Center for
National Truck Statistics

TRUCKS INVOLVED IN FATAL ACCIDENTS

FACTBOOK 1990

Kathleen P. Sullivan

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UMTRI
The University of Michigan
Transportation Research Institute

UMTRI-93-1

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Ann Arbor, Michigan 48109-2150

The research reported herein was conducted under general research funds provided by the American Automobile Manufacturers Association and the American Trucking Associations. The opinions, findings, and conclusions expressed in this publication are not necessarily those of the AAMA or ATA.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
UMTRI-93-1		

4. Title and Subtitle	5. Report Date
TRUCKS INVOLVED IN FATAL ACCIDENTS, 1990 FACTBOOK	April, 1993
	6. Performing Organization Code
7. Author(s) Kathleen P. Sullivan, Dawn L. Massie	8. Performing Organization Report No. UMTRI-93-1
9. Performing Organization Name and Address The University of Michigan Transportation Research Institute 2901 Baxter Road, Ann Arbor, Michigan 48109-2150	10. Work Unit No.
	11. Contract or Grant No. 3164
12. Sponsoring Agency Name and Address American Automobile Manufacturers Association 7430 Second Avenue, Suite 300 Detroit, Michigan 48202	13. Type of Report and Period Covered Final Report
	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This report contains a series of distributions of variables from UMTRI's file of Trucks Involved in Fatal Accidents, 1990. This file combines the coverage of the Fatal Accident Reporting System (FARS) data with the detail of the Office of Motor Carriers (OMC) data. When no OMC report existed for a medium or heavy truck listed by FARS, UMTRI conducted a telephone interview to obtain the desired information on ownership, type of trip, vehicle configuration, cargo weights, and lengths. The 1990 TIFA dataset contains 5,003 cases, down 5.4% from the 5,288 in 1989.

Following an introductory section on the TIFA survey procedure, a trend section tracks the incidence of large truck fatal involvements from 1980, the initial data year of TIFA, through 1990. The next section provides an overview of the fatal involvements in 1990, with most of the distributions presented on the basis of power unit type, comparing straight trucks with tractor combinations. Most of the variables in the overview section are based on the FARS file variables and describe basic information on the time and place of the accident, environmental conditions, and collision type. Following this is a pair of sections that focus separately on straight trucks and tractor combinations in more detail, with the distributions presented on the basis of cargo body style. The majority of the variables in these sections were derived from telephone interviews and OMC reports and describe the cargo type, cab style, vehicle weight, and trailer and axle configurations of the trucks. The final section compares the fatal accident experience of tractor-semitrailers with that of tractors with twin trailers, and discusses the fatal accident involvement of longer combination vehicles (LCVs).

17. Key Words	18. Distribution Statement
Medium trucks, heavy trucks, fatal accident data, power unit type, cargo body style.	Unlimited

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
None	None	126	

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TIFA Summary Facts and Figures

- From 1980 through 1990, 56,945 medium and heavy trucks were involved in fatal accidents. This is an average of 5,177 fatal involvements per year.
- The total number of fatal involvements for large trucks in 1990 was 5,003, compared with 5,288 in 1989, a decrease of 5.4%.
- 3,496 (69.9%) of the large trucks involved in fatal accidents in 1990 had a tractor as the power unit, and 1,498 (29.9%) were straight trucks.
- Tractor-semitrailers were involved in 3,066 fatal accidents in 1990. Doubles (tractors hauling a semi and a full trailer) were involved in 195 fatal accidents. Triples were involved in two fatal accidents[1] in 1990.
- A total of 9,861 vehicles were involved in large-truck fatal accidents in 1990.
- These accidents resulted in 5,620 fatalities, 595 (10.6%) of whom were truck drivers.
- The 1990 figure for fatally injured truck drivers represents a 20% decrease from the 1989 total and a drop of 36% since 1980.
- About 62% of all of the 1990 large-truck fatal involvements occurred during the daytime, 34% at night, and 4% during the dawn and dusk periods.
- 26% of the 1990 fatal accidents occurred on limited access highways, 54% on major arteries, and 19% on other classes of roads.
- The road surface was wet in 16% of the 1990 fatal accidents and covered with snow or ice in 4%.
- 64% of the 1990 fatal involvements took place in rural areas, compared with 36% in urban areas.
- Of all the large-truck fatal involvements in 1990, 24.5% occurred at intersections.

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[1] There were three cases with three trailers in the 1990 TIFA file; two were triples, and the other was a heavy equipment hauler with a jeep, lowboy, booster dolly combination.

INTRODUCTION

In 1981 UMTRI initiated a survey of all large trucks involved in fatal accidents in the continental United States, with 1980 being the initial year covered. The survey combines information from the Fatal Accident Reporting System (FARS) of the U.S. Department of Transportation National Highway Traffic Safety Administration (NHTSA) with data from the Federal Highway Administration Office of Motor Carriers (OMC) MCS 50-T report, state police accident reports, and comprehensive follow-up telephone surveys conducted by UMTRI research staff to produce the datafile called Trucks Involved in Fatal Accidents (TIFA). The TIFA survey has been conducted continuously since 1981 and is currently complete for accident years 1980 through 1990. The dataset provides detailed descriptions of all medium and heavy trucks (greater than 10,000 pounds gross vehicle weight rating) involved in fatal accidents. Fire trucks are excluded from the file, as are passenger vehicles, such as buses and ambulances.

Survey Methodology

TIFA covers all medium and heavy trucks included in the public version of the FARS file. The TIFA dataset contains virtually all of the FARS variables—the accident variables, the vehicle variables (for the truck), and the occupant variables (for the driver of the truck). All variables are at the *vehicle* level; that is, there is one record for each truck involved. The information on trucks supplied by FARS is limited to make, model year, and configuration. The FARS variables contain no information on cargo body style, cargo type and weight, or the weights of any of the units. In addition, there are some configurations that FARS does not identify accurately. Therefore, an additional set of variables in the TIFA file contains the more detailed description of the vehicle and its cargo that is on the OMC MCS 50-T report. Interstate carriers of goods are required to file reports with OMC on accidents resulting in injury treated away from the scene or in property damage of at least $4,400. For FARS cases without an OMC report, a follow-up telephone survey is conducted to collect a detailed physical description of the involved truck. The questions cover most of the information reported on the MCS 50-T form. It is the objective of the TIFA survey to obtain the detail of the MCS 50-T information for all large trucks involved in fatal accidents, not just those operated by interstate motor carriers and reported to OMC.

The survey procedure (illustrated in the flow chart on the next page) begins by matching OMC fatal accident reports with FARS cases. In all instances where a computerized match is made, the vehicle description variables from the OMC file are picked up and added to the data already in the FARS file, producing a much fuller record for each event. The FARS/OMC matched cases then proceed directly to Consistency Checking, where a set of computerized algorithms check for the total consistency between elements in each individual dataset. If inconsistencies are found in the vehicle description—for example, a vehicle coded as empty but with a high gross weight—the case is reviewed by an editor. If the editor cannot resolve the discrepancy, the case is sent to Interviewing for follow-up calls to gather direct information about the vehicle. Police accident reports (PARs), which are obtained from the states for all large trucks involved in fatal accidents each year, provide the names of individuals to contact for further information. The additional data are added to the record, and it is forwarded to Editing. If all conflicting information can be reconciled, the record is again sent to Consistency Checking and, if passed, added to the TIFA database. In addition to the consistency checking, all OMC cases of double and triple trailers are verified through examination of police accident reports and, if necessary, phone interviews.

For cases that cannot be matched, the OMC reports are discarded, and the FARS report is used as the base for creating a complete record by means of a telephone interview. The FARS cases are matched with PARs, and telephone interviews are then conducted to obtain company and vehicle descriptions of the trucks. Interviewers begin by attempting to contact the owner of the vehicle as listed in the police report. If that fails, they try to reach the driver, the investigating police officer, or the tow truck operator if the vehicle was towed from the scene. If no knowledgeable respondent can be found, as much information as possible is coded from the police report. Extensive editing and consistency checking are performed on all information obtained by interview. The typical case will go through the Interviewer/Edit/Consistency Check loop more than once. It is rare that a case is sufficiently developed to proceed directly to the TIFA file with only one interview.

TIFA CASE FLOW

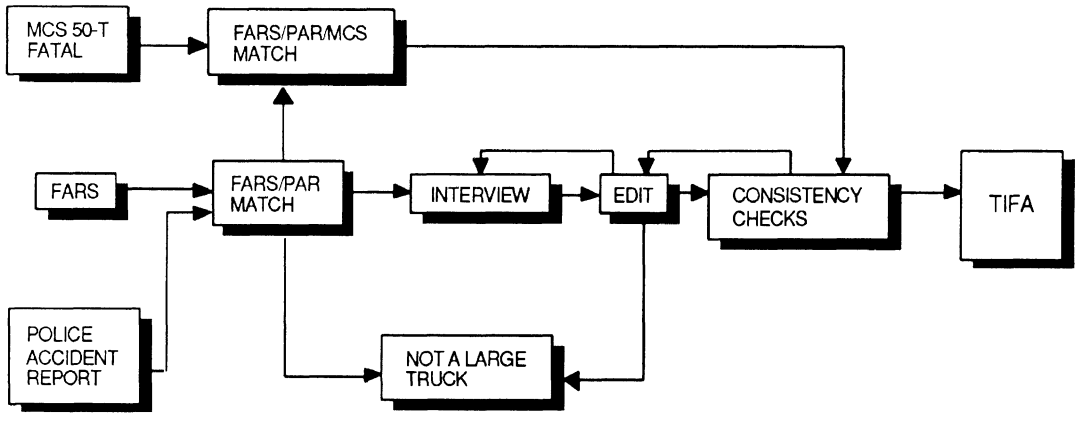

Figure 1-1

Part of editing and consistency checking involves decoding the Vehicle Identification Number (VIN) from every PAR and FARS record to confirm that the make and model information and the power unit description are consistent with published model specifications. In addition, Edit Data Lists, which are UMTRI-developed editing manuals, are used to evaluate information obtained from interviews to ascertain the accuracy of the reporting, especially concerning the types of freight hauled, the necessary equipment, and the typical hardware configurations used under such conditions. UMTRI has also developed a database on cargo weights and densities so that a cargo weight can, if necessary, be computed from information on cargo type and volume. The scrutiny to which each case is subjected assures the internal consistency of the information in the final product, TIFA itself. The use of multiple sources of information for the same accident permits a deeper level of description and greater confidence in the accuracy of the file. A prime benefit of this procedure is that the level of missing data in TIFA is on the order of 1-2% for most specific factors of interest, an exceptionally low rate for this kind of data.

Sampling and the 1990 File

The 1990 version of TIFA is the fourth that is not a census of all cases. Stratified random sampling was done among the two most common truck configurations to limit the number of cases to be interviewed, while preserving the representation and accuracy of a census file. Accordingly, after the FARS cases were matched with the OMC cases, and after nonsample vehicles were removed from the file, sampling was done on cases that the FARS configuration variables showed to be either a straight truck with no trailer or a tractor pulling a semitrailer. These two vehicle types are the two most common configurations, as well as the configurations most likely to be identified accurately in FARS. After sorting to ensure even coverage across the accident year, an interval selection procedure was employed within each accident state to select every other case. As a result, all cases matched with OMC are included in the file, as well as all cases that, from the FARS coding, did *not* appear to be a straight truck or a tractor-semitrailer. These cases have a weight of one. Half of the unmatched straight trucks and tractor-semitrailers (as identified from FARS coding) were selected for the survey and have a weight of two.

Confidence intervals were calculated for population estimates from the 1990 file in two ways. The first took into account the fact that the file is a stratified random sample. The 95% confidence intervals for population proportions are very tight. For example, the proportion of cases in urban areas is 35.6% ± 1.6. The proportion of cases with fires is 4.4% ± 0.7. Six other representative proportions were checked. The widest confidence interval for any of the proportions was ± 1.6%.

Confidence intervals were also calculated using a technique that treats the 1990 file *as if* it were a census file, or a simple random sample of all 5,288 cases.[2] The confidence intervals for the stratified random sample are only about 23% wider than they would have been had all the cases been taken. For example, the 95% confidence interval for the proportion of urban cases would have been ± 1.3 rather than ± 1.6. It is to be expected that sampling would produce somewhat wider confidence intervals, since there is a smaller number of cases, but the difference is not large. The confidence intervals calculated by these two techniques indicate that the limited sampling performed has only a negligible effect on the accuracy of estimates derived from the 1990 file.

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[2] Calculating confidence intervals for census data is appropriate and frequently done. It is true that if the proportion of urban accidents in a census file from a particular year is 0.32, then that is the proportion of urban accidents for that year. But in another sense, interest typically is not narrowly in any particular year of accident data but in the relationship between certain factors and the probability of an accident. In that sense, any particular accident year constitutes a sample of accidents, so confidence intervals are properly calculated for the resulting estimates. The point of calculating confidence intervals for the sample actually taken and confidence intervals as if all accidents were taken is to see whether the sampling significantly degrades our ability to discern relationships in the factors of interest. Since the accuracy of the population estimates from the sampled file is comparable to that which would have been obtained had no sampling been done, we can safely assume that the effects of sampling are not significant. Similarly, the estimates calculated from the 1990 file are comparable to figures from previous TIFA files.

Conventions Followed

Most of this Factbook concerns the 1990 TIFA file, which was the fourth year in which sampling was conducted. All of the statistics presented in this document for 1990 are based on *weighted* frequencies from the file. Therefore, the 1990 figures reflect estimates of the total population based on the sampling technique used, not the actual number of cases contained in the file. Figures quoted for the years 1980-1986 were derived from census files and are identical to the number of cases in the files. Annual fatality trends for the years 1980-1990 are presented in the next section.

The majority of the comparisons presented in this report are made according to power unit type or configuration. The 1990 TIFA file contains 92 cases of unknown power unit type. Most of these are cases that could not be matched with OMC reports, and we were unable to contact any knowledgeable respondent during the interview process. In order to reduce the number of unknowns for the purposes of the Factbook, the FARS coding of power unit type was accepted for those cases coded as unknown in the TIFA file. This reduces the number of unknowns from 92 to 9. Power unit type comparisons are made for straight-trucks versus tractor combinations, with the nine unknown cases excluded, in the section entitled *Overview of Large-Truck Accident Involvements in 1990.* The same definition of power unit type is used in the separate straight-truck and tractor sections, where most of the comparisons are based on cargo body style.

In several places in the Factbook, large trucks are classified according to configuration type. The configuration type classifications are based solely on TIFA variables, not FARS variables, and so include 92 cases of unknown power unit type. Straight trucks are split into single units versus those hauling one trailer. Tractors are divided into bobtails, tractor-semitrailers, and tractor-semitrailer full-trailer combinations. There is no category for triples (tractors hauling a semitrailer and two full trailers) because there were only two triples involved in fatal accidents in 1990. An "other" category includes the triples as well as tractors hauling trailer types other than a semitrailer or a semitrailer and a full trailer, and trucks towing or piggybacking other vehicles. The configuration type variable also includes an "unknown" level. The configuration type classification is used in the *Trends in the TIFA Data, 1980-1990* section, the geographic distributions portion of the *Overview* section, and the *Multiple-Trailer Fatal Accident Involvements in 1990* section. The power unit type coding from FARS, with nine cases unknown, is used throughout the remainder of the Factbook.

The usual procedure in the Factbook is to illustrate distributions of variables with both tables and graphs. The tables all include missing data for the particular variables. Since most of the missing data rates are low, the missing data have usually been excluded when graphing the distributions. This facilitates visual comparisons of the distributions and enables a clearer graphic presentation. Unless stated otherwise, the unit of analysis is the vehicle; that is, the number of *trucks* involved in fatal accidents.

TRENDS IN THE TIFA DATA, 1980-1990

The eleven years of data currently contained in the TIFA files allow for the analysis of trends in large truck fatal involvements. This section contains graphs illustrating these trends for all fatal truck involvements, all fatalities, and truck driver fatalities. The graphs are presented for all large trucks together, and separately for each of the five main configurations. These include straight trucks alone, straight trucks hauling a single trailer, bobtails (tractors alone), singles (tractor-semitrailers), and doubles (tractors hauling a semi and a full trailer).

Annual Fatal Involvements

The number of large trucks involved in fatal accidents has varied only slightly from year to year since 1980. The lowest number of involvements, 4,719, occurred in 1982. This dip corresponds with the recession at the beginning of that decade. The yearly total increased steadily after that, reaching 5,394 in 1985. Instead of continuing to rise as might be expected, the total remained relatively flat for several years, then dropped 8.5% from the 1988 total of 5,467 to 5,003 in 1990.

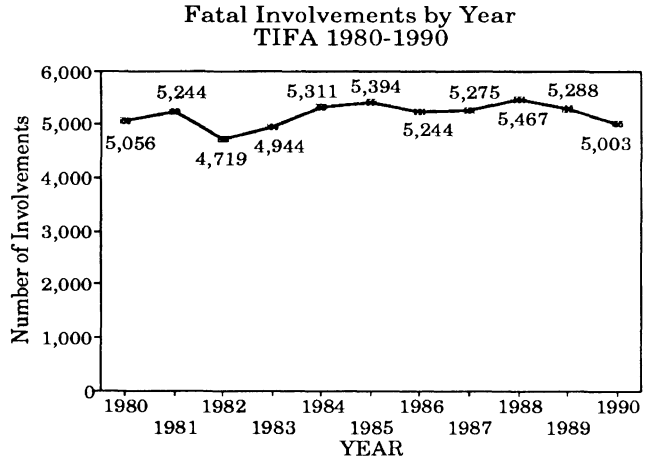


Figure 2-1

The next five graphs depict the annual number of fatal involvements for each of the five main large-truck configurations.

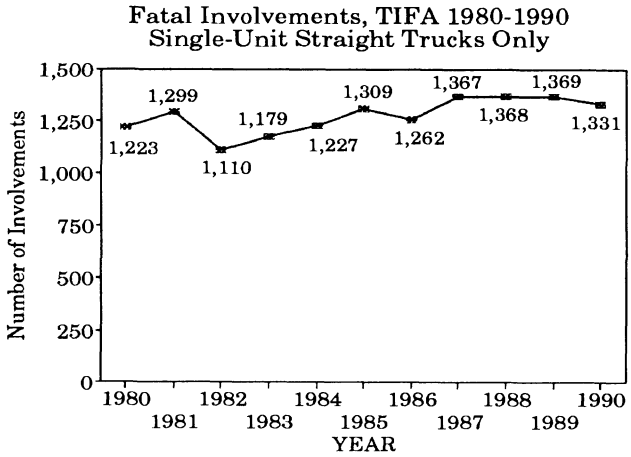


Figure 2-2

Single-unit straight-truck involvements correspond closely to the overall trend. While the 1990 figure of 1,331 is 8.1% higher than the 1980 figure, it is a decline of 2.8% from the previous year.

While the lowest number of fatal involvements overall occurred in 1982, this had been the peak year for fatal accidents involving straight trucks with one trailer until 1988. The current year, 1990, is the new peak - 8.9% greater than 1988. This configuration type, however, comprises a very small proportion of the large-truck population.

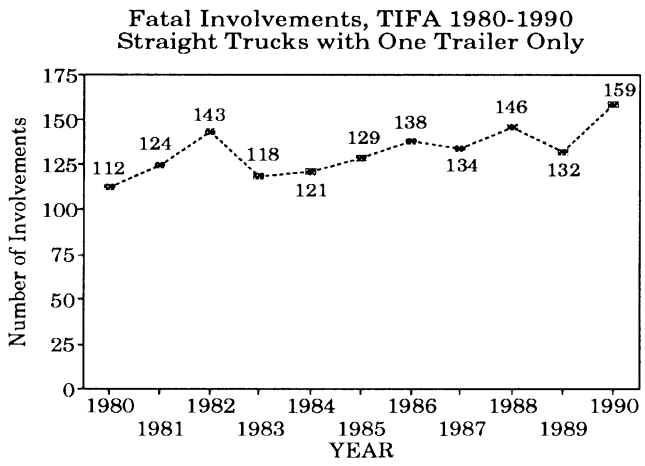


Figure 2-3

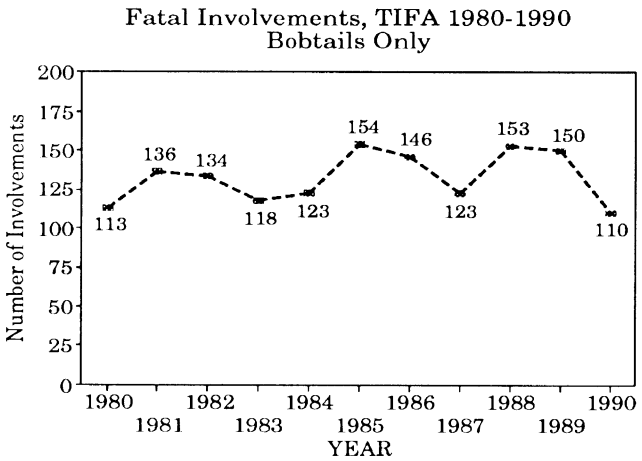


Figure 2-4

Bobtails similarly account for only a minor number of large truck fatal involvements each year. The peak number of bobtail involvements, 154, occurred in 1985. The lowest number of involvements, 110, occurred in 1990. This figure was 26.7% lower than the 1989 total of 150.

The eleven-year trend for tractor-semitrailer involvements closely mirrors the overall trend. This is not surprising since this configuration accounts for a majority of all medium and heavy trucks. The 3,066 involvements in 1990 represent a drop of 6.7% from 1989.

