folds up like a pocket knife.

Limited-access road: A road to which access is limited to certain points only. Interstate highways are limited access roads.

Major arterial: A U.S. or State numbered route which is not a *limited-access* highway.

MCMIS crash file: The Motor Carrier Management Information System is operated by the FHWA Office of Motor Carriers and contains safety data accumulated nationally on truck and bus operations and other related commercial entities, e.g., hazardous materials shippers. The data include those transmitted from the States and OMC field personnel through SAFETYNET and operation identification information provided by State and Federal offices and the motor carriers. The crash file in MCMIS contains the NGA crash data elements sent to the OMC by the States.

Multitrailer: A truck, either tractor or straight truck, operating with two or more trailers. A multitrailer combination is most often a tractor pulling two trailers.

NGA crash data elements: The set of 22 crash variables that the National Governors' Association (NGA) recommended that all State and local governments collect on each truck or bus involved in a highway crash.

The recommendations include definitions of truck and bus, and the definition of a qualifying crash based on outcome severity. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 mandated that States send this data to the OMC.

One-trailer: A truck, either tractor or straight truck, operating with one trailer. A one-trailer combination is most often a tractor pulling one semitrailer.

Other road: Any road which is not a *limited-access* road or a *major arterial.*

Passenger vehicle: Includes all automobiles and utility vehicles as well as vans and pickup trucks, which are increasingly used for personal transportation.

Private carrier: A private carrier uses its trucks to carry its own goods. Farms, construction companies, and grocery distributors are all examples of private carriers.

Rollover: Rollover occurs when the vehicle overturns. Rollover includes any number of quarter turns. A truck that turned onto its side would count as a rollover.

Rural: A rural area is any area not in an *urban* area.

SAFETYNET reporting system: The Office of Motor Carriers-developed computer-based system by which States and OMC field personnel report to OMC headquarters data on trucks and buses including crashes, roadside inspections, motor carrier compliance reviews, and enforcement actions. The crash data reported are the NGA crash data elements.

Semitrailer: A trailer pulled by a tractor, with one or more axles located toward the rear of the trailer. The trailer is connected to the tractor by means of a kingpin/fifth-wheel connection.

Single-unit: A truck with no trailer. These are primarily *straight trucks,* but also include some tractors operating without a trailer. See *straight truck* and *bobtail.*

Single: A combination vehicle consisting of a tractor pulling a semitrailer.

Straight truck: A power unit that includes a permanently mounted cargo body (e.g., a dump truck).

Towaway crash: A crash in which there is no fatality or injury but one or more involved vehicles towed from the scene due to disabling damage from the crash. Disabling damage is damage that renders the vehicle unsafe to drive under the conditions. A crash that involves either a fatality or an injured person transported for immediate medical attention is classified as a fatal or injury crash, respectively.

Towaway involvement: The involvement of a vehicle in a towaway crash, whether the vehicle itself is towed or not.

Tractor: A heavy truck, with little or no cargo-carrying capacity, designed to pull semitrailers and full trailers.

Traffic crash: An unintended traffic event involving motor vehicles in transport on public roads that includes at least one harmful event. In this document, all traffic crashes conform to the MCMIS crash file reporting threshold, with at least one of the following:

- one or more persons killed as a result of the crash
- one or more persons transported from the scene for immediate medical attention
- one or more vehicles towed from the crash as a result of disabling damage sustained in the crash

Triple: A combination vehicle consisting of a tractor pulling three trailers, most often a semitrailer and two full trailers.

Truck configuration: A classification of the combination of power unit type and number of trailers. See *single, double,* and *straight truck.*

Truck: A cargo-carrying vehicle with at least two axles and six tires. Includes tractors as well as straight trucks. Excludes buses, motorhomes, and farm and construction equipment not designed to carry cargo on public roads.

Trucks Involved in Fatal Accidents (TIFA): See page five in the Introduction.

Urban: An area with a population of 5,000 or more whose boundaries are fixed by State and local authorities and approved by the Federal Highway Administration. The boundaries do not necessarily correspond to political boundaries.

Technical Appendix

GES sample design

The police accident reports (PARs) from which the GES data are coded are a probability sample of police-reported crashes that occurred in the United States. Since each crash had a chance of being selected, the design makes it possible to compute not only national estimates but also probable errors associated with the estimates.