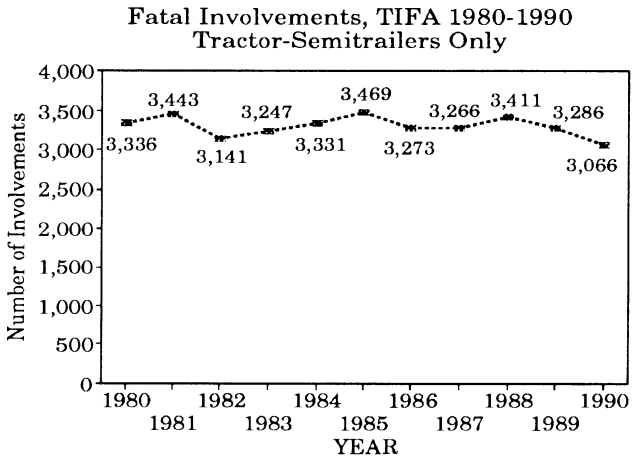


Figure 2-5

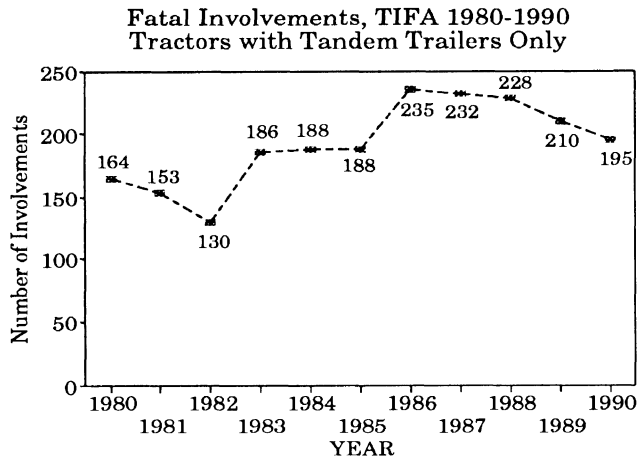


Figure 2-6

The number of fatal involvements for doubles rose over the period 1982-1986 and has been gradually declining since then. The 1990 figure of 195 represents a drop of 7.1% from the previous year.

Annual Fatalities

The trend for the annual number of fatalities resulting from accidents involving large trucks closely corresponds to the trend for the annual number of involvements. The peak year for fatalities was 1988 with 6,100, and the low year was 1982 with 5,295. The number of fatalities in 1990 was 5,620, a decrease of 5.1% from the previous year. The 1990 total is slightly lower than the figure for 1980.

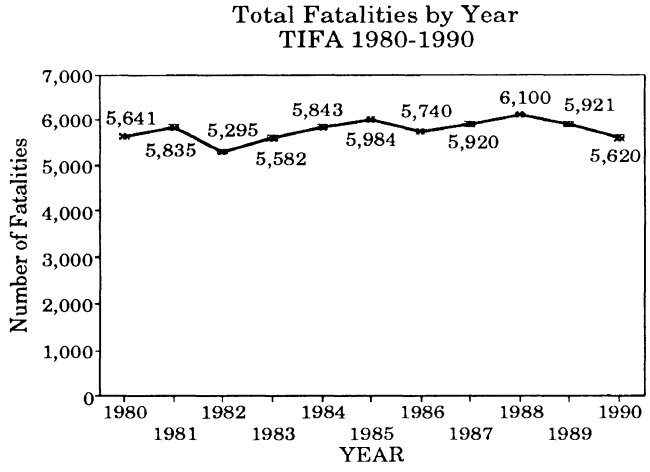


Figure 2-7

The following series of graphs illustrates yearly fatalities for each of the five truck configurations.

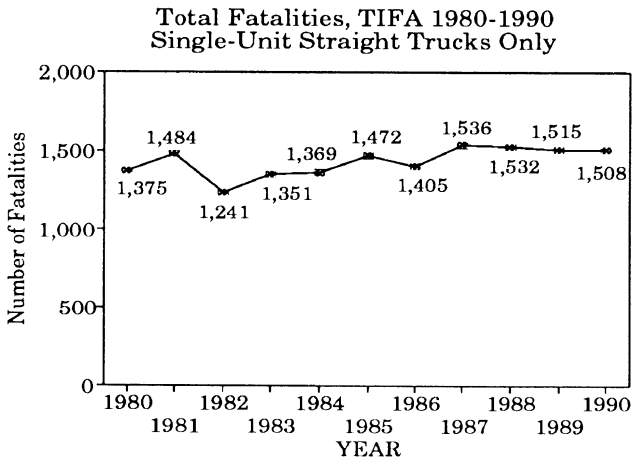


Figure 2-8

The number of fatalities resulting from straight-truck accidents rose 9% between 1986 and 1987, and has remained virtually unchanged since then. In 1990 the total was 1,508, a 1.8% decrease from the 1987 figure.

The annual number of fatalities resulting from accidents involving straight trucks with one trailer has ranged from 132 in 1984 to 189 in 1990. The 1990 total was a 22% increase from the previous year.

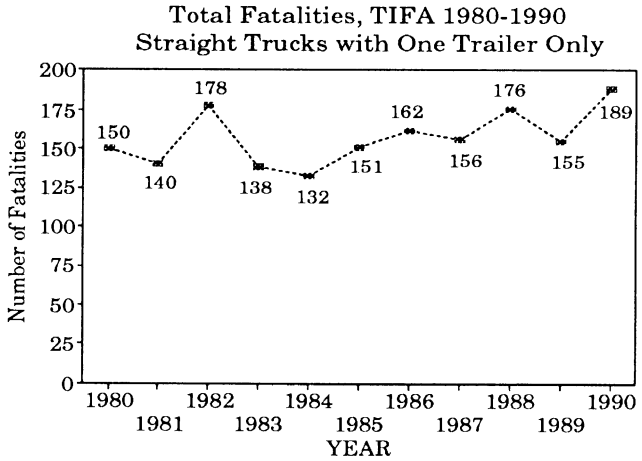


Figure 2-9

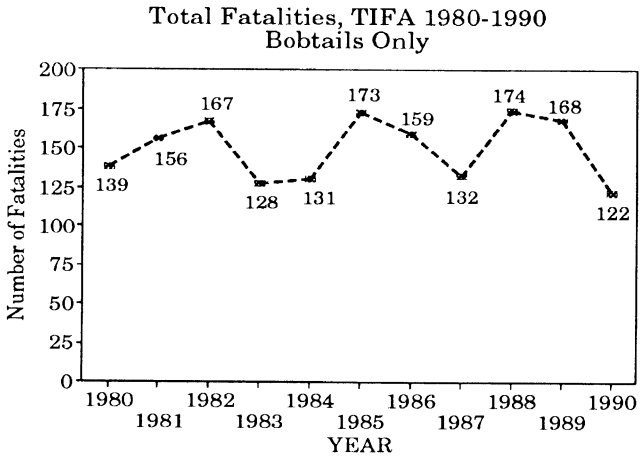


Figure 2-10

In 1990, the number of fatalities resulting from bobtail involvements was 122, a decrease of 27.4% from 168 in 1989, and the lowest in the eleven years of data.

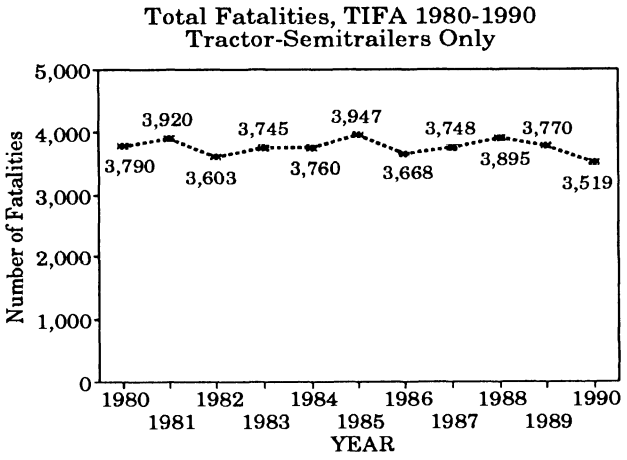


Figure 2-11

The number of fatalities resulting from singles involvements has remained relatively stable throughout the decade. The 1990 figure of 3,519 fatalities represents a drop of 6.7% from 1989 and a decline of 10.8% from the peak year of 1985.

In contrast, fatalities resulting from doubles involvements clearly increased during the eleven years. This corresponds with the increased reliance on doubles and the higher number of fatal involvements they have experienced. After reaching a peak in 1986, the total number of fatalities has dropped slightly in the subsequent years. The 1990 figure of 233 fatalities represents a drop of almost 15% from the 1986 total.

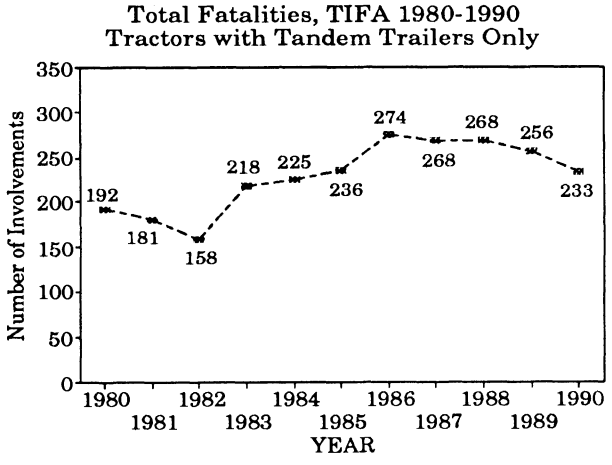


Figure 2-12

Annual Truck Driver Fatalities

While the annual trends for fatal involvements and total fatalities closely resemble each other, the trend for truck driver fatalities is quite different. Despite a fairly constant number of annual involvements from 1984 through 1990, the number of truck driver fatalities has shown a general decline during this time period. The 1990 figure of 595 represents a 20% decrease from the previous year, and it is 33% less than the 1984 total. Furthermore, the *proportion* of truck driver fatalities out of all fatal truck involvements has declined from 18.4% in 1980 to 11.9% in 1990. As the next five graphs illustrate, the overall trend for truck driver fatalities is clearly driven by the pattern shown for drivers of tractor-semitrailers.

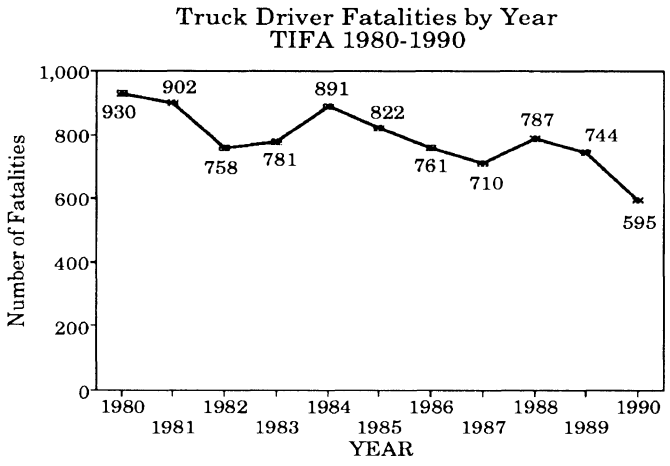


Figure 2-13

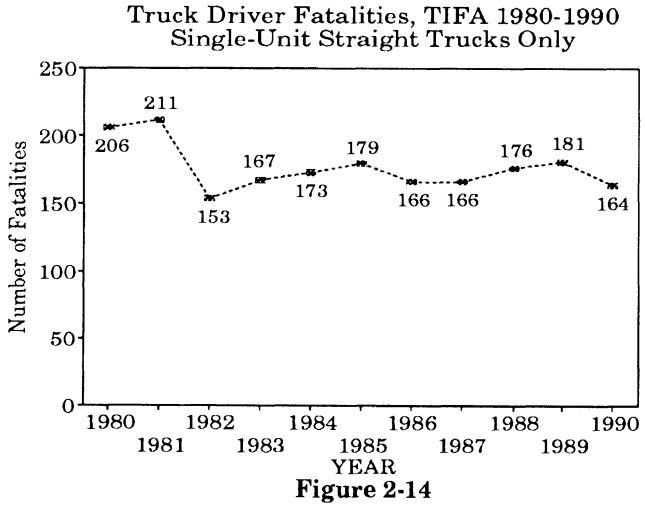
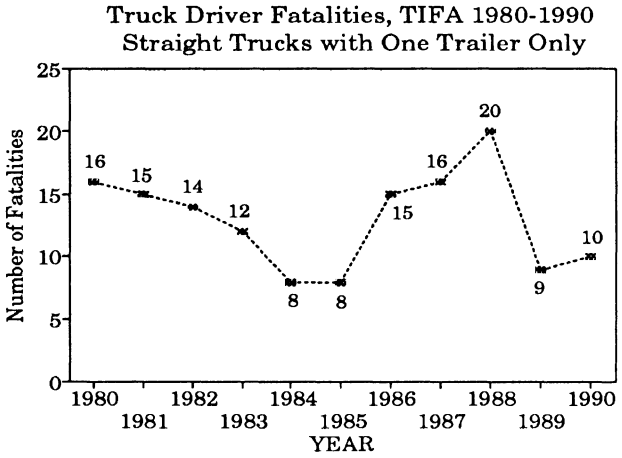


Figure 2-14

In 1980 and 1981 the annual number of fatalities for single-unit straight-truck drivers was over 200. Since then the figure has ranged from 153 in 1982 to 181 in 1989. In 1990 the total dropped 9.4% to 164.

Not surprisingly, there is only a small number of fatalities each year for drivers of straight trucks with one trailer. This number dropped from 16 in 1980 to 8 in 1984 and 1985, then increased to 20 in 1988. The number of fatalities dropped to 9 in 1989 and 10 in 1990.



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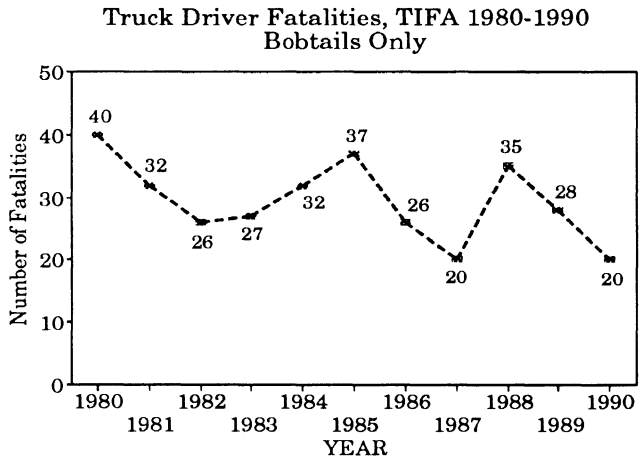


Figure 2-16

The annual number of fatalities for bobtail drivers has fluctuated from year to year. The highest number of fatalities (40) was reached in 1980, while the low of 20 occurred in 1987 and again in 1990.

The fatality trend for singles drivers very closely matches the overall trend for all drivers of large trucks. The number of fatalities for tractor-semitrailer drivers dropped noticeably in the years between 1984 and 1987. In 1988 the number increased 9.4% from the previous year, and declined only slightly in 1989. The 1990 total of 355 represents a drop of 25.3% from the 1989 total.

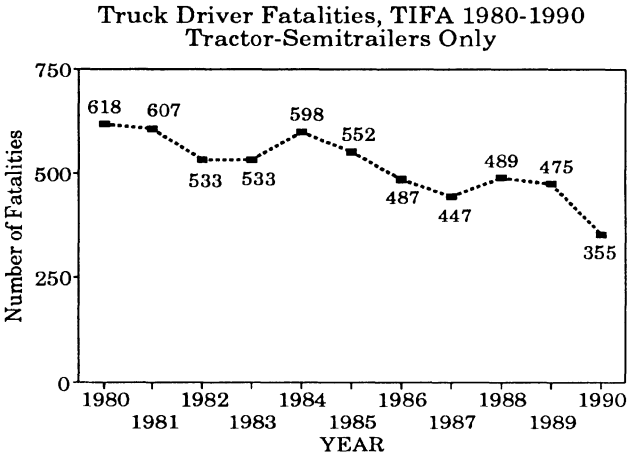


Figure 2-17

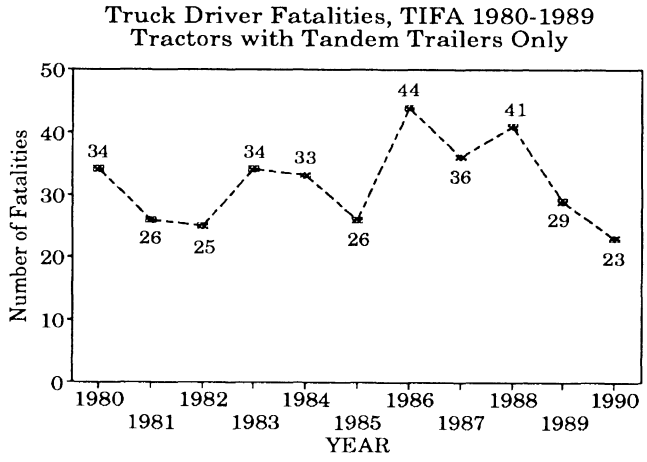


Figure 2-18

The number of fatalities for drivers of doubles shows a good deal of year-to-year variation. The high of 44 was reached in 1986; the low of 23 fatalities occurred in 1990. This represented a 20.7% decrease from the previous year.

OVERVIEW OF LARGE-TRUCK FATAL ACCIDENT INVOLVEMENTS IN 1990

The information in this section characterizes the general fatal accident experience of medium and heavy trucks in 1990. The section begins with the distribution of truck fatal involvements by state. Figures are presented for each of the five main configuration types as in the last section on yearly trends.

The remainder of the section presents the data according to power unit type, contrasting straight trucks with tractor combinations. One focus is on when and where the accidents took place and under what type of conditions, such as day versus night and rural versus urban. Some of the other variables describe the accident itself in terms of the type of collision. Another part of the section pertains to the drivers of the trucks and includes information on driver age, restraint use, alcohol use, and injury experience. The section concludes by comparing the involved straight trucks and tractors in terms of physical characteristics of the trucks themselves.

Geographic Distributions

The map of the continental United States below indicates where fatal accidents involving large trucks were concentrated in 1990. Not surprisingly, the more populous states, such as California and those in the northeast and the sunbelt, tended to have the greatest number of fatal accidents. The more sparsely populated western and northwestern states experienced fewer fatal involvements.

Trucks Involved in Fatal Accidents by State

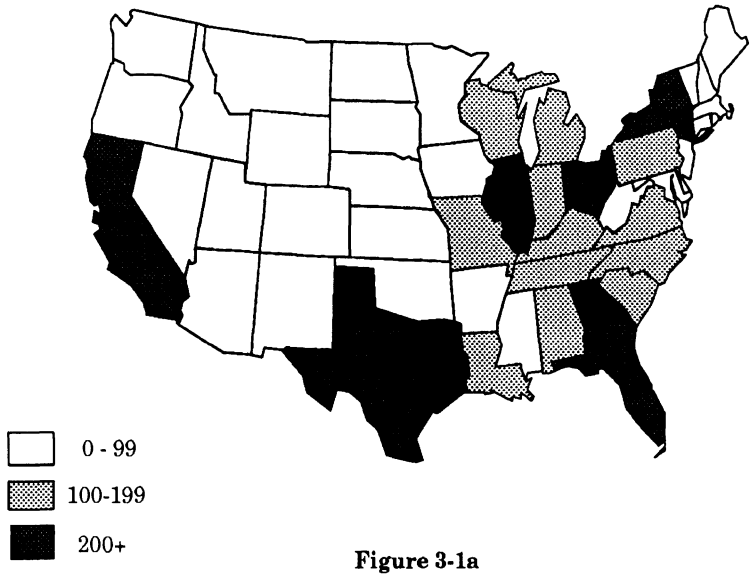


Figure 3-1a

The next two maps illustrate the distribution of fatal involvements for tractor-semitrailers and for tractor doubles. The state distribution for singles corresponds closely to the overall distribution. The doubles distribution shows a shift towards the western portion of the country. Of the 195 fatal accidents involving doubles in 1990, 76 took place in California, 9 in Arizona , and 8 in Ohio. These three states accounted for 48% of the total number of doubles involvements, and California alone accounted for 39%.

Trucks Involved in Fatal Accidents by State
Singles Only

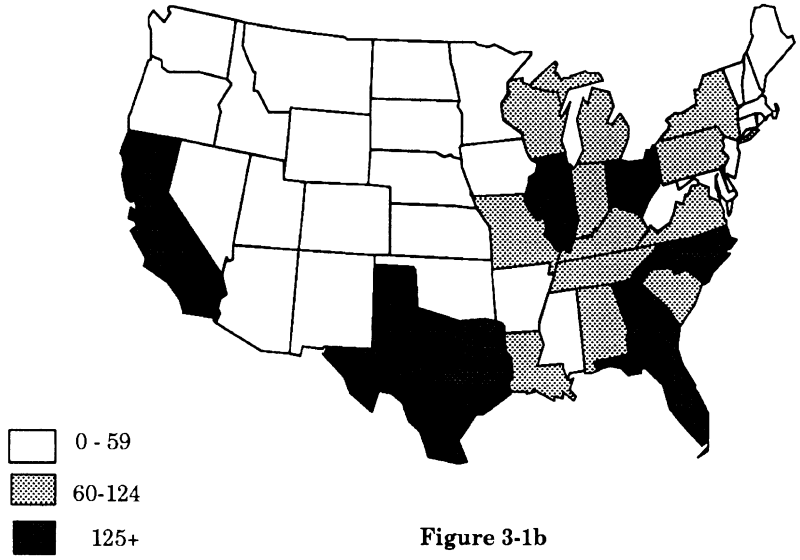


Figure 3-1b

Trucks Involved in Fatal Accidents by State
Doubles Only

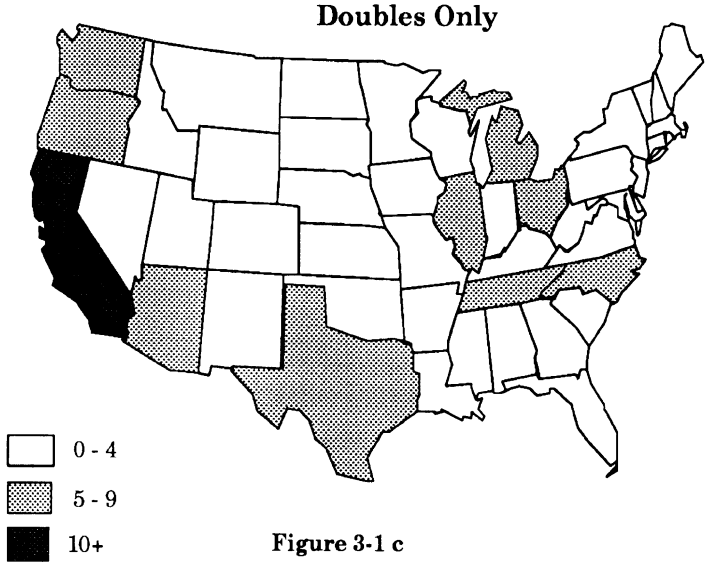


Figure 3-1 c

Table 3-1A on the next page lists the number of involvements for each state, with a breakdown according to the five main configuration types. Table 3-1B lists the percentages for each state. California recorded the greatest number of fatal accidents (450), followed by Texas (321), and Florida (282). Together these three states accounted for 21% of the fatal involvements in 1990.

TABLE 3-1A
Distribution of Trucks in Fatal Accidents by State and Type of Truck, TIFA 1990

State	Total Number	Straight Truck Alone	Straight Truck w/Trailer	Bobtail	Single	Double	Other	Unknown Truck Type
Alabama	152	30	5	4	111	2	0	0
Arizona	70	18	1	2	40	9	0	0
Arkansas	79	15	1	0	56	3	4	0
California	450	105	42	13	206	76	7	1
Colorado	47	15	0	2	29	1	0	0
Connecticut	40	18	0	0	22	0	0	0
Delaware	16	3	0	0	11	0	2	0
District of Columbia	3	3	0	0	0	0	0	0
Florida	282	94	7	6	172	3	0	0
Georgia	218	42	8	2	160	4	2	0
Idaho	27	10	2	0	11	2	2	0
Illinois	213	65	2	3	135	7	1	0
Indiana	152	27	2	2	116	4	1	0
Iowa	67	17	2	3	45	0	0	0
Kansas	70	18	1	0	48	3	0	0
Kentucky	127	53	2	1	67	2	1	1
Louisiana	117	27	2	0	87	0	1	0
Maine	23	10	0	0	13	0	0	0
Maryland	81	33	5	0	40	1	0	2
Massachusetts	49	19	1	0	29	0	0	0
Michigan	135	37	4	2	84	7	1	0
Minnesota	69	17	0	5	46	1	0	0
Mississippi	99	0	0	1	13	0	0	85
Missouri	142	34	3	4	96	2	3	0
Montana	21	1	2	0	13	3	2	0
Nebraska	45	8	4	0	32	1	0	0
Nevada	22	3	1	0	14	1	3	0
New Hampshire	10	4	0	1	5	0	0	0
New Jersey	98	37	1	2	54	3	1	0
New Mexico	35	7	1	3	22	2	0	0
New York	224	115	8	3	91	4	2	1
North Carolina	194	50	4	8	126	6	0	0
North Dakota	8	1	0	0	6	0	1	0
Ohio	250	60	3	8	170	8	0	1
Oklahoma	71	14	2	1	51	3	0	0
Oregon	63	8	6	0	41	6	2	0
Pennsylvania	199	61	8	2	123	2	2	1
Rhode Island	7	3	1	0	3	0	0	0
South Carolina	143	35	1	7	99	1	0	0
South Dakota	11	3	0	0	8	0	0	0
Tennessee	131	29	3	2	89	6	2	0
Texas	321	75	6	6	224	6	4	0
Utah	23	3	1	1	10	4	4	0
Vermont	4	2	2	0	0	0	0	0
Virginia	133	46	1	3	83	0	0	0
Washington	76	18	11	4	34	7	2	0
West Virginia	65	16	0	4	44	1	0	0
Wisconsin	102	22	3	5	71	1	0	0
Wyoming	19	0	0	0	16	3	0	0
TOTAL	5,003	1,331	159	110	3,066	195	50	92

TABLE 3-1B
Distribution of Trucks in Fatal Accidents by State and Type of Truck, TIFA 1990
Column Percents

State	Total	Straight Truck Alone	Straight Truck w/Trailer	Bobtail	Single	Double	Other	Unknown Truck Type
Alabama	3.04%	2.25%	3.14%	3.64%	3.62%	1.03%	0.00%	0.00%
Arizona	1.40	1.35	0.63	1.82	1.30	4.62	0.00	0.00
Arkansas	1.58	1.13	0.63	0.00	1.83	1.54	8.00	0.00
California	8.99	7.89	26.42	11.82	6.72	38.97	14.00	1.09
Colorado	0.94	1.13	0.00	1.82	0.95	0.51	0.00	0.00
Connecticut	0.80	1.35	0.00	0.00	0.72	0.00	0.00	0.00
Delaware	0.32	0.23	0.00	0.00	0.36	0.00	4.00	0.00
Dist. of Columbia	0.06	0.23	0.00	0.00	0.00	0.00	0.00	0.00
Florida	5.64	7.06	4.40	5.45	5.61	1.54	0.00	0.00
Georgia	4.36	3.16	5.03	1.82	5.22	2.05	4.00	0.00
Idaho	0.54	0.75	1.26	0.00	0.36	1.03	4.00	0.00
Illinois	4.26	4.88	1.26	2.73	4.40	3.59	2.00	0.00
Indiana	3.04	2.03	1.26	1.82	3.78	2.05	2.00	0.00
Iowa	1.34	1.28	1.26	2.73	1.47	0.00	0.00	0.00
Kansas	1.40	1.35	0.63	0.00	1.57	1.54	0.00	0.00
Kentucky	2.54	3.98	1.26	0.91	2.19	1.03	2.00	1.09
Louisiana	2.34	2.03	1.26	0.00	2.84	0.00	2.00	0.00
Maine	0.46	0.75	0.00	0.00	0.42	0.00	0.00	0.00
Maryland	1.62	2.48	3.14	0.00	1.30	0.51	0.00	2.17
Massachusetts	0.98	1.43	0.63	0.00	0.95	0.00	0.00	0.00
Michigan	2.70	2.78	2.52	1.82	2.74	3.59	2.00	0.00
Minnesota	1.38	1.28	0.00	4.55	1.50	0.51	0.00	0.00
Mississippi	1.98	0.00	0.00	0.91	0.42	0.00	0.00	92.39
Missouri	2.84	2.55	1.89	3.64	3.13	1.03	6.00	0.00
Montana	0.42	0.08	1.26	0.00	0.42	1.54	4.00	0.00
Nebraska	0.90	0.60	2.52	0.00	1.04	0.51	0.00	0.00
Nevada	0.44	0.23	0.63	0.00	0.46	0.51	6.00	0.00
New Hampshire	0.20	0.30	0.00	0.91	0.16	0.00	0.00	0.00
New Jersey	1.96	2.78	0.63	1.82	1.76	1.54	2.00	0.00
New Mexico	0.70	0.53	0.63	2.73	0.72	1.03	0.00	0.00
New York	4.48	8.64	5.03	2.73	2.97	2.05	4.00	1.09
North Carolina	3.88	3.76	2.52	7.27	4.11	3.08	0.00	0.00
North Dakota	0.16	0.08	0.00	0.00	0.20	0.00	2.00	0.00
Ohio	5.00	4.51	1.89	7.27	5.54	4.10	0.00	1.09
Oklahoma	1.42	1.05	1.26	0.91	1.66	1.54	0.00	0.00
Oregon	1.26	0.60	3.77	0.00	1.34	3.08	4.00	0.00
Pennsylvania	3.98	4.58	5.03	1.82	4.01	1.03	4.00	1.09
Rhode Island	0.14	0.23	0.63	0.00	0.10	0.00	0.00	0.00
South Carolina	2.86	2.63	0.63	6.36	3.23	0.51	0.00	0.00
South Dakota	0.22	0.23	0.00	0.00	0.26	0.00	0.00	0.00
Tennessee	2.62	2.18	1.89	1.82	2.90	3.08	4.00	0.00
Texas	6.42	5.63	3.77	5.45	7.31	3.08	8.00	0.00
Utah	0.46	0.23	0.63	0.91	0.33	2.05	8.00	0.00
Vermont	0.08	0.15	1.26	0.00	0.00	0.00	0.00	0.00
Virginia	2.66	3.46	0.63	2.73	2.71	0.00	0.00	0.00
Washington	1.52	1.35	6.92	3.64	1.11	3.59	4.00	0.00
West Virginia	1.30	1.20	0.00	3.64	1.44	0.51	0.00	0.00
Wisconsin	2.04	1.65	1.89	4.55	2.32	0.51	0.00	0.00
Wyoming	0.38	0.00	0.00	0.00	0.52	1.54	0.00	0.00
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

In the remainder of this section, distributions of TIFA variables will be compared on the basis of power unit type of the involved trucks. "Straight trucks" will include single unit straight trucks as well as those hauling one trailer. "Tractors" will refer to bobtails, singles, doubles, and combinations other than the usual tractor-semitrailer and tractor-semitrailer-full trailer configurations. As explained in the introduction, the FARS power unit type classification was accepted for those cases with unknown power unit type in TIFA for the purposes of this section. This results in weighted totals of 1,498 straight trucks and 3,496 tractors involved in fatal accidents in 1990.

Temporal Distributions

Many of the FARS variables that are included in the TIFA file pertain to the accident itself. Distributions are illustrated here for three FARS variables that describe when the accident took place. Beginning with the month, the greatest number of fatal involvements took place in August, June, and October. The most were recorded in August (480), while the fewest took place in February (353).

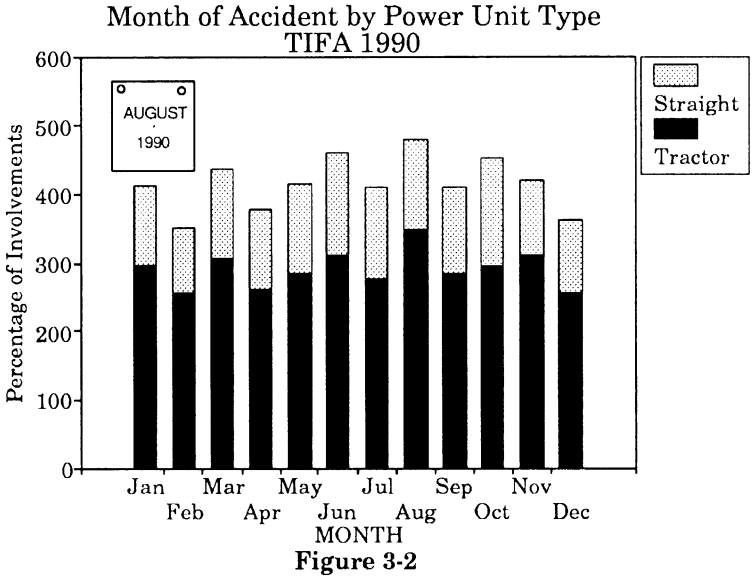


Figure 3-2

TABLE 3-2
Month of Accident by Power Unit Type
TIFA 1990

Month	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
January	117	7.81%	295	8.44%	412	8.25%
February	96	6.41	257	7.35	353	7.07
March	129	8.61	307	8.78	436	8.73
April	117	7.81	262	7.49	379	7.59
May	130	8.68	286	8.18	416	8.33
June	150	10.01	311	8.90	461	9.23
July	134	8.95	276	7.89	410	8.21
August	130	8.68	350	10.01	480	9.61
September	125	8.34	286	8.18	411	8.23
October	155	10.35	297	8.50	452	9.05
November	109	7.28	313	8.95	422	8.45
December	106	7.08	256	7.32	362	7.25
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

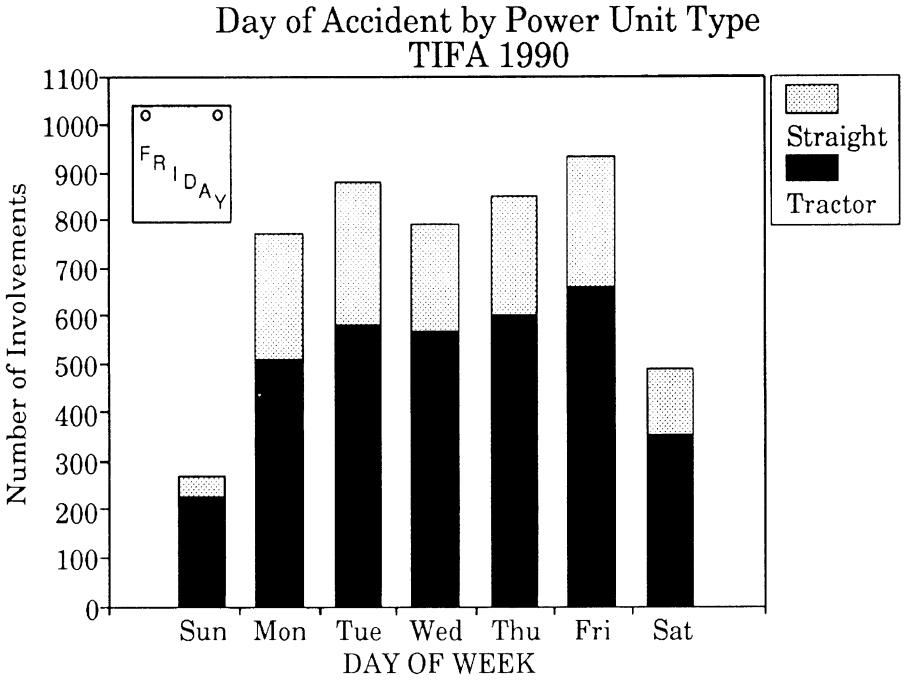


Figure 3-3

Many more fatal involvements took place during the week than on the weekends. An especially low number occurred on Sundays. The drop-off on the weekends is slightly more pronounced for straight trucks than for tractors.

TABLE 3-3
Day of Accident by Power Unit Type
TIFA 1990

Day	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Monday	266	17.76%	510	14.59%	776	15.54%
Tuesday	300	20.03	580	16.59	880	17.62
Wednesday	223	14.89	567	16.22	790	15.82
Thursday	251	16.76	601	17.19	852	17.06
Friday	272	18.16	661	18.91	933	18.68
Saturday	140	9.35	352	10.07	492	9.85
Sunday	46	3.07	225	6.44	271	5.43
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

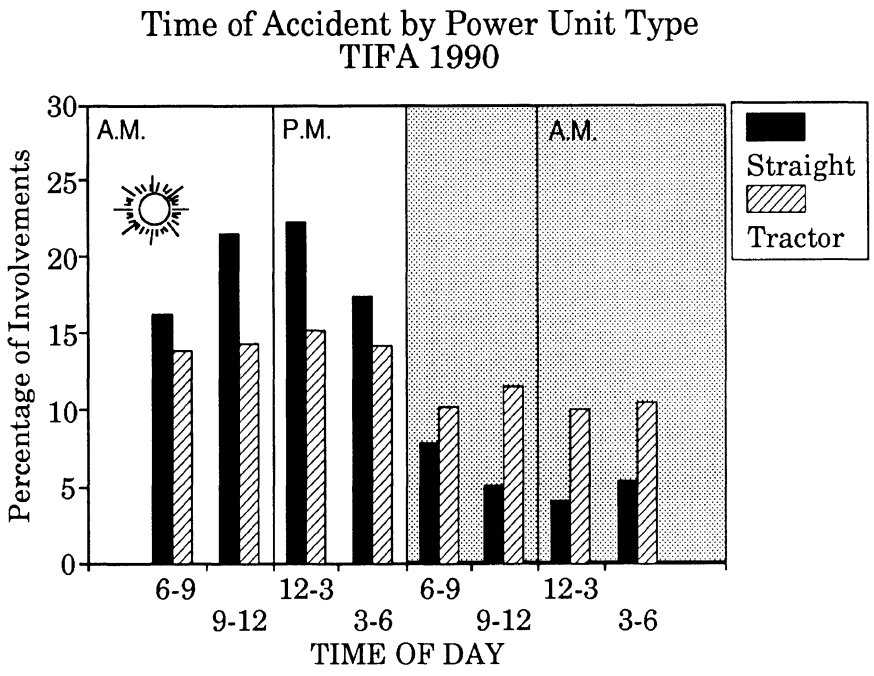


Figure 3-4

The time that the accidents took place has been broken down into three-hour blocks in the table and graph shown here. The distribution for straight trucks is concentrated during the daytime. Almost 78% of straight-truck involvements took place between 6 a.m. and 6 p.m., which probably reflects the much greater use of straight trucks during the day than at night. Tractor involvements are more evenly distributed across the hours of the day, although there is somewhat of a drop-off at night. Tractors typically log more nighttime travel than do straight trucks.

TABLE 3-4
Time of Day of Accident by Power Unit Type
TIFA 1990

Time of Day	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
6–9 a.m.	243	16.22%	486	13.90%	729	14.60%
9 a.m.–12 p.m.	323	21.56	502	14.36	825	16.52
12–3 p.m.	333	22.23	531	15.19	864	17.30
3–6 p.m.	262	17.49	498	14.24	760	15.22
6–9 p.m.	117	7.81	357	10.21	474	9.49
9 p.m.–12 a.m.	76	5.07	402	11.50	478	9.57
12–3 a.m.	60	4.01	354	10.13	414	8.29
3–6 a.m.	80	5.34	364	10.41	444	8.89
Unknown	4	0.27	2	0.06	6	0.12
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

Environmental Distributions

The FARS files contain a series of variables describing the accident environment in terms of where the accident took place and under what conditions. In FARS, the Federal Highway Administration's classification of urban and rural areas is used to determine land use. Urban areas have a population of 5,000 people or more, and rural areas have a population of under 5,000 people. A greater share of fatal involvements took place in rural areas than urban areas for both straight trucks and tractors in 1990. Tractor involvements were especially likely to occur in rural areas; 68% took place there.

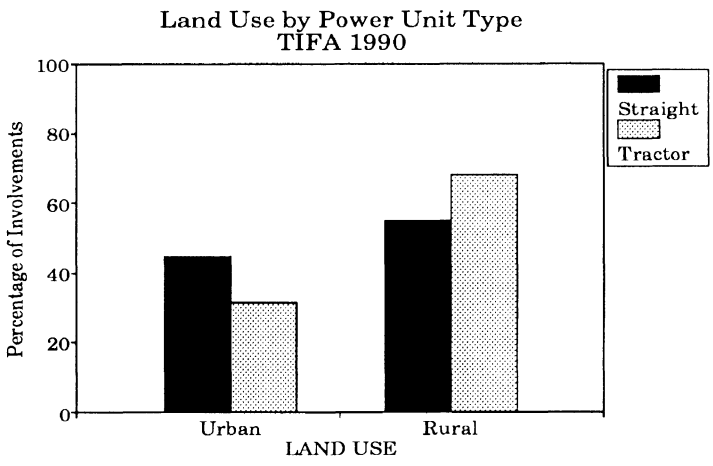


Figure 3-5

TABLE 3-5
Land Use by Power Unit Type
TIFA 1990

Land Use	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Urban	672	44.86%	1,104	31.58%	1,776	35.56%
Rural	821	54.81	2,380	68.08	3,201	64.10
Unknown	5	0.33	12	0.34	17	0.34
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

The light condition at the time of the accident is coded as daylight; dark, not lighted; dark, but lighted; dawn; or dusk. The distribution of this variable differs between straight trucks and tractors. While 77.8% of the straight-truck involvements took place during daylight, only 55.2% of the tractor involvements occurred when it was light. This corresponds with the distribution for the time of the accident, discussed earlier in this section. The distributions of both variables probably reflect the greater share of nighttime travel for tractors compared with straight trucks.

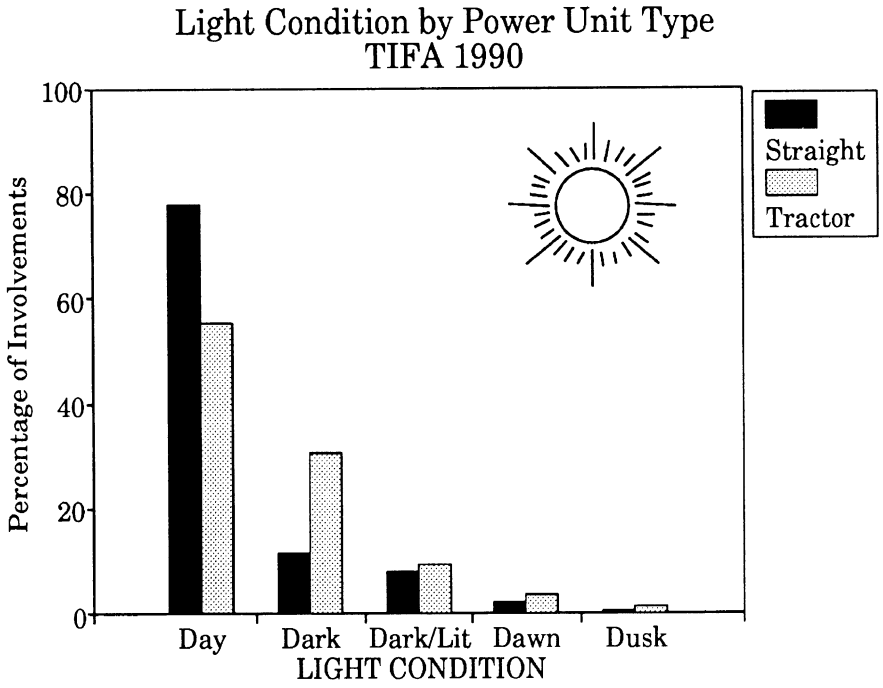


Figure 3-6

TABLE 3-6
Light Condition by Power Unit Type
TIFA 1990

Light Condition	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Daylight	1,165	77.77%	1,929	55.18%	3,094	61.95%
Dark, not lighted	169	11.28	1,068	30.55	1,237	24.77
Dark, but lighted	117	7.81	326	9.32	443	8.87
Dawn	34	2.27	120	3.43	154	3.08
Dusk	11	0.73	49	1.40	60	1.20
Unknown	2	0.13	4	0.11	6	0.12
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

On the next page, the distributions for the roadway surface condition variable are presented. This variable reflects the road conditions reported by the investigating officer. Straight-truck and tractor involvements were fairly similar in terms of the road surface condition in 1990. Overall 80% of the accidents took place under dry conditions, and 16% occurred on wet roadways.