The selection of the sample of PARs for the GES sample was accomplished in three stages. The first stage is a sample of geographic areas, called Primary Sampling Units (PSUs), from across the United States. A PSU is either a central city, a county surrounding a central city, an entire county, or group of contiguous counties. The U.S. was divided into 1,195 of these PSUs. The PSUs were then grouped into 12 categories according to the following geographic regions and types of PSUs:

- Geographic region—Northeast, South, Central, and West
- Type—Large Central City, Large Suburban Area, All others

The second stage of selection is a sample of police jurisdictions within the geographic areas. In most areas, the number of police jurisdictions is more than can be reasonably visited by a data collector. All jurisdictions within a PSU were enumerated and the number of crashes investigated by each was determined. A probability sample of jurisdictions within each PSU was selected with probability proportional to the number of crashes investigated. That is, as the number of crashes investigated increased, the probability of selecting that jurisdiction increased. An average of six or seven police jurisdictions are selected within each area.

The third and final stage of the sample is the selection of PARs within the sample police jurisdictions. The GES data collectors make weekly, biweekly, or monthly visits to each of the jurisdictions in the sample. During the visit, the data collectors list all PARs not previously listed. The PARs are grouped, or stratified, into four groups:

- Group 1. All crashes involving a towed passenger vehicle (i.e., a passenger car, light truck, or van, but no medium or heavy trucks)
- Group 2. All crashes involving a medium or heavy truck and where at least one passenger vehicle was towed or an involved person was injured

- Group 3. All crashes not involving a towed passenger vehicle or medium or heavy truck, but in which an involved person was injured

- Group 4. All other crashes

Within each of these groups a systematic sample of crashes is selected, based on different sampling ratios. In some very large police jurisdictions the number of police-investigated crashes is too large for reasonable listing. In these jurisdictions the data collector will list a subsample of PARs, with those listed depending on the Police Accident Report Number.

The data collector obtains copies of the selected PARs and sends them to a central contractor, who extracts the required data, codes them into a common format and enters the data into an electronic file. In 1995 53,749 PARs were sampled.

GES estimates

In order to calculate estimates of national characteristics, cases from each selected sample PAR must be weighted to reflect their probability of selection. Because there are three stages in the GES sampling process, the sample weight is the product of the inverse of the probability of selection at each of these stages. These sample weights are appended to the record for that sample PAR in the electronic data file. By summing the sampling weights for each PAR on the electronic data file that have a certain characteristic, an estimate of the National total for the characteristic can be produced.

Estimates of accuracy

The national estimates produced from GES data may differ from the true values, because they are based on a probability sample of crashes and not a census of all crashes. The size of these differences may vary depending on which sample of crashes was selected. The standard error of an estimate is a measure of the precision or reliability with which an estimate from this particular GES sample approximates the results of a census.

It is impractical to compute and provide a standard error for each estimate in the *Factbook*. Instead, generalized standard errors for estimates of totals are provided in the following table. Generalized standard errors are shown for crash characteristics, vehicle characteristics, and people characteristics. The generalized errors were produced separately for the crash, vehicle, and people estimates using three steps:

1. The standard errors for selected estimates in the report were calculated using a Taylor series approximation.

2. An equation that best fit these standard errors was found using regression techniques.

3. Approximate standard errors were generated from this equation and the generalized errors shown in the table were produced.

The table lists several representative estimated population values and an estimate of one standard error for that value derived from 1995 GES data. By adding and subtracting one standard error to the associated estimate, approximate 68% confidence intervals for an estimate can be created. For example, the estimated number of trucks involved in traffic crashes in 1995 is given in table II-2 as 129,000. To calculate one standard error for this involvement estimate, use the column headed "vehicles" in the table. Since the figure 129,000 does not appear in the column, use linear interpolation from the standard error values for 120,000 and 130,000. One approximate standard error would be 9,900 + 630 = 10,530. The 68% confidence interval for this estimate would be 129,000 ± 10,530 or 118,470 to 139,530. Twice the standard error gives approximately the 95% confidence interval. For the number of trucks involved in traffic crashes in 1995, the 95% confidence interval would be 107,940 to 150,060.

More information on standard error estimates can be obtained from the National Center for Statistics and Analysis in the National Traffic Highway Safety Administration.

Standard errors for estimates of accidents, vehicles, and people from 1995 GES file

	Standard errors		
Estimate	accidents	vehicles	people
1,000	400	400	400
2,000	600	600	600
3,000	800	700	700
4,000	900	900	800
5,000	1,000	1,000	900
10,000	1,600	1,600	1,400
15,000	2,100	2,000	1,900
20,000	2,600	2,500	2,300
25,000	3,000	2,900	2,700
30,000	3,500	3,300	3,100
35,000	3,900	3,800	3,400
40,000	4,300	4,200	3,800
45,000	4,700	4,500	4,100
50,000	5,100	4,900	4,500
60,000	5,900	5,700	5,100
70,000	6,600	6,400	5,800
80,000	7,400	7,100	6,400
90,000	8,100	7,800	7,100
100,000	8,800	8,500	7,700
110,000	9,500	9,200	8,300
120,000	10,300	9,900	8,900
130,000	11,000	10,600	9,500

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