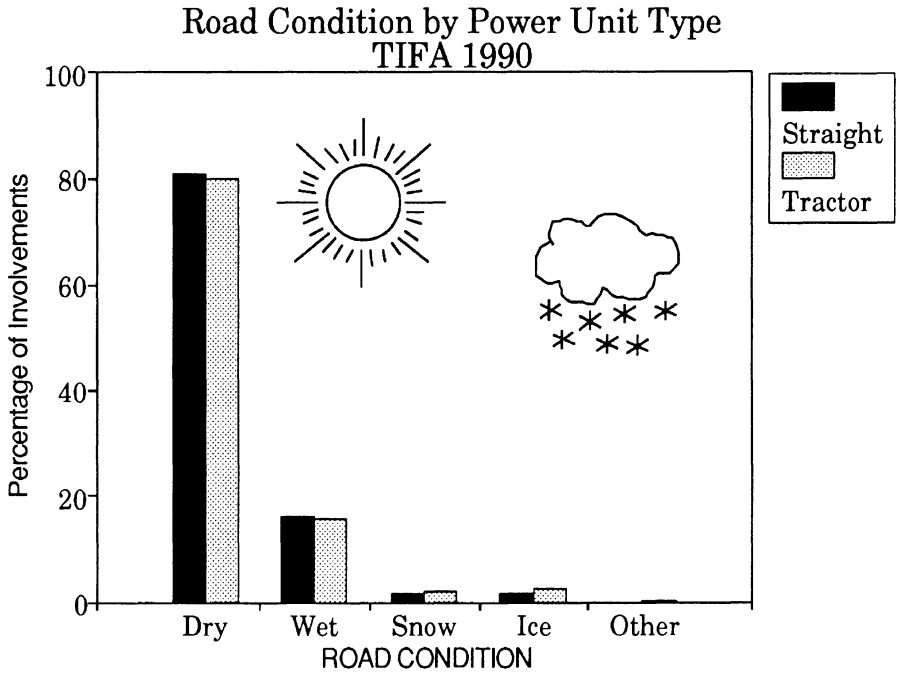


Figure 3-7

TABLE 3-7
Road Surface Condition by Power Unit Type
TIFA 1990

Road Surface Condition	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Dry	1,207	80.57%	2,790	79.81%	3,997	80.04%
Wet	240	16.02	547	15.65	787	15.76
Snow/Slush	23	1.54	67	1.92	90	1.80
Ice	24	1.60	82	2.35	106	2.12
Sand/Dirt/Oil	0	0.00	3	0.09	3	0.06
Other	1	0.07	2	0.06	3	0.06
Unknown	3	0.20	5	0.14	8	0.16
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

The FARS files contain several variables describing the class of road where the accident occurred. These have been recoded into a single three-level road class variable. The category of limited access roadways includes the interstate highway system, as well as state highways that are similar to interstates in that access to them is limited. Major arteries include all U.S. and state routes that do not have limited access, plus some other primary thoroughfares in large urban areas. The "other" road class category includes all public roads that do not fall into the two other classes.

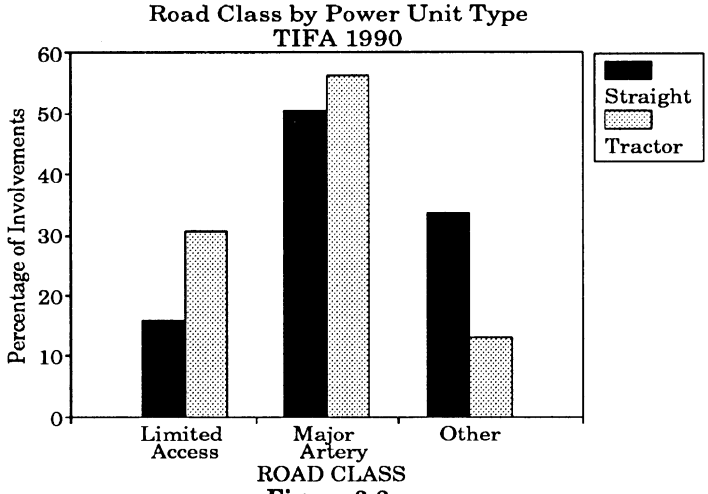


Figure 3-8

The majority of both straight-truck and tractor fatal involvements took place on major arteries in 1990. The main difference between the two distributions is in the proportion of involvements that occurred on limited access and on other roads. Over 30% of tractor involvements were on limited access highways, compared with 16% of straight-truck involvements. On the other hand, more than 33% of straight-truck fatal accidents occurred on other roads, as opposed to 13% of the tractor involvements. Much of this difference is attributable to the travel patterns of the two kinds of large trucks. Tractors are much more likely than straight trucks to be involved in long-haul operations that carry them over the interstate highway system.

TABLE 3-8
Road Class by Power Unit Type
TIFA 1990

Road Class	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Limited Access	239	15.95%	1,073	30.69%	1,312	26.27%
Major Artery	754	50.33	1,961	56.09	2,715	54.37
Other	502	33.51	458	13.10	960	19.22
Unknown	3	0.20	4	0.11	7	0.14
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

Road class distributions were also prepared on the basis of land use. The graph to the right shows the urban road class distributions. The two power unit types had very different patterns of involvements in urban areas in 1990. The major share of tractor involvements was on limited access routes and the least on other roads. Conversely, 40% of straight-truck involvements occurred on other roads and 26% on limited access routes.

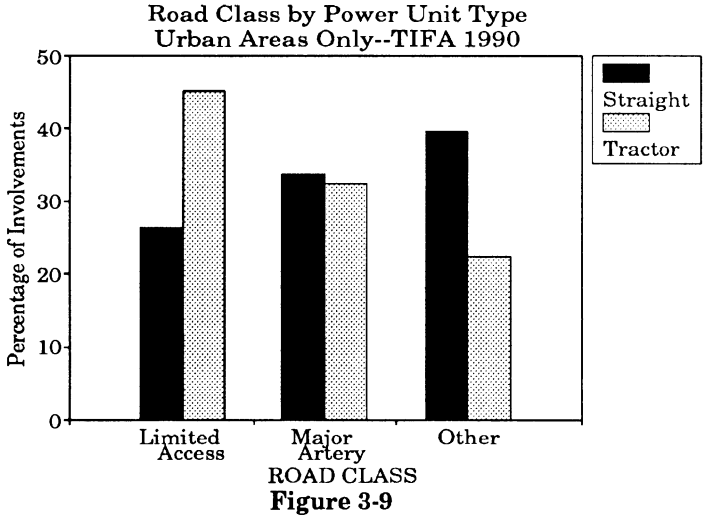


Figure 3-9

TABLE 3-9
Road Class by Power Unit Type
Urban Areas Only
TIFA 1990

Road Class	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Limited Access	178	26.49%	499	45.20%	677	38.12%
Major Artery	227	33.78	359	32.52	586	33.00
Other	267	39.73	246	22.28	513	28.89
TOTAL	672	100.00%	1,104	100.00%	1,776	100.00%

NOTE: The four cases of unknown power unit type are excluded from this table.

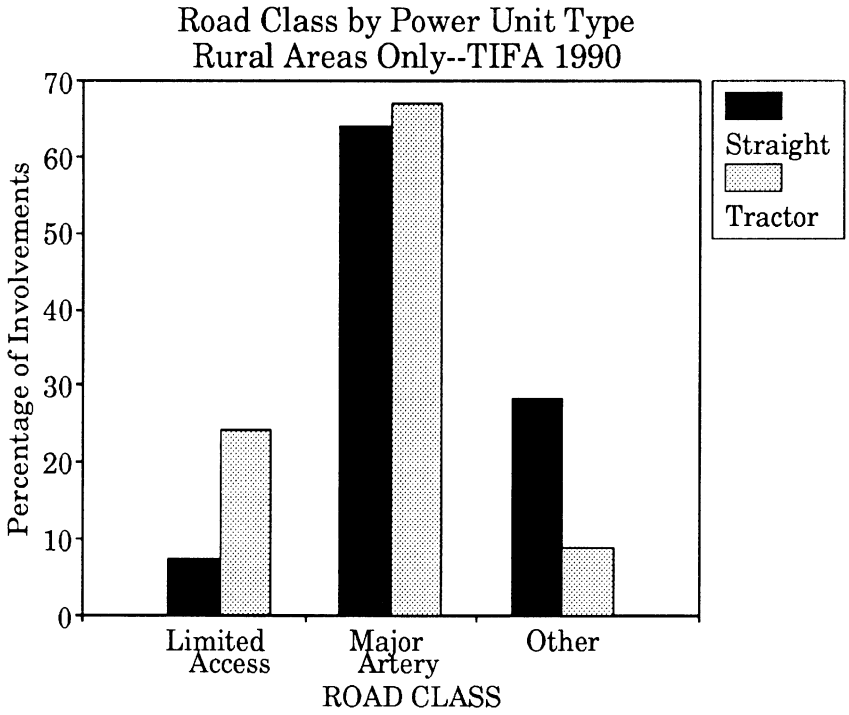


Figure 3-10

The rural area road class distributions are quite different from the urban area distributions. Overall, close to two-thirds of straight-truck and tractor rural area involvements occurred on major arteries. The proportion taking place on limited access routes was much lower for both types of trucks than it was on limited access routes in urban areas. These patterns are consistent with rural limited access roads being generally considered the safest for travel.

TABLE 3-10
Road Class by Power Unit Type
Rural Areas Only
TIFA 1990

Road Class	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Limited Access	61	7.43%	574	24.12%	635	19.84%
Major Artery	527	64.19	1,595	67.02	2,122	66.29
Other	233	28.38	211	8.87	444	13.87
TOTAL	821	100.00%	2,380	100.00%	3,201	100.00%

NOTE: The five cases of unknown power unit type are excluded from this table.

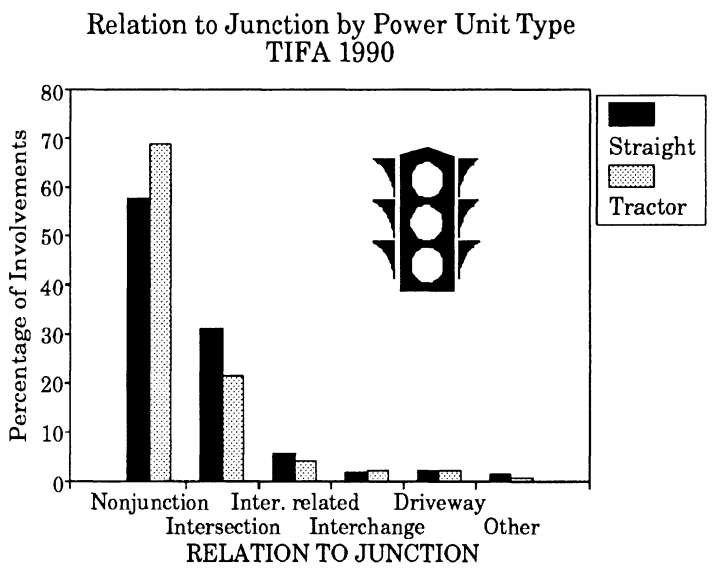


Figure 3-11

The relation to junction variable indicates whether the accident occurred on a nonjunction section of road, or at such locations as an intersection, driveway, or interchange. The location of involvements in 1990 reveals some interesting differences between straight trucks and tractors, which probably reflect their respective travel patterns. For example, 31% of straight-truck involvements took place at intersections, compared with 22% for tractors. In contrast, 69% of tractor involvements occurred at nonjunctions, compared with 58% for straight trucks. These figures are consistent with tractors logging a greater share of their miles on limited access roads compared with straight trucks.

TABLE 3-11
Relation to Junction by Power Unit Type
TIFA 1990

Relation to Junction	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Nonjunction	866	57.81%	2,405	68.79%	3,271	65.50%
Intersection	467	31.17	756	21.62	1,223	24.49
Intersection related	85	5.67	140	4.00	225	4.51
Interchange area	26	1.74	79	2.26	105	2.10
Driveway/alley, etc.	33	2.20	79	2.26	112	2.24
Entrance/exit ramp	5	0.33	13	0.37	18	0.36
Rail grade crossing	13	0.87	14	0.40	27	0.54
In crossover	3	0.20	6	0.17	9	0.18
Unknown	0	0.00	4	0.11	4	0.08
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

In 1990, a total of 1,223 large-truck fatal involvements took place at intersections. Distributions were prepared for the type of traffic control at these intersection accidents. The traffic control distributions are fairly similar for straight trucks and tractors. The main difference is that a larger share of straight-truck involvements occurred at intersections marked by an automated traffic signal compared to tractor involvements.

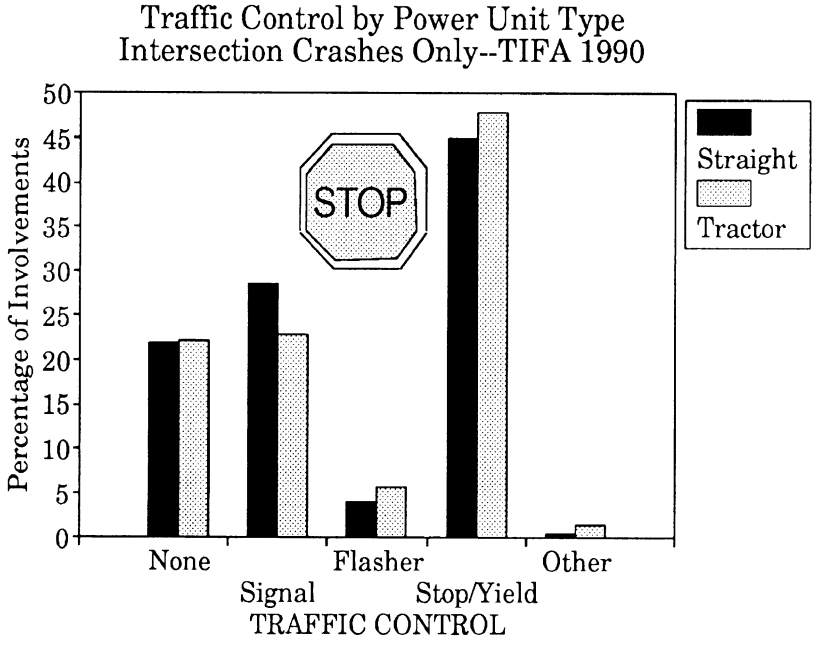


Figure 3-12

TABLE 3-12
Traffic Control at Intersection Crashes by Power Unit Type
TIFA 1990

Traffic Control	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
None	102	21.84%	167	22.09%	269	22.00%
Automated traffic signal	134	28.69	172	22.75	306	25.02
Flasher/other signal	19	4.07	43	5.69	62	5.07
Stop or yield sign	210	44.97	362	47.88	572	46.77
Warning/other sign	1	0.21	11	1.46	12	0.98
Other	1	0.21	0	0.00	1	0.08
Unknown	0	0.00	1	0.13	1	0.08
TOTAL	467	100.00%	756	100.00%	1,223	100.00%

NOTE: The two cases of unknown power unit type are excluded from this table.

A final variable pertaining to the accident environment is the legal speed limit where the accident took place. The greatest share of involvements for both power unit types occurred in 55 mph zones: 58% for tractors and 49% for straight trucks. A higher proportion of tractor involvements (15%) than straight-truck involvements (3%) took place in 65 mph zones as well. The relatively greater share of straight-truck fatal accidents that occurred on lower speed roads corresponds with the typical travel patterns of these trucks.

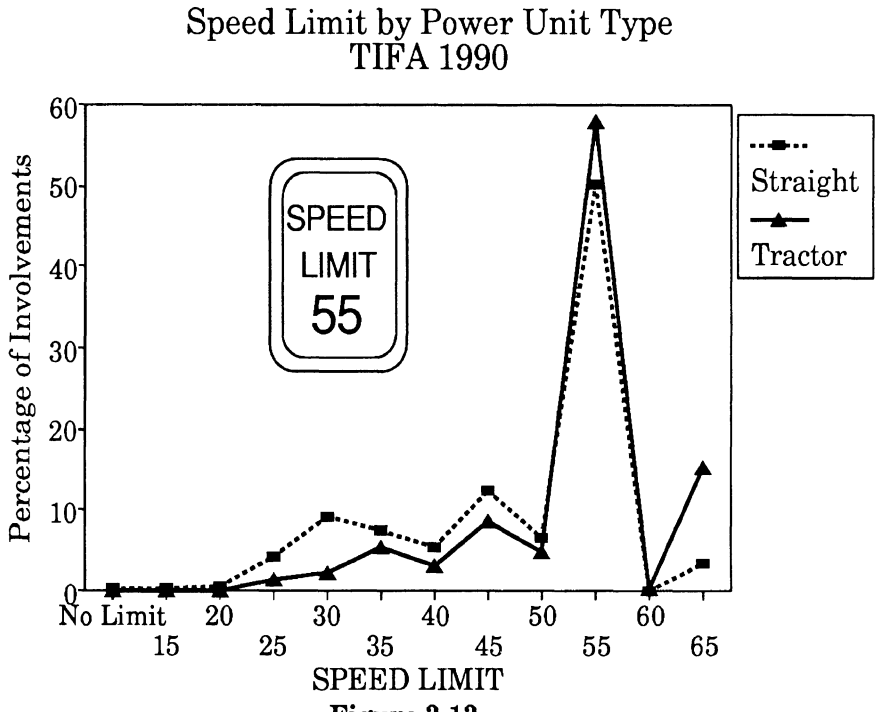


Figure 3-13

TABLE 3-13
Speed Limit by Power Unit Type
TIFA 1990

Speed Limit	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
No statutory limit	4	0.27%	2	0.06%	6	0.12%
15 mph	2	0.13	3	0.09	5	0.10
20 mph	10	0.67	4	0.11	14	0.28
25 mph	62	4.14	47	1.34	109	2.18
30 mph	134	8.95	80	2.29	214	4.29
35 mph	109	7.28	191	5.46	300	6.01
40 mph	79	5.27	114	3.26	193	3.86
45 mph	181	12.08	297	8.50	478	9.57
50 mph	96	6.41	174	4.98	270	5.41
55 mph	731	48.80	2013	57.58	2,744	54.95
60 mph	0	0.00	5	0.14	5	0.10
65 mph	50	3.34	534	15.27	584	11.69
Unknown	40	2.67	32	0.92	72	1.44
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

Collision Types

Distributions of several additional FARS variables contained in the TIFA files are illustrated here. They characterize the crash itself in terms of the object struck and the manner of collision. On the next page, the distributions for first harmful event by power unit type are illustrated. The first harmful event refers to the first event in the crash that results in injury or property damage. FARS categorizes this variable into non-collisions, collisions with fixed objects, and collisions with non-fixed objects. All of the non-collisions, such as rollovers and incidents of an occupant falling from a vehicle, have been combined into a single group. Similarly, all of the crashes where the first harmful event is a collision with a fixed object are considered together here. Fixed objects include bridges, guardrails, embankments, and trees, among others. The major classes of non-fixed objects, such as a motor vehicle in transport or a pedestrian, are represented separately here. The remaining non-fixed objects, which include things like thrown or falling objects and loose boulders, have been combined into one group.

The majority of fatal accidents involving large trucks in 1990 were collisions with another motor vehicle in transport. These collisions accounted for 76% of the straight-truck and 79% of the tractor involvements. Straight trucks had a slightly higher proportion of involvements with pedestrians and pedalcyclists than did tractors, while tractors were involved more in crashes with fixed objects.

First Harmful Event by Power Unit Type
TIFA 1990

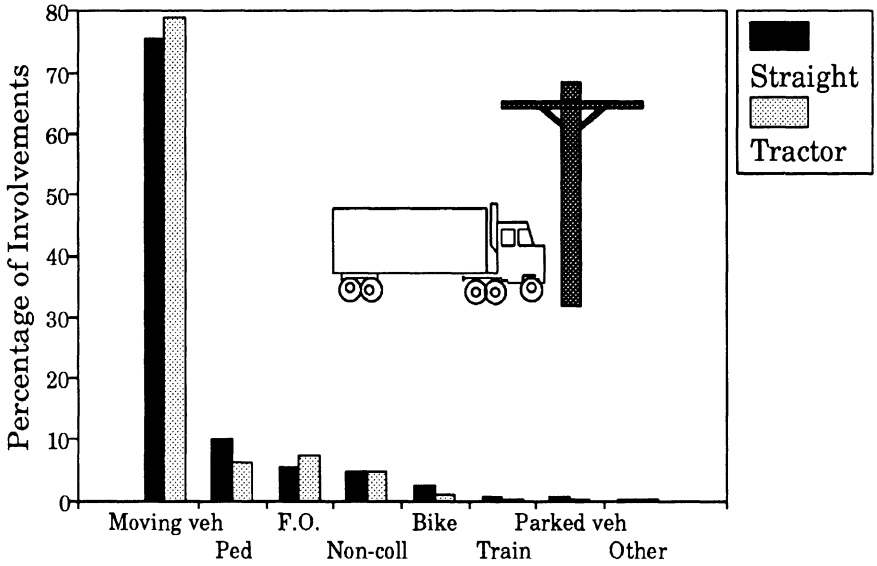


Figure 3-14

TABLE 3-14
First Harmful Event by Power Unit Type
TIFA 1990

Collision with:	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Pedestrian	151	10.08%	227	6.49%	378	7.57%
Pedalcyclist	36	2.40	30	0.86	66	1.32
Train	11	0.73	13	0.37	24	0.48
Animal	0	0.00	1	0.03	1	0.02
Moving vehicle	1,133	75.63	2,765	79.09	3,898	78.05
Parked vehicle	10	0.67	17	0.49	27	0.54
Other non-fixed object	2	0.13	15	0.43	17	0.34
Fixed object	83	5.54	265	7.58	348	6.97
Non-collision	72	4.81	163	4.66	235	4.71
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

A total of 3,898 of the fatal accidents involving large trucks in 1990 were collisions with another motor vehicle in transport. The distributions of the manner of collision variable for these accidents are illustrated on the following page. Overall, the most common collision type among the fatal involvements was angle crashes (42%), followed by head-ons (27%), and rear-end collisions (24%). The straight-truck and tractor distributions are fairly similar

overall, but there are some differences. Straight trucks had higher proportions of angle collisions than did tractors. Tractors were more likely to experience rear-end crashes than were straight trucks.

Manner of Collision by Power Unit Type
for Crashes with Another Motor Vehicle
TIFA 1990

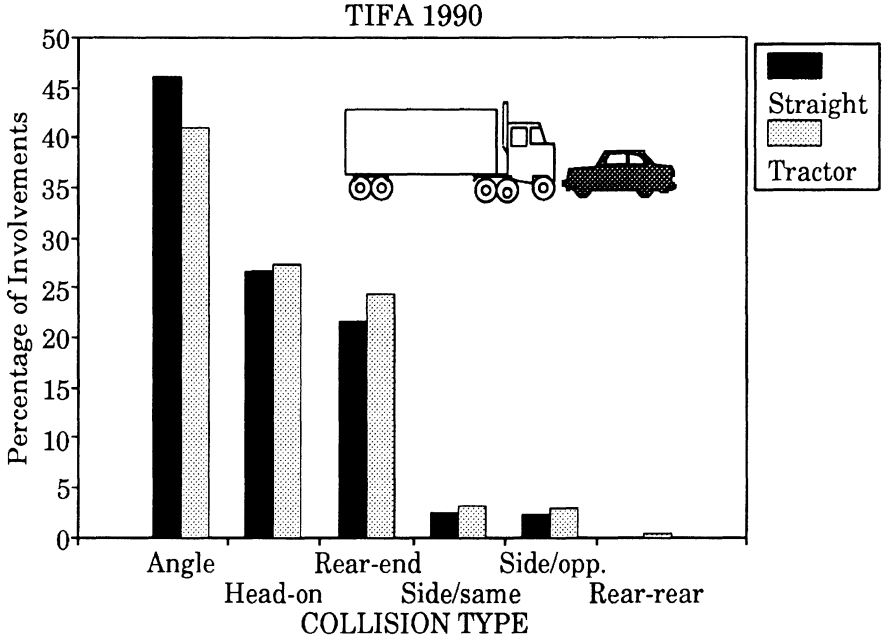


Figure 3-15

TABLE 3-15
Manner of Collision by Power Unit Type
for Crashes with Another Motor Vehicle
TIFA 1990

Manner of Collision	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Rear-end	245	21.62%	672	24.30%	917	23.52%
Head-on	301	26.57	761	27.52	1,062	27.24
Rear-to-rear	1	0.09	13	0.47	14	0.36
Angle	522	46.07	1,132	40.94	1,654	42.43
Sideswipe, same dir.	29	2.56	87	3.15	116	2.98
Sideswipe, opp. dir.	27	2.38	85	3.07	112	2.87
Unknown	8	0.71	15	0.54	23	0.59
TOTAL	1,133	100.00%	2,765	100.00%	3,898	100.00%

NOTE: The five cases of unknown power unit type are excluded from this table.

The vehicle role variable describes whether the case vehicle was the striking or struck vehicle in the collision. In all head-on collisions, both vehicles are coded as striking. If a vehicle is coded as both striking and struck, the events must either occur at different points on the vehicle, or at the same point at different times. Below are the vehicle role distributions for straight trucks and tractors in 1990. In two-thirds of the total large-truck involvements, the truck was coded as the striking vehicle. However, 32% of the striking cases were head-on collisions (meaning both vehicles were coded as striking), and almost 20% represented single vehicle crashes other than collisions with pedestrians or bicyclists. In the remaining multivehicle crashes, the truck was 1.4 times as likely to be the striking vehicle as the struck vehicle. In evaluating this statistic, it should be remembered that the accidents under consideration typically involved the collision of a truck with a much lighter vehicle, with the fatality occurring in the other vehicle.

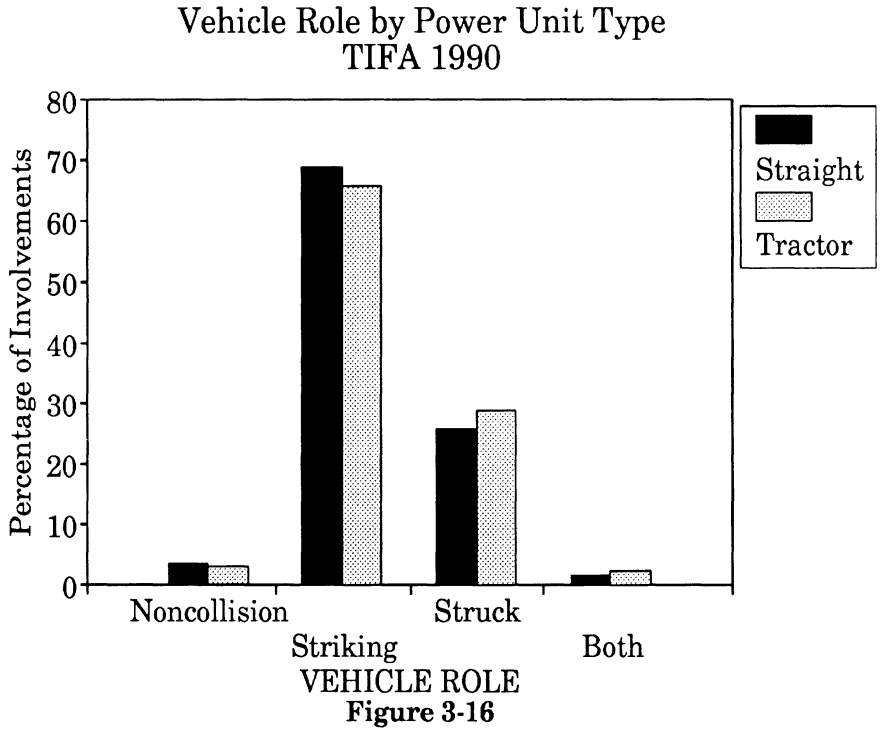


Figure 3-16

TABLE 3-16
Vehicle Role by Power Unit Type
TIFA 1990

Vehicle Role	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Noncollision	54	3.60%	114	3.26%	168	3.36%
Striking	1,033	68.96	2293	65.59	3,326	66.60
Struck	390	26.03	1008	28.83	1,398	27.99
Both	21	1.40	80	2.29	101	2.02
Unknown	0	0.00	1	0.03	1	0.02
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

The rollover variable indicates whether or not the case vehicle overturned during the accident. Rollovers are divided into those that occurred as the first harmful event and those that took place subsequently. In the 1990 fatal involvements, the distribution of both first and subsequent event rollovers is virtually identical for straight trucks and tractors.

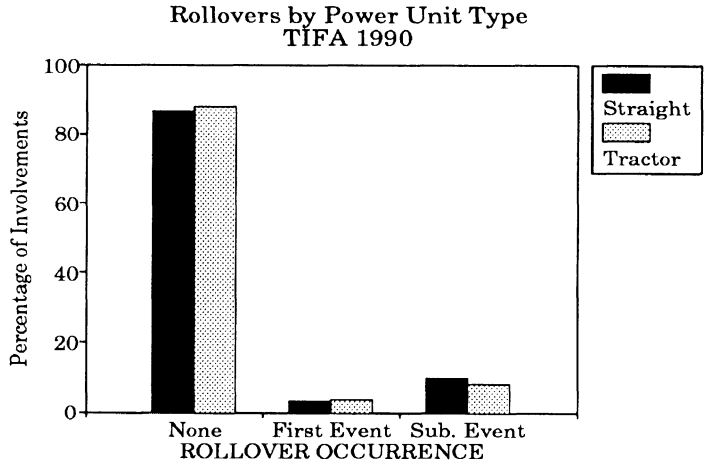


Figure 3-17

TABLE 3-17
Occurrence of Rollovers by Power Unit Type
TIFA 1990

Rollover	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
None	1,296	86.52%	3,076	87.99%	4,586	86.87%
First event	54	3.60	136	3.89	186	3.52
Subsequent event	148	9.88	284	8.12	507	9.60
TOTAL	1,498	100.00%	3,496	100.00%	5,279	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

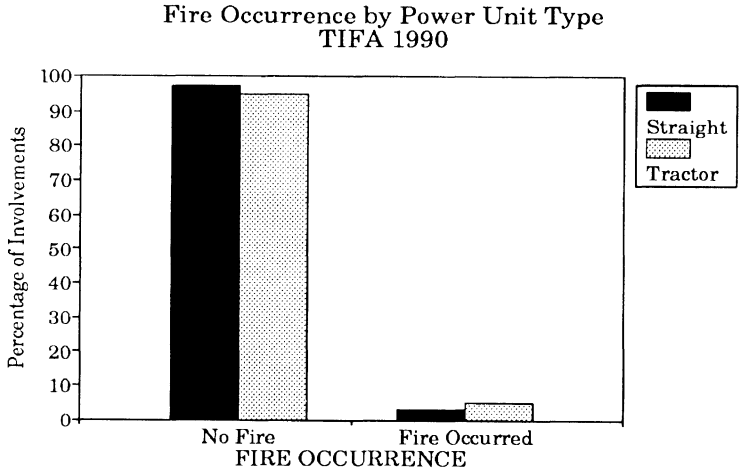


Figure 3-18

Another variable indicates whether a fire occurred on the vehicle during the accident. There was a fire on 2.8% of the straight trucks and 5.1% of the tractors involved in fatal accidents in 1990.

TABLE 3-18
Fire Occurrence by Power Unit Type
TIFA 1990

Fire	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
No fire	1,456	97.20%	3,319	94.94%	4,775	95.61%
Fire occurred	42	2.80	177	5.06	219	4.39
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

Driver Characteristics

The next group of variables describes the drivers of the trucks involved in fatal accidents in 1990. These are predominantly FARS variables. The figure below depicts driver age distributions by power unit type. The distributions indicate younger ages for the straight-truck drivers compared with the ages of tractor drivers. For the known cases, nearly 55% of the straight-truck drivers were 35 or younger, while 62% of the tractor drivers were over 35.

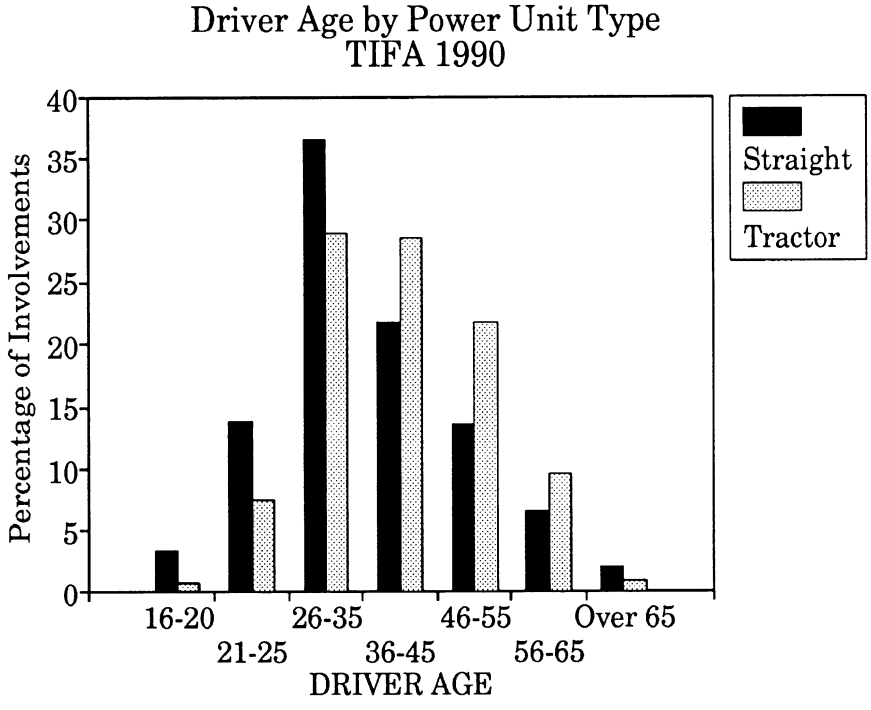


Figure 3-19

TABLE 3-19
Age of Truck Driver by Power Unit Type
TIFA 1990

Driver Age	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
16–20	49	3.27%	23	0.66%	72	1.44%
21–25	207	13.82	265	7.58	472	9.45
26–35	546	36.45	1,014	29.00	1,560	31.24
36–45	325	21.70	1,001	28.63	1,326	26.55
46–55	204	13.62	761	21.77	965	19.32
56–65	98	6.54	337	9.64	435	8.71
Over 65	31	2.07	31	0.89	62	1.24
Unknown	38	2.54	64	1.83	102	2.04
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

For both the straight-truck and tractor drivers, males were overwhelmingly represented among the fatal involvements. Only 1.7% of the drivers were female.

TABLE 3-20
Truck Driver Gender by Power Unit Type
TIFA 1990

Driver Gender	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Male	1,436	95.86%	3,373	96.48%	4,809	96.30%
Female	24	1.60	63	1.80	87	1.74
Unknown	38	2.54	60	1.72	98	1.96
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

The distributions for driver restraint use are presented on the next page. The categories for this variable are no restraint used, shoulder belt, lap belt only, lap and shoulder belt, restraint used of other or unknown type, and unknown if restraint was used. This last category accounts for 16% of the cases. It appears that a greater proportion of the involved tractor drivers were restrained, compared to the straight-truck drivers. Over 50% of the tractor drivers were using some kind of restraint device, compared to only 40% of the straight-truck drivers. Note that the unknown cases are included in Figure 3-21.

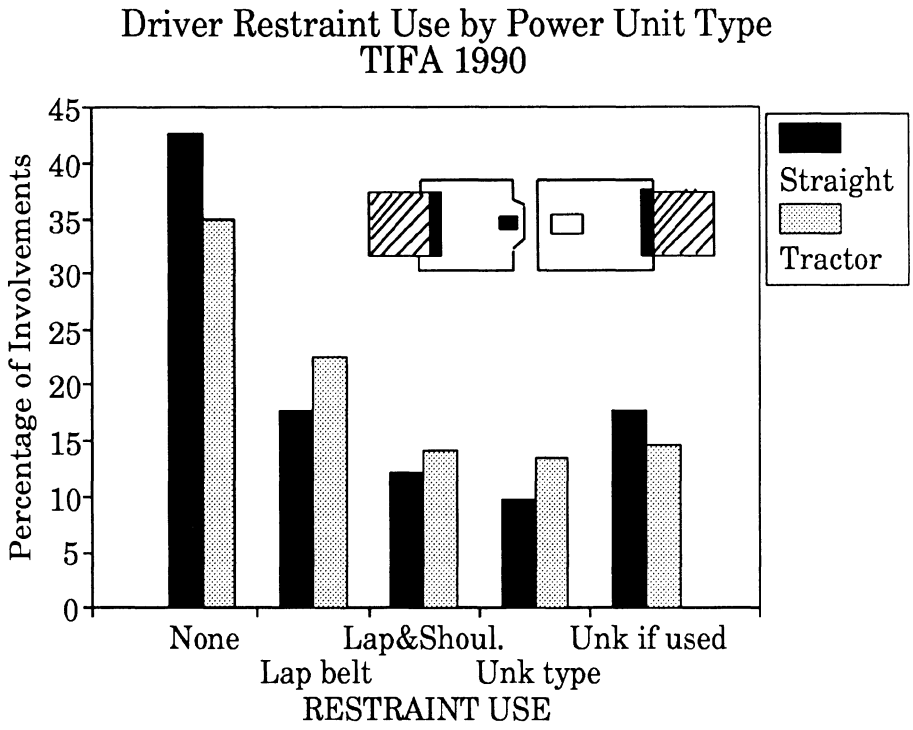


Figure 3-21

TABLE 3-21
Truck Driver Restraint Use by Power Unit Type
TIFA 1990

Driver Restraint Use	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
None used	639	42.66%	1,223	34.98%	1,862	37.28%
Shoulder	1	0.07	6	0.17	7	0.14
Lap belt	264	17.62	789	22.57	1,053	21.09
Lap and shoulder	183	12.22	494	14.13	677	13.56
Restraint used, type unknown	147	9.81	471	13.47	618	12.37
Unknown if used	264	17.62	513	14.67	777	15.56
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

On the following page are the distributions for driver alcohol use. Overall, drinking was reported for the driver of the truck in 3.7% of the involvements. This figure was 3.6% for drivers of tractors and 3.9% for straight-truck drivers.

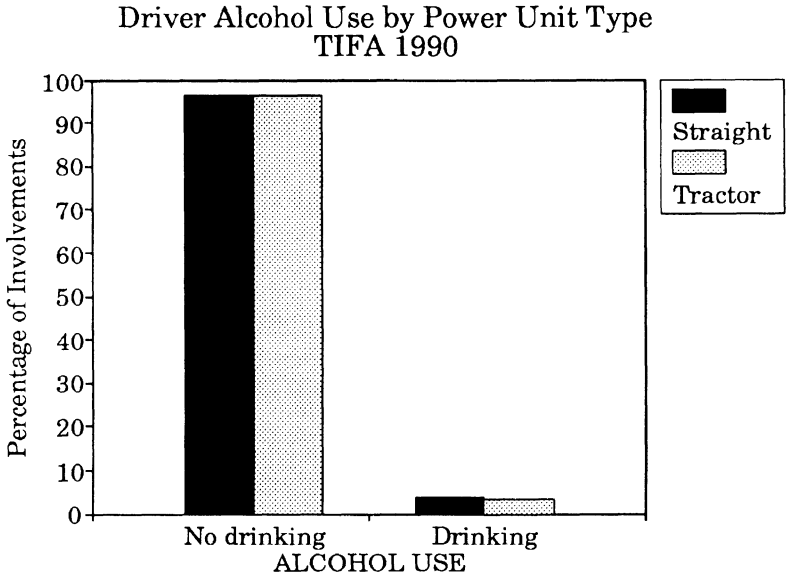


Figure 3-22

TABLE 3-22
Truck Driver Alcohol Use by Power Unit Type
TIFA 1990

Alcohol Use	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
No drinking	1,440	96.13%	3,370	96.40%	4,810	96.32%
Drinking	58	3.87	126	3.60	184	3.68
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

The ejection variable refers to the driver of the truck being thrown from the cab during the course of the crash. Ejections are classified by FARS as total and partial. In 1990, the truck driver was totally ejected in 3.9% of the fatal involvements and partially ejected in less than 1%. Straight-truck drivers were slightly more likely to be ejected in 1990 than tractor drivers.

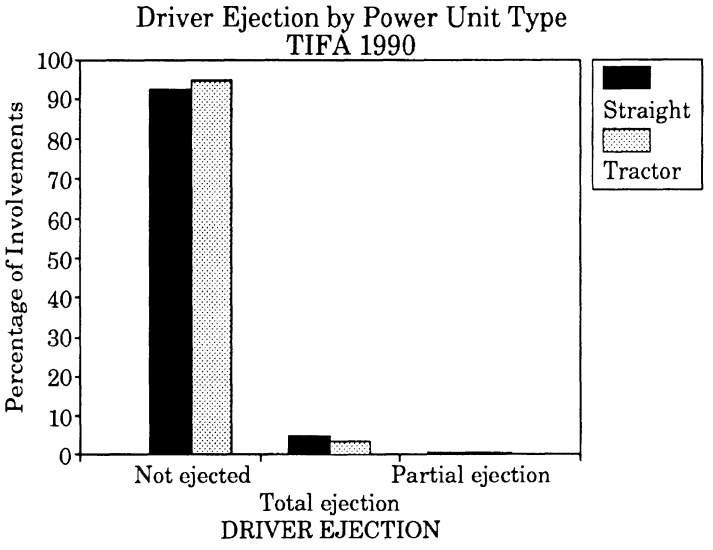


Figure 3-23

TABLE 3-23
Truck Driver Ejection by Power Unit Type
TIFA 1990

Driver Ejection	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Not ejected	1,378	91.99%	3,308	94.62%	4,686	93.83%
Totally ejected	76	5.07	120	3.43	196	3.92
Partially ejected	9	0.60	26	0.74	35	0.70
Unknown	35	2.34	42	1.20	77	1.54
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

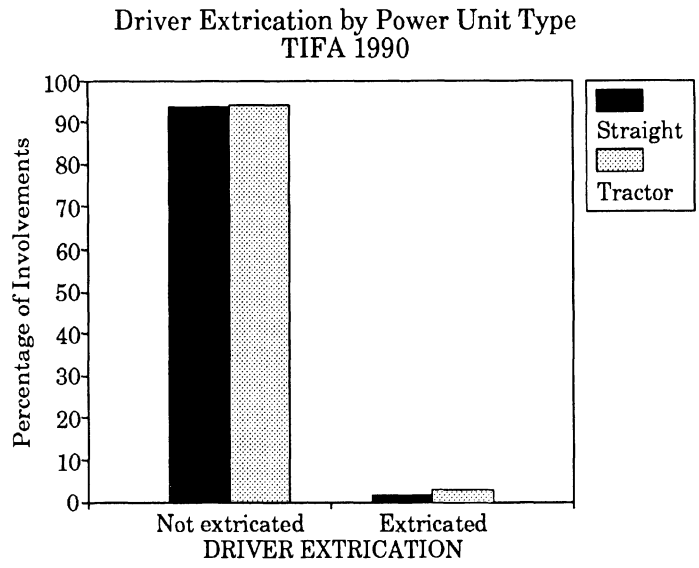


Figure 3-24

The driver extrication variable refers to the use of equipment or other force to remove the driver from the truck. In other words, more than carrying or lifting was required to get the driver out of the wreckage. Extrication of the truck driver occurred in a very small proportion of the fatal involvements but was more common among tractor involvements (2.9%) than among straight-truck involvements (1.6%).

TABLE 3-24
Truck Driver Extrication by Power Unit Type
TIFA 1990

Driver Extrication	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Not extricated	1,400	93.46%	3,292	94.16%	4,692	93.95%
Extricated	24	1.60	101	2.89	125	2.50
Unknown	74	4.94	103	2.95	177	3.54
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

The injury severity distributions for the truck drivers are shown in this figure. "C," "B," and "A" injuries correspond to possible, nonincapacitating, and incapacitating injuries, respectively. FARS records fatalities that occur up to 30 days after an accident. While all of the accidents considered here resulted in at least one fatality, the truck driver was fatally injured in only about 12% of the cases. The injury severity distributions for straight-truck and tractor drivers was virtually identical in 1990.

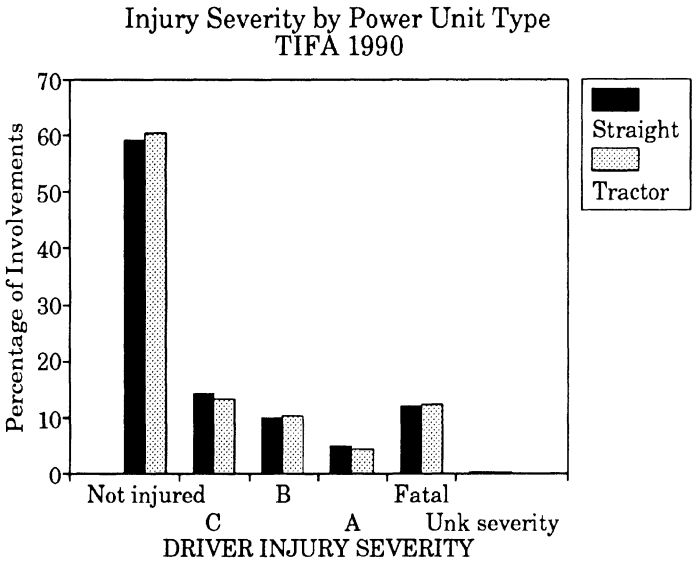


Figure 3-25

TABLE 3-25
Truck Driver Injury Severity by Power Unit Type
TIFA 1990

Injury Severity	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Not injured	862	57.54%	2,075	59.35%	2,937	58.81%
C injury	208	13.89	456	13.04	664	13.30
B injury	145	9.68	345	9.87	490	9.81
A injury	70	4.67	143	4.09	213	4.27
Fatal injury	174	11.62	420	12.01	594	11.89
Injured, severity unknown	4	0.27	8	0.23	12	0.24
Died prior to accident	0	0.00	2	0.06	2	0.04
Unknown if injured	35	2.34	47	1.34	82	1.64
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

The next variable, hours driven, is not a part of the FARS files but is included in the OMC reports and is part of the telephone interviews conducted by UMTRI. It records the number of hours that the truck driver had been driving at the time of the accident since his last period of eight consecutive hours off duty. The "not applicable" level of this variable refers to accidents in which the truck was not in transport when the accident occurred, as in the case of a parked truck. In addition, OMC records anything over 12 hours as "not applicable."

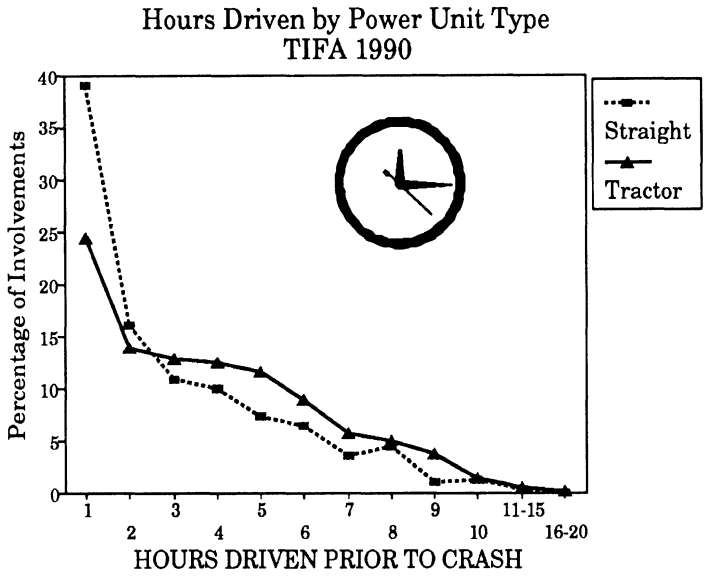


Figure 3-26

Even though a large proportion of cases (16.5%) was coded unknown or not applicable for the hours driven variable, these cases have been removed from the distributions shown in the graph at left so that straight trucks and tractors may be more easily compared. In general, the involved straight-truck drivers had been driving for a shorter period of time prior to the crash than the tractor drivers. Of the known cases, 39.1% of the straight-truck drivers had been driving for only an hour, compared with 24.6% of the tractor drivers. In contrast, just 6.7% of the straight-truck drivers had been on duty for eight or more hours prior to the crash, compared with 10.5% of the tractor drivers. To a large extent, this probably reflects the differential reliance on straight trucks and tractors in short-haul versus long-haul operations.

TABLE 3-26
Hours Driven Prior to Crash
by Power Unit Type
TIFA 1990

Hours Driven	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
1	488	32.58%	713	20.39%	1,201	24.05%
2	201	13.42	404	11.56	605	12.11
3	136	9.08	373	10.67	509	10.19
4	124	8.28	367	10.50	491	9.83
5	91	6.07	340	9.73	431	8.63
6	80	5.34	260	7.44	340	6.81
7	45	3.00	163	4.66	208	4.16
8	55	3.67	142	4.06	197	3.94
9	12	0.80	107	3.06	119	2.38
10	14	0.93	37	1.06	51	1.02
11–15	3	0.20	15	0.43	18	0.36
16–20	0	0.00	2	0.06	2	0.04
N/A	46	3.07	101	2.89	147	2.94
Unknown	203	13.55	472	13.50	675	13.52
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

The driver related factors variable is coded by FARS from a list of nearly 100 possibilities. The variable is coded based on information recorded in the narrative section of the accident report filed by the investigating officer, not on the basis of citations. Up to three possible contributing factors may be recorded for each driver, but the distributions here are based on the first factor coded for each case. The numerous levels of the FARS variable have been combined into general categories. Note that not all of the levels of this variable imply culpability on the part of the driver. Examples include the cases of obscured vision and swerving to avoid an object.

The majority of straight-truck and tractor drivers had no contributing factors recorded. Some of the more common factors that were coded were passing/lane change violations (6.7%), speeding/tailgating violations (6.0%), and right-of-way/traffic control violations (5.2%). The straight-truck and tractor distributions are very similar, and the observed differences are probably related to typical travel patterns. An example is the higher incidence of right-of-way/traffic control violations among the drivers of straight trucks.

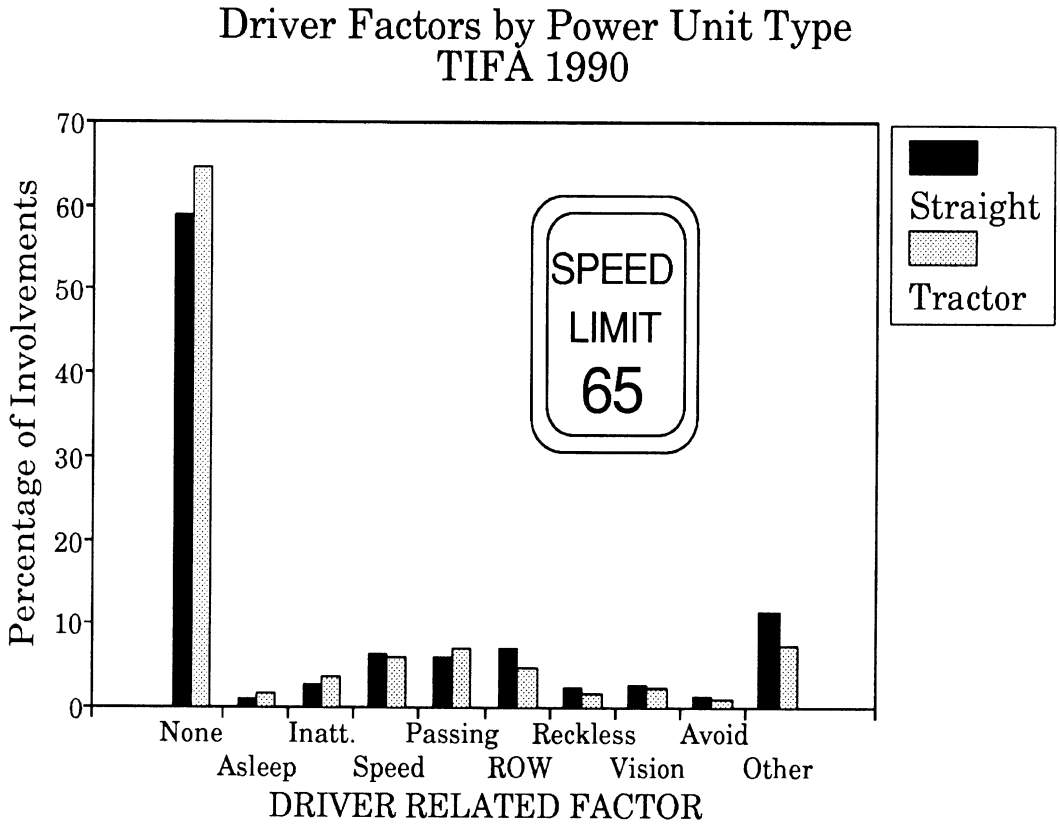


Figure 3-27

TABLE 3-27
Truck Driver Related Factors by Power Unit Type
TIFA 1990

Driver Factor	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
None	875	58.41%	2247	64.27%	3,122	62.52%
Asleep/Ill	15	1.00	56	1.60	71	1.42
Drugs	1	0.07	5	0.14	6	0.12
Inattentive	37	2.47	135	3.86	172	3.44
Speed violations/ tailgating	94	6.28	208	5.95	302	6.05
Passing/lane change violations	90	6.01	244	6.98	334	6.69
Right-of-way/traffic control violations	104	6.94	157	4.49	261	5.23
Reckless driving	35	2.34	56	1.60	91	1.82
Vision obscured	40	2.67	76	2.17	116	2.32
Avoiding/swerving	21	1.40	34	0.97	55	1.10
Other	170	11.35	252	7.21	422	8.45
Unknown	16	1.07	26	0.74	42	0.84
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: Up to three factors reported for each case by FARS. This table based on first response for each case. The nine cases of unknown power unit type are excluded from this table.

Vehicle Characteristics

This overview section of TIFA 1990 concludes with some additional comparisons of straight trucks and tractors, this time focusing on features of the trucks themselves. All of these variables are derived from telephone interviews and OMC reports, not from the FARS files. They are examples of the detailed information concerning large trucks that is contained in the TIFA files.

On the following page are the distributions by power unit type for carrier type of the involved trucks. Carrier type is broken down into *inter*state and *intra*state carriers and then further separated into private versus for-hire companies. Interstate for-hire are then divided into ICC-*authorized* carriers—the common and contract carriers—and those hauling ICC-*exempt* commodities. There are also separate categories for government owned and daily rental trucks.

Trucks involved in fatal accidents in 1990 showed great differences in carrier type according to the type of power unit. Of the known cases of carrier type, 40% of the straight trucks fell into the intrastate private category, while 63% of the tractors were in the interstate authorized class. Over 85% of the tractors were owned by interstate companies, compared with only 42% of the straight trucks. Almost 71% of the straight trucks were operated by private carriers, compared with only 26% of the tractors.

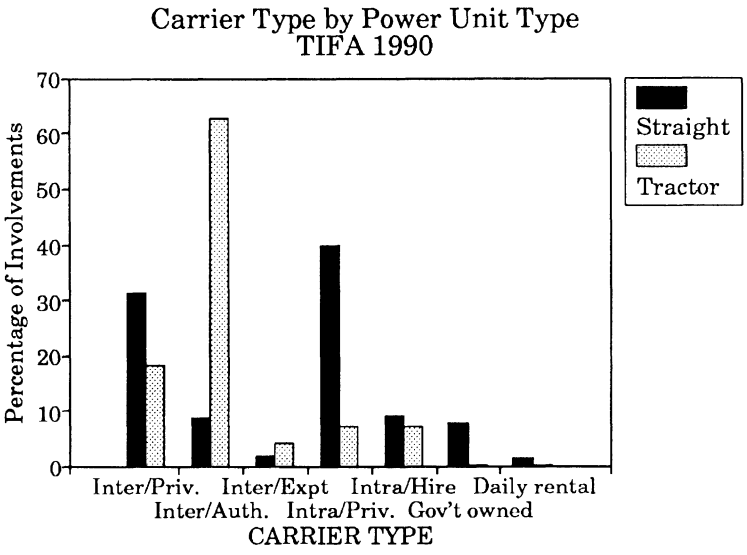


Figure 3-28

TABLE 3-28
Carrier Type by Power Unit Type
TIFA 1990

Carrier Type	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Interstate private	453	30.24%	608	17.39%	1,061	21.25%
Interstate authorized	125	8.34	2,084	59.61	2,209	44.23
Interstate exempt	30	2.00	139	3.98	169	3.38
Intrastate private	575	38.38	241	6.89	816	16.34
Intrastate for hire	132	8.81	236	6.75	368	7.37
Government owned	111	7.41	8	0.23	119	2.38
Daily rental	23	1.54	6	0.17	29	0.58
Unknown	49	3.27	174	4.98	223	4.47
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

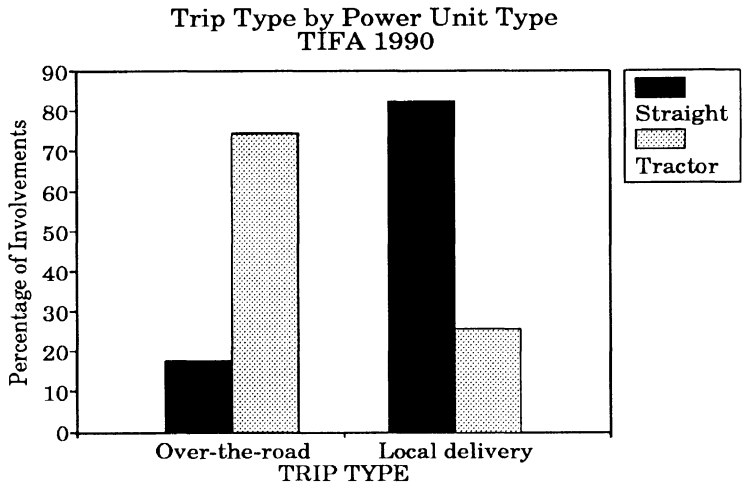


Figure 3-29

The trip type variable is split into over-the-road (one-way trip distance of at least 50 miles) versus local delivery (within a 50 mile radius of base). Again there is a tremendous difference between the straight trucks and tractors. The majority of the involved straight trucks were making local delivery trips at the time of the accident, while most of the tractors were involved in over-the-road operations.

TABLE 3-29
Trip Type by Power Unit Type
TIFA 1990

Trip Type	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Over-the-road	256	17.09%	2,466	70.54%	2,722	54.51%
Local delivery	1,199	80.04	845	24.17	2,044	40.93
Unknown	43	2.87	185	5.29	228	4.57
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

The table and pie graphs on the following pages present the cargo type distributions for the involved trucks. Over 32% of the straight trucks and over 28% of the tractors were empty at the time of the accident. The most common types of cargo hauled by the loaded straight trucks were solids in bulk (24% of all cases), general freight (14%), liquids in bulk (5%), and farm products (5%). For tractors, the cargo type distribution included general freight (26%), solids in bulk (9%), refrigerated food (7%), and logs and lumber (6%). Cases with unknown cargo have been omitted from the pie graphs.

TABLE 3-30
Type of Cargo by Power Unit Type
TIFA 1990

Cargo Type	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
General freight	203	13.55%	900	25.74%	1,103	22.09%
Household goods	30	2.00	43	1.23	73	1.46
Metal	14	0.93	166	4.75	180	3.60
Heavy machinery	64	4.27	128	3.66	192	3.84
Motor vehicles	2	0.13	25	0.72	27	0.54
Driveaway/towaway	7	0.47	24	0.69	31	0.62
Gases in bulk	9	0.60	8	0.23	17	0.34
Solids in bulk	353	23.56	301	8.61	654	13.10
Liquids in bulk	74	4.94	153	4.38	227	4.55
Explosives	0	0.00	5	0.14	5	0.10
Logs/lumber	34	2.27	196	5.61	230	4.61
Empty	485	32.38	997	28.52	1,482	29.68
Refrigerated food	49	3.27	259	7.41	308	6.17
Mobile home	0	0.00	7	0.20	7	0.14
Farm products	72	4.81	144	4.12	216	4.33
Other	85	5.67	9	0.26	94	1.88
Unknown	17	1.13	131	3.75	148	2.96
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

Cargo Type for Straight Trucks
TIFA 1990

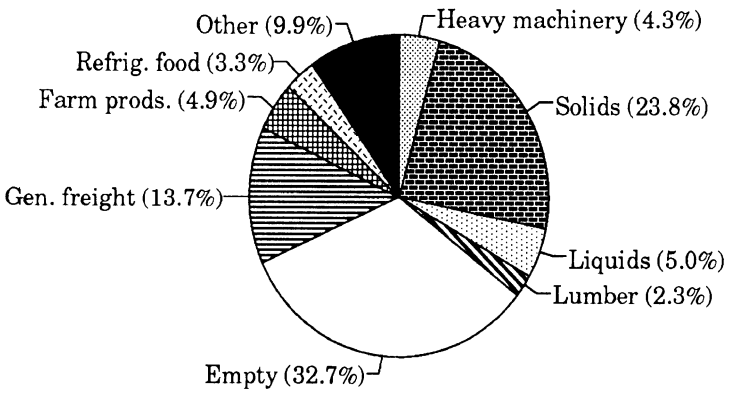


Figure 3-30a

Cargo Type for Tractors
TIFA 1990

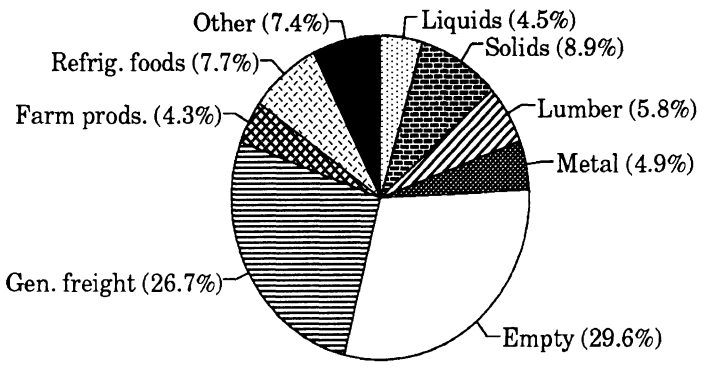


Figure 3-30b

Cab style is split into conventional cabs versus cabover engine and cab-forward cabs. Most of the straight trucks and tractors involved in fatal accidents in 1990 had conventional cabs. Straight trucks in particular were more likely to have conventional cabs; over 82% of them were in that category.

Cab Style by Power Unit Type
TIFA 1990

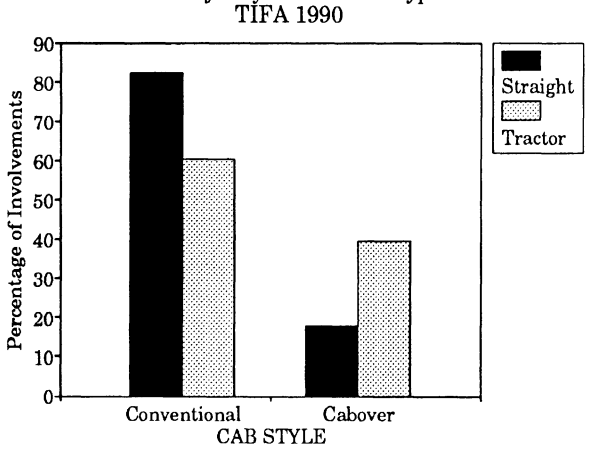


Figure 3-31

TABLE 3-31
Cab Style by Power Unit Type
TIFA 1990

Cab Style	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Conventional	1,231	82.18%	2,052	58.70%	3,283	65.74%
Cabover/Cab-forward	266	17.76	1,345	38.47	1,611	32.26
Unknown	1	0.07	99	2.83	100	2.00
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

The graph below depicts the number of trailers being hauled by the power unit at the time of the accident. If the power unit was towing or piggybacking another vehicle, but not hauling any trailers, the number of trailers was coded as none. Not surprisingly, over 89% of the straight trucks were not hauling a trailer, while 88% of the tractors were hauling a single trailer. While there were three tractors with three trailing units, only two were triples (three cargo units) and the other was a heavy equipment hauler with a jeep, lowboy, booster dolly combination.

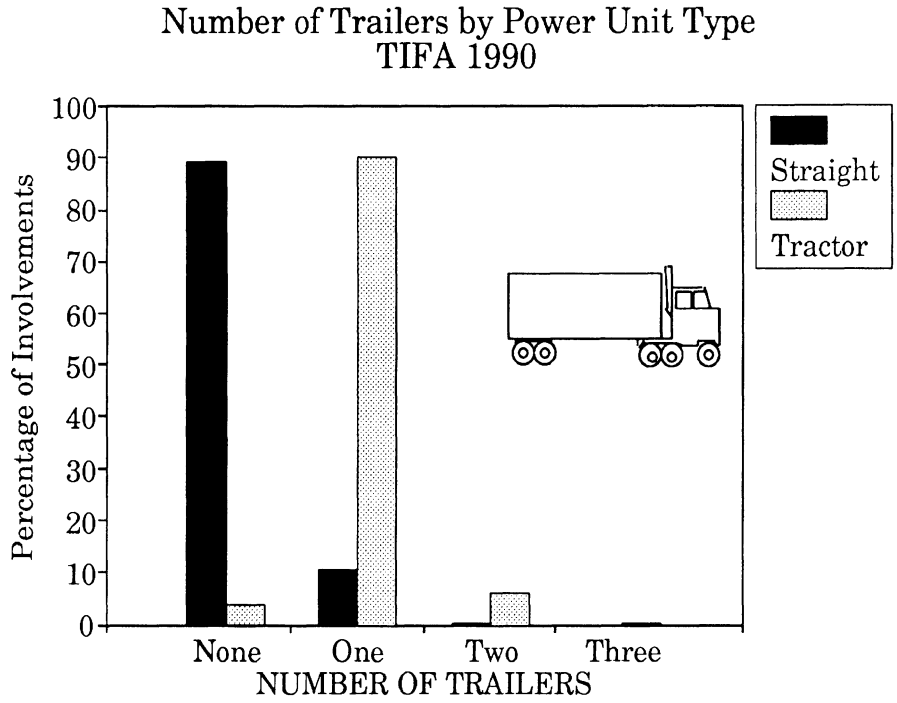


Figure 3-32

TABLE 3-32
Number of Trailers by Power Unit Type
TIFA 1990

Number of Trailers	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
No trailers	1,338	89.32%	133	3.80%	1,471	29.46%
One trailer	159	10.61	3,078	88.04	3,237	64.82
Two trailers	1	0.07	199	5.69	200	4.00
Three trailers	0	0.00	3	0.09	3	0.06
Unknown	0	0.00	83	2.37	83	1.66
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

The type of fuel used by each involved truck was coded as gasoline, diesel fuel, or all other types. Again there is a great difference according to power unit type. Over 96% of the involved tractors used diesel fuel, while the straight trucks were split between diesel and gasoline, 72% and 27%, respectively.

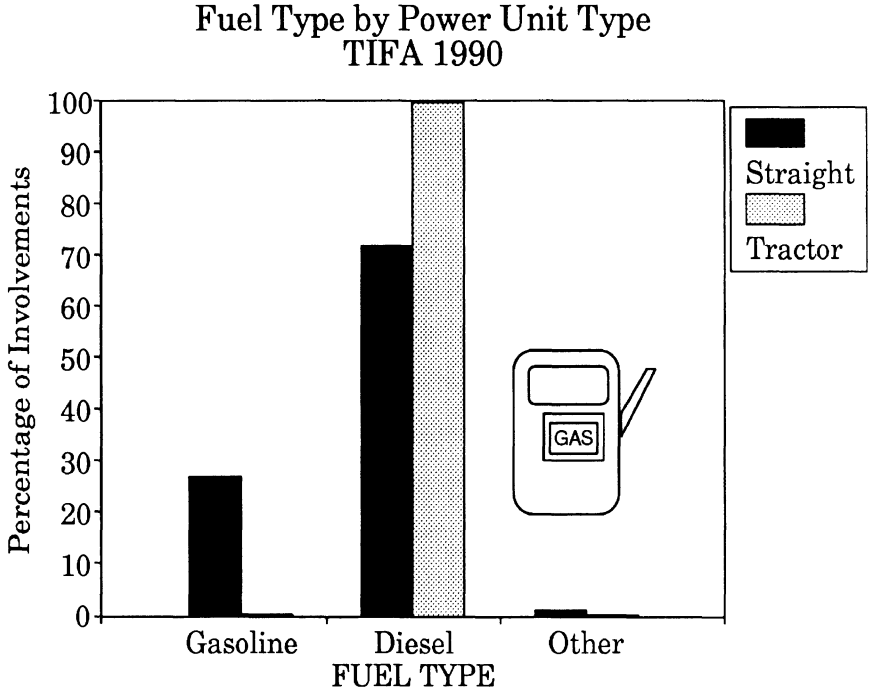


Figure 3-33

TABLE 3-33
Fuel Type by Power Unit Type
TIFA 1990

Fuel Type	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Gasoline	402	26.84%	10	0.29%	412	8.25%
Diesel	1,074	71.70	3,367	96.31	4,441	88.93
Other	16	1.07	5	0.14	21	0.42
Unknown	6	0.40	114	3.26	120	2.40
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

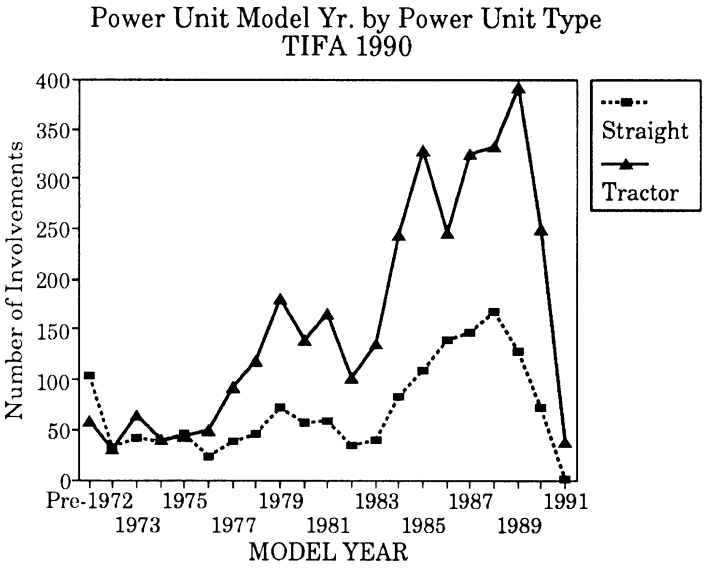


Figure 3-34

The line graph on the left depicts the number of fatal involvements in 1990 according to the model year of the power unit. Tractors involved in fatal accidents were relatively newer than the straight trucks. Of the known cases, 64% of the tractors were from model years 1984-1991, compared to 57% of the straight trucks. On the other hand, 18% of the straight trucks dated from 1975 and earlier, compared to 7% of the tractors. This difference is probably related to the typically high annual mileage of tractors, relative to straight trucks, which limits their number of years of service.

TABLE 3-34
Model Year of Power Unit by Power Unit Type
TIFA 1990

Model Year	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
1966–1971	104	6.94%	59	1.69%	163	3.26%
1972	33	2.20	31	0.89	64	1.28
1973	43	2.87	65	1.86	108	2.16
1974	40	2.67	41	1.17	81	1.62
1975	46	3.07	45	1.29	91	1.82
1976	24	1.60	50	1.43	74	1.48
1977	40	2.67	94	2.69	134	2.68
1978	46	3.07	119	3.40	165	3.30
1979	72	4.81	180	5.15	252	5.05
1980	57	3.81	139	3.98	196	3.92
1981	60	4.01	165	4.72	225	4.51
1982	35	2.34	103	2.95	138	2.76
1983	41	2.74	136	3.89	177	3.54
1984	83	5.54	244	6.98	327	6.55
1985	111	7.41	329	9.41	440	8.81
1986	140	9.35	246	7.04	386	7.73
1987	148	9.88	325	9.30	473	9.47
1988	167	11.15	332	9.50	499	9.99
1989	129	8.61	392	11.21	521	10.43
1990	72	4.81	249	7.12	321	6.43
1991	1	0.07	39	1.12	40	0.80
Unknown	6	0.40	113	3.23	119	2.38
TOTAL	1,498	100.00%	3,496	100.00%	4,994	100.00%

NOTE: The nine cases of unknown power unit type are excluded from this table.

STRAIGHT-TRUCK FATAL ACCIDENT INVOLVEMENTS IN 1990

Distributions that characterize fatal accident involvements of straight trucks in 1990 are presented in this section. Most of the variables are presented according to the cargo body style of the trucks. Cargo body style is known for 99.8% of the 1,498 straight trucks in the TIFA 1990 file. Of the known cases, 29% were dumps, 26% vans, 8% refuse, 8% flatbeds, and 8% tanks. The remaining straight trucks had some other type of cargo body style. Many of the variables discussed in this section concern specific physical characteristics of the trucks themselves. This type of information is not available in the FARS files.

The section begins by characterizing the configuration of the straight trucks according to cargo body style, weight, number of axles, number of trailers, and type of cargo. Next are descriptions of the use of the trucks, in terms of carrier type, trip type, and road class. Following these are distributions pertaining to collision type, and the section concludes with information on the injury experience of the straight-truck drivers.

Configuration

The graph at right illustrates the gross vehicle weight rating (GVWR) distributions for van, flatbed, tank, dump, and refuse straight trucks. The GVWR indicates what the truck would weigh if loaded to its rated capacity. Of the known cases of GVWR, 84.7% were class 6, 7, or 8. These classes correspond to weight ranges of 19,501-26,000 lbs., 26,001-33,000 lbs., and over 33,000 lbs., respectively. The GVWR distributions vary according to cargo body style. Vans and flatbeds were represented throughout the range of GVWRs. Tanks, dumps, and refuse trucks typically had GVWRs in classes 6 through 8.

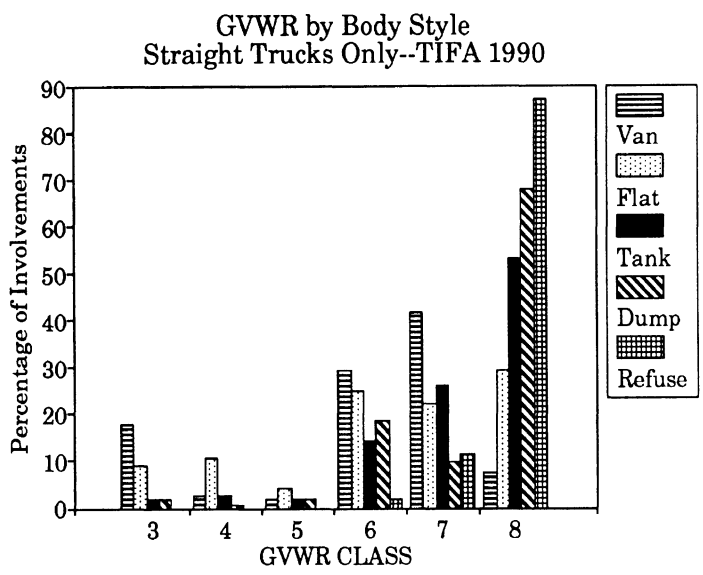


Figure 4-1

TABLE 4–1
GVWR by Body Style
Straight Trucks Only
TIFA 1990

GVWR Class/ Weight Range	BODY STYLE (Frequencies and Column Percents							
	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
3 10,001–14,000	67 16.96	10 8.70	2 1.77	8 1.85	0 0.00	44 13.54	0 0.00	131 8.74
4 14,001–16,000	10 2.53	12 10.43	3 2.65	3 0.69	0 0.00	27 8.31	0 0.00	55 3.67
5 16,001–19,500	6 1.52	5 4.35	2 1.77	7 1.62	0 0.00	18 5.54	0 0.00	38 2.54
6 19,501–26,000	111 28.10	28 24.35	16 14.16	78 18.06	2 1.74	61 18.77	1 33.33	297 19.83
7 26,001–33,000	159 40.25	25 21.74	29 25.66	41 9.49	13 11.30	44 13.54	0 0.00	311 20.76
8 33,001+	28 7.09	33 28.70	59 52.21	287 66.44	100 86.96	121 37.23	1 33.33	629 41.99
Unknown	14 3.54	2 1.74	2 1.77	8 1.85	0 0.00	10 3.08	1 33.33	37 2.47
TOTAL	395 100.00	115 100.00	113 100.00	432 100.00	115 100.00	325 100.00	3 100.00	1,498 100.00

TABLE 4-2
Gross Vehicle Weight by Body Style
Straight Trucks Only
TIFA 1990

Gross Weight (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
< 20,000	234 59.24	66 57.39	27 23.89	90 20.83	4 3.48	154 47.38	1 33.33	576 38.45
20,000	62 15.70	21 18.26	36 31.86	142 32.87	24 20.87	60 18.46	0 0.00	345 23.03
30,000	16 4.05	4 3.48	12 10.62	34 7.87	43 37.39	24 7.38	0 0.00	133 8.88
40,000	5 1.27	3 2.61	10 8.85	34 7.87	15 13.04	17 5.23	0 0.00	84 5.61
50,000	1 0.25	3 2.61	5 4.42	35 8.10	8 6.96	7 2.15	0 0.00	59 3.94
60,000	0 0.00	0 0.00	0 0.00	31 7.18	7 6.09	6 1.85	0 0.00	44 2.94
70,000	0 0.00	4 3.48	2 1.77	21 4.86	4 3.48	10 3.08	0 0.00	41 2.74
80,000+	0 0.00	0 0.00	10 8.85	13 3.01	0 0.00	3 0.92	0 0.00	26 1.74
Unknown	77 19.49	14 12.17	11 9.73	32 7.41	10 8.70	44 13.54	2 66.67	190 12.68
TOTAL	395 100.00	115 100.00	113 100.00	432 100.00	115 100.00	325 100.00	3 100.00	1,498 100.00

NOTE: The figures in the left column indicate the low end of each gross weight range.

The table above presents the gross vehicle weight distributions for straight trucks in the 1990 TIFA file according to cargo body style. Gross vehicle weight refers to the total weight of the configuration and its cargo at a particular time, in this case the time of the accident. Gross vehicle weight is unknown for almost 13% of the straight-truck cases. For the known cases, 70% were operating at a gross weight of under 30,000 pounds, and 81% had a gross weight of less than 40,000 pounds. Of course the gross vehicle weight varied according to the cargo body style. Less than 2% of the involved vans were at a weight of at least 40,000 pounds, compared to more than 33% of the dumps.

On the following page, the gross vehicle weights of the known cases are depicted in a cumulative frequency diagram based on percentages. In general, the lower the line on the graph, the heavier the typical gross weight for that cargo body style. For example, the graph indicates that 75% of the dumps, 83% of the tanks, and over 99% of the vans were operating at a gross weight under 50,000 pounds.

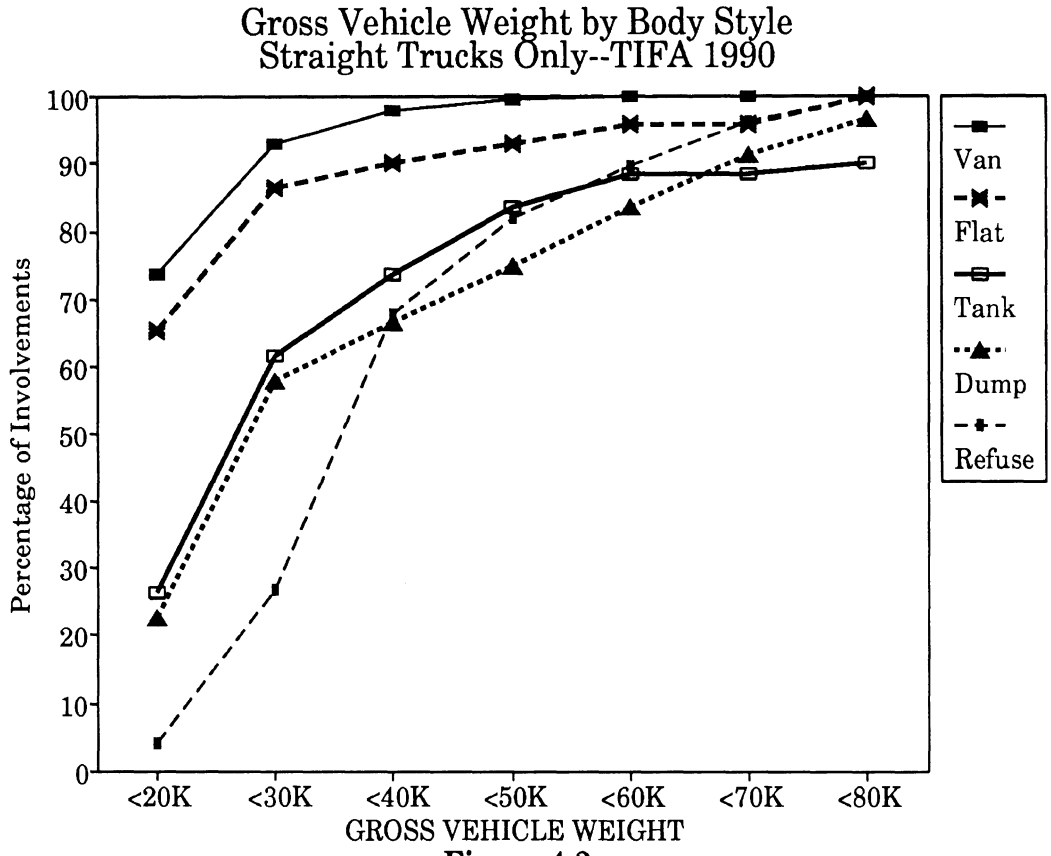


Figure 4-2

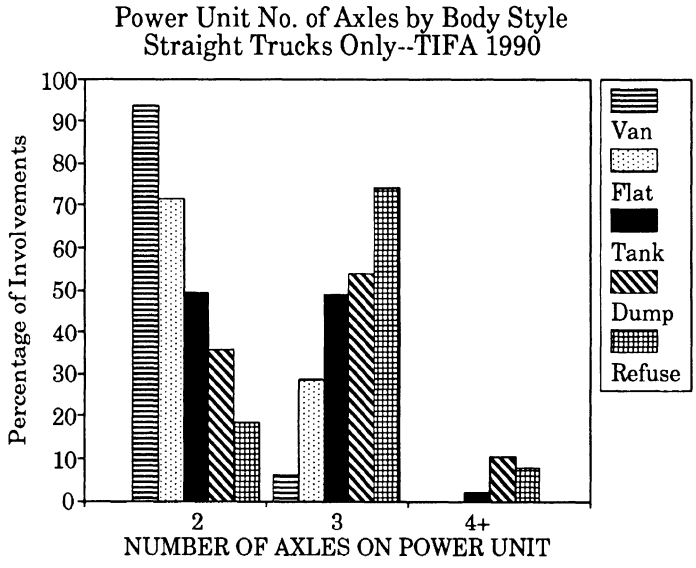


Figure 4-3

The number of axles on the power unit for the 1990 TIFA straight trucks is directly related to the trucks' cargo body style. The highest percentage of two-axle trucks was found among the vans, followed by flatbeds, tanks, dumps, and refuse trucks. The reverse order held for three-axle trucks. Power units with four or more axles were relatively uncommon but comprised over 10% of the dumps and smaller proportions of the refuse trucks and tanks.

TABLE 4-3
Number of Axles on Power Unit by Body Style
Straight Trucks Only
TIFA 1990

Power Unit No. of Axles (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
2	369 93.42	82 71.30	56 49.56	154 35.65	21 18.26	215 66.15	2 66.67	899 60.01
3	24 6.08	33 28.70	55 48.67	232 53.70	85 73.91	94 28.92	1 33.33	524 34.98
4+	0 0.00	0 0.00	2 1.77	46 10.65	9 7.83	16 4.92	0 0.00	73 4.87
Unknown	2 0.51	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	2 0.13
TOTAL	395 100.00	115 100.00	113 100.00	432 100.00	115 100.00	325 100.00	3 100.00	1,498 100.00

The table below attempts to characterize the configuration of the straight trucks in terms of number of units and number of axles on each unit. The rows of the table indicate the number of axles on the power unit, with possibilities of two, three, four or more, and unknown. The columns list frequencies for trucks without a trailer, with one trailer, and with two trailers. Subheadings of the trailer columns indicate the number of axles on the trailer. So, for example, the most common configuration among the 1,498 straight trucks (824 cases) was a two-axle truck not hauling a trailer. Among the cases of trucks hauling a single trailer, the most common axle configuration (60 cases) was a three-axle power unit and a two-axle trailer.

TABLE 4-4
Number of Axles on Power Unit and Trailers
Straight Trucks Only
TIFA 1990

Power Unit No. of Axles	Number of Trailers/Number of Axles on Trailer							
		One Trailer					Two Trailers	TOTAL
	No Trailer	1	2	3	4+	Unk.	3,3	
2	824	21	40	13	1	0	0	899
3	447	1	60	10	6	0	0	524
4+	67	0	1	1	3	0	1	73
Unknown	0	0	0	0	0	2	0	2
TOTAL	1,338	22	101	24	10	2	1	1,498

The table below presents the cargo type distributions of the straight trucks according to cargo body style. The proportion of the trucks that were empty at the time of the accident ranged from 19.5% of the vans to 45.2% of the flatbeds.

TABLE 4-5
Cargo Type by Body Style
Straight Trucks Only
TIFA 1990

Cargo Type (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
General freight	181 45.82	11 9.57	0 0.00	0 0.00	0 0.00	11 3.38	0 0.00	203 13.55
Household goods	30 7.59	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	30 2.00
Metal	3 0.76	2 1.74	0 0.00	1 0.23	0 0.00	8 2.46	0 0.00	14 0.93
Heavy machinery	5 1.27	19 16.52	0 0.00	28 6.48	0 0.00	12 3.69	0 0.00	64 4.27
Motor vehicles	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	2 0.62	0 0.00	2 0.13
Driveaway/tow	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	7 2.15	0 0.00	7 0.47
Gases in bulk	0 0.00	0 0.00	9 7.96	0 0.00	0 0.00	0 0.00	0 0.00	9 0.60
Solids in bulk	16 4.05	6 5.22	0 0.00	198 45.83	79 68.70	54 16.62	0 0.00	353 23.56
Liquids in bulk	0 0.00	0 0.00	74 65.49	0 0.00	0 0.00	0 0.00	0 0.00	74 4.94
Logs/lumber	0 0.00	15 13.04	0 0.00	2 0.46	0 0.00	17 5.23	0 0.00	34 2.27
Empty	77 19.49	52 45.22	30 26.55	175 40.51	31 26.96	120 36.92	0 0.00	485 32.38
Refrig. food	49 12.41	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	49 3.27
Farm products	19 4.81	9 7.83	0 0.00	24 5.56	0 0.00	20 6.15	0 0.00	72 4.81
Other	6 1.52	1 0.87	0 0.00	4 0.93	1 0.87	72 22.15	1 33.33	85 5.67
Unknown	9 2.28	0 0.00	0 0.00	0 0.00	4 3.48	2 0.62	2 66.67	17 1.13
TOTAL	395 100.00	115 100.00	113 100.00	432 100.00	115 100.00	325 100.00	3 100.00	1,498 100.00

Obviously the various types of cargo bodies were designed to haul different kinds of goods, so the distributions vary a great deal from one type of cargo body to another. All the loaded tanks were carrying liquids or gases in bulk, while most of the loaded dumps and refuse trucks were hauling solids in bulk. Vans and flatbeds were more variable in the type of cargo they were hauling, as the pie graphs below indicate. Cases with unknown cargo have been excluded from the pie graphs.

Cargo Type for Van Straight Trucks
TIFA 1990

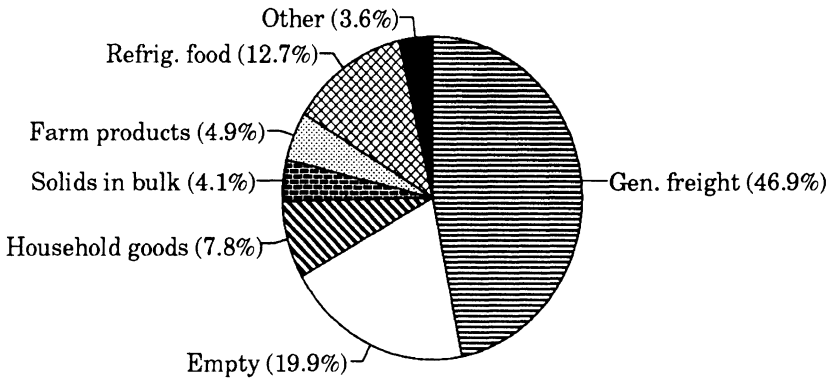


Figure 4-5a

Cargo Type for Flatbed Straight Trucks
TIFA 1990

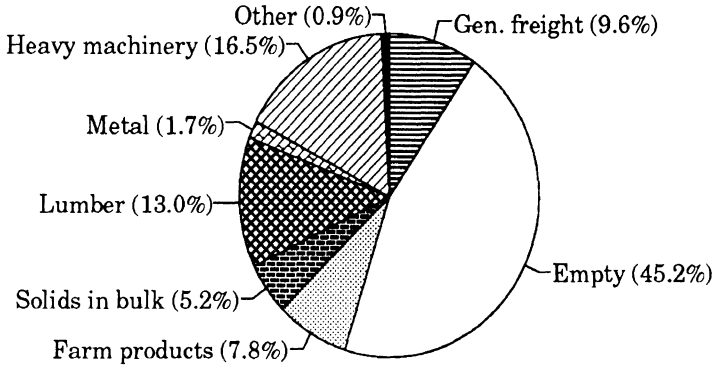


Figure 4-5b

Use

Carrier type, which was discussed earlier for straight trucks versus tractors, is shown here for straight trucks according to cargo body style. In the graph, all interstate carriers and all intrastate carriers have been combined, but in the table below they are separated into private and for-hire groups. Not surprisingly, the carrier type of the involved trucks varies according to the cargo body style. The highest proportion of interstate carriers was found among the vans (58% of the known cases). Vans also had the highest percentage of interstate authorized carriers (16%). On the other hand, dumps were characterized by the highest proportion of intrastate carriers (58%), and refuse trucks by the highest percentage of intrastate private carriers (51% of the known cases).

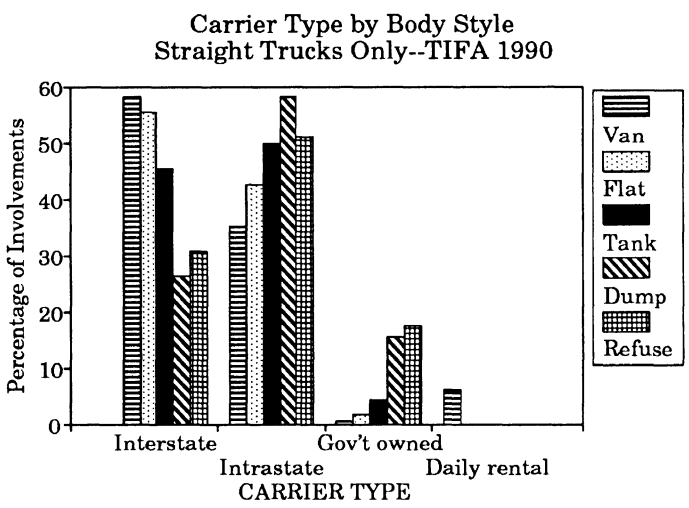


Figure 4-6

TABLE 4-6
Carrier Type by Body Style
Straight Trucks Only
TIFA 1990

Carrier Type (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Interstate private	151 38.23	55 47.83	37 32.74	74 17.13	29 25.22	106 32.62	1 33.33	453 30.24
Interstate authorized	62 15.70	2 1.74	12 10.62	29 6.71	5 4.35	15 4.62	0 0.00	125 8.34
Interstate exempt	7 1.77	3 2.61	2 1.77	9 2.08	1 0.87	8 2.46	0 0.00	30 2.00
Intrastate private	107 27.09	39 33.91	48 42.48	172 39.81	58 50.43	151 46.46	0 0.00	575 38.38
Intrastate for hire	26 6.58	7 6.09	8 7.08	75 17.36	0 0.00	16 4.92	0 0.00	132 8.81
Government owned	2 0.51	2 1.74	5 4.42	66 15.28	20 17.39	16 4.92	0 0.00	111 7.41
Daily rental	23 5.82	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	23 1.54
Unknown	17 4.30	7 6.09	1 0.88	7 1.62	2 1.74	13 4.00	2 66.67	49 3.27
TOTAL	395 100.00	115 100.00	113 100.00	432 100.00	115 100.00	325 100.00	3 100.00	1,498 100.00

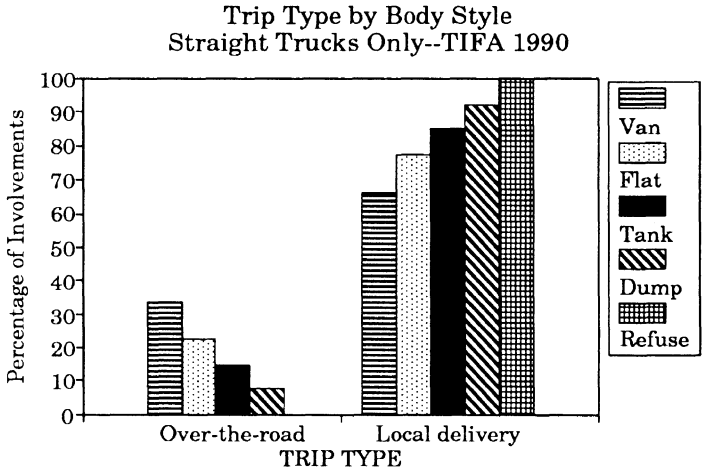


Figure 4-7

For all five kinds of cargo body styles considered, the majority of involved straight trucks were conducting local delivery trips at the time of the accident. Of the known cases, vans had the highest proportion making over-the-road trips (34%), followed by flatbeds (23%), tanks (14%), dumps (8%), and refuse trucks (0%).

TABLE 4-7
Trip Type by Body Style
Straight Trucks Only
TIFA 1990

Trip Type (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Over-the-road	128 32.41	25 21.74	16 14.16	34 7.87	0 0.00	53 16.31	0 0.00	256 17.09
Local delivery	250 63.29	85 73.91	95 84.07	393 90.97	111 96.52	264 81.23	1 33.33	1,199 80.04
Unknown	17 4.30	5 4.35	2 1.77	5 1.16	4 3.48	8 2.46	2 66.67	43 2.87
TOTAL	395 100.00	115 100.00	113 100.00	432 100.00	115 100.00	325 100.00	3 100.00	1,498 100.00

There is less variation among the different types of straight trucks for the class of road where the accident occurred. Overall, more than 50% of the straight-truck involvements occurred on major arteries, and all categories of cargo body styles had a substantial proportion of involvements on these roads. Only 16% of the overall involvements occurred on limited access roads, but the percentages for vans and tanks were slightly higher, and for refuse trucks were much lower. Over 33% of all the accidents took place on the "other" class of roads, but refuse trucks were over represented with 59% of involvements on "other" class roads.

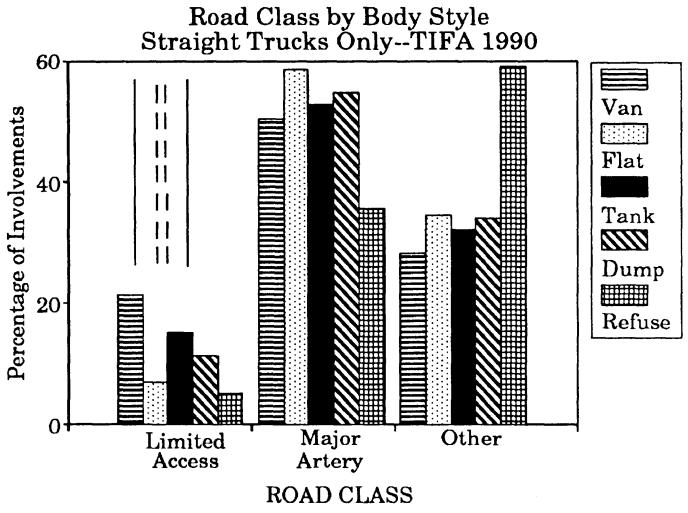


Figure 4-8

TABLE 4-8
Road Class by Body Style
Straight Trucks Only
TIFA 1990

Road Class (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Limited Access	90 22.78	13 11.30	20 17.70	55 12.73	8 6.96	53 16.31	0 0.00	239 15.95
Major Artery	196 49.62	62 53.91	56 49.56	231 53.47	39 33.91	169 52.00	1 33.33	754 50.33
Other	109 27.59	38 33.04	36 31.86	146 33.80	68 59.13	103 31.69	2 66.67	502 33.51
Unknown	0 0.00	2 1.74	1 0.88	0 0.00	0 0.00	0 0.00	0 0.00	3 0.20
TOTAL	395 100.00	115 100.00	113 100.00	432 100.00	115 100.00	325 100.00	3 100.00	1,498 100.00

Accidents

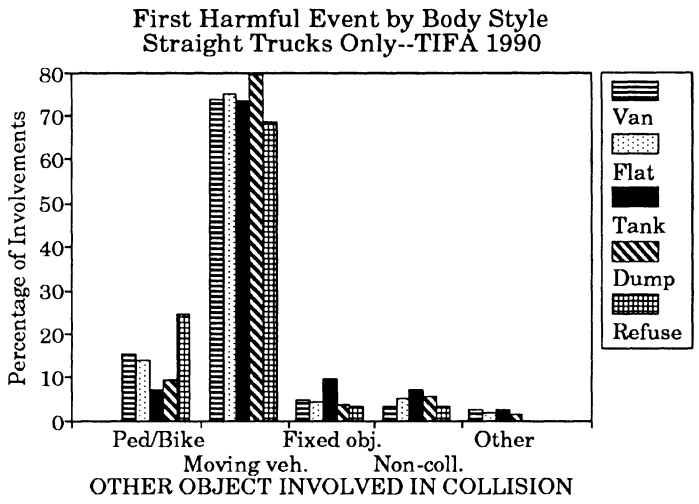


Figure 4-9

The graph on the left illustrates the distribution of the first harmful event in the accident for the 1990 TIFA straight trucks by cargo body style. The distribution of this variable does not show much variation from one type of straight truck to the next. For all five cargo body styles, the first harmful event, in the majority of cases, was a collision with a motor vehicle in transport. Some of the differences among the different straight trucks include a higher proportion of pedestrian accidents among refuse trucks, and a higher incidence of fixed object and non-collisions for tanks.

TABLE 4-9
First Harmful Event by Body Style
Straight Trucks Only
TIFA 1990

First Harmful Event (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Pedestrian	49 12.41	9 7.83	7 6.19	29 6.71	27 23.48	29 8.92	1 33.33	151 10.08
Pedalcyclist	12 3.04	7 6.09	1 0.88	12 2.78	1 0.87	3 0.92	0 0.00	36 2.40
Train	3 0.76	1 0.87	3 2.65	3 0.69	0 0.00	1 0.31	0 0.00	11 0.73
Moving vehicle	292 73.92	86 74.78	83 73.45	344 79.63	79 68.70	247 76.00	2 66.67	1,133 75.63
Parked vehicle	5 1.27	1 0.87	0 0.00	3 0.69	0 0.00	1 0.31	0 0.00	10 0.67
Other non-fixed object	2 0.51	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	2 0.13
Fixed object	19 4.81	5 4.35	11 9.73	16 3.70	4 3.48	28 8.62	0 0.00	83 5.54
Non-collision	13 3.29	6 5.22	8 7.08	25 5.79	4 3.48	16 4.92	0 0.00	72 4.81
TOTAL	395 100.00	115 100.00	113 100.00	432 100.00	115 100.00	325 100.00	3 100.00	1,498 100.00

Most harmful event is a FARS variable that categorizes the most severe event in the accident sequence for each vehicle. The graph to the right illustrates the distribution of most harmful event for the 1990 TIFA straight trucks by body style. In comparing the most harmful event with the first harmful event, the primary differences are the large increase in non-collisions, such as rollovers, explosions, and fires, for tanks and the drop in fixed object collisions for all cargo body styles.

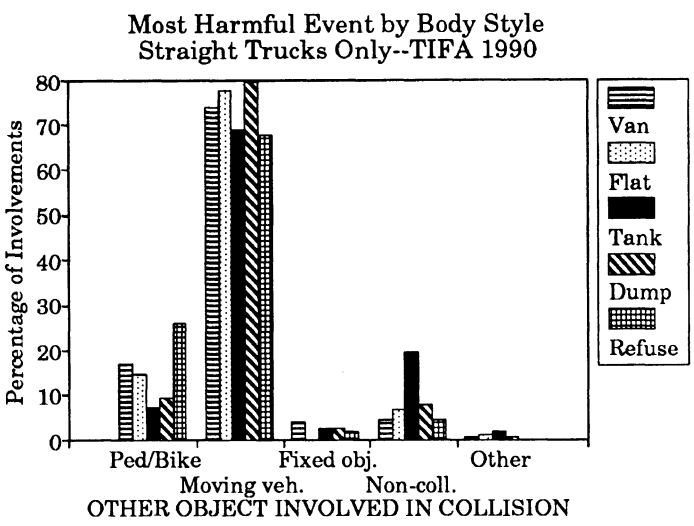


Figure 4-10

TABLE 4-10
Most Harmful Event by Body Style
Straight Trucks Only
TIFA 1990

Most Harmful Event (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Pedestrian	55 13.92	10 8.70	7 6.19	29 6.71	29 25.22	34 10.46	1 33.33	165 11.01
Pedalcyclist	12 3.04	7 6.09	1 0.88	12 2.78	1 0.87	3 0.92	0 0.00	36 2.40
Train	3 0.76	1 0.87	2 1.77	3 0.69	0 0.00	1 0.31	0 0.00	10 0.67
Moving vehicle	291 73.67	89 77.39	78 69.03	343 79.40	78 67.83	242 74.46	2 66.67	1,123 74.97
Fixed object	16 4.05	0 0.00	3 2.65	11 2.55	2 1.74	11 3.38	0 0.00	43 2.87
Non-collision	18 4.56	8 6.96	22 19.47	34 7.87	5 4.35	34 10.46	0 0.00	121 8.08
TOTAL	395 100.00	115 100.00	113 100.00	432 100.00	115 100.00	325 100.00	3 100.00	1,498 100.00

The manner of collision distributions are shown in the graph to the right for the 1,133 straight-truck involvements where the first harmful event was a collision with another motor vehicle. Overall, angle collisions were the most common type (46%), followed by head-ons (27%), rear-ends (22%), and sideswipes (5%). Most of the different cargo body styles had collision type distributions similar to the overall pattern. The major exceptions were the overinvolvement of tanks (42.2%) and flatbeds (36.0%) in head-on collisions, and of refuse trucks (54.4%) in angle collisions. Vans had the highest percentage of sideswipe collisions (7.2%).

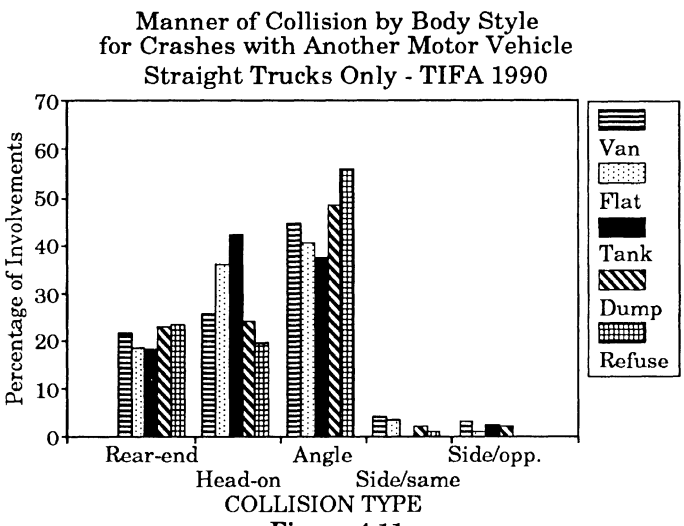


Figure 4-11

TABLE 4-11
Manner of Collision by Body Style
for Crashes with Another Motor Vehicle
Straight Trucks Only
TIFA 1990

Manner of Collision (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Rear-end	63 21.58	16 18.60	15 18.07	79 22.97	18 22.78	54 21.86	0 0.00	245 21.62
Head-on	75 25.68	31 36.05	35 42.17	82 23.84	15 18.99	63 25.51	0 0.00	301 26.57
Rear-to-rear	1 0.34	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 0.09
Angle	130 44.52	35 40.70	31 37.35	166 48.26	43 54.43	116 46.96	1 50.00	522 46.07
Sideswipe, same dir.	12 4.11	3 3.49	0 0.00	7 2.03	1 1.27	5 2.02	1 50.00	29 2.56
Sideswipe, opp. dir.	9 3.08	1 1.16	2 2.41	7 2.03	0 0.00	8 3.24	0 0.00	27 2.38
Unknown	2 0.68	0 0.00	0 0.00	3 0.87	2 2.53	1 0.40	0 0.00	8 0.71
TOTAL	292 100.00	86 100.00	83 100.00	344 100.00	79 100.00	247 100.00	2 100.00	1,133 100.00

Driver Injury

The graph at right shows the distributions for the injury severity sustained by the straight-truck drivers. There is not a lot of variation among the different cargo body styles. One difference is the higher proportion of casualties among tank-truck drivers, 54.1% of the known cases, compared to the overall average of 41.1%. The incidence of driver fatality was especially high among tank trucks with 27.5% of the known cases. The overall incidence of fatalities among the straight-truck drivers was less than 12%.

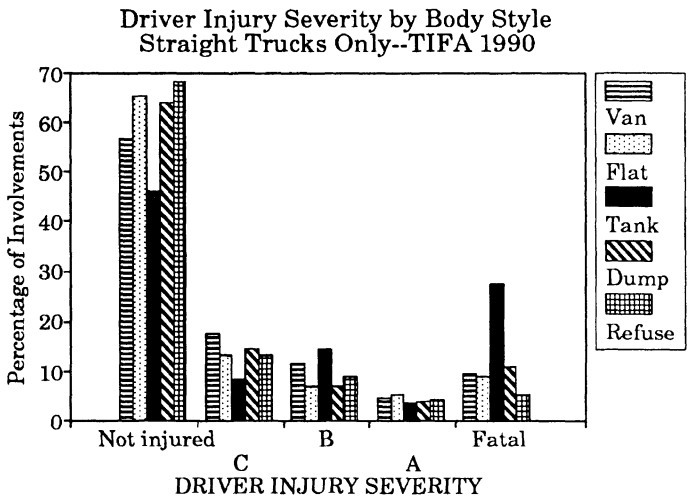


Figure 4-12

TABLE 4–12
Truck Driver Injury Severity by Body Style
Straight Trucks Only
TIFA 1990

Injury Severity (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Not injured	221 55.95	73 63.48	50 44.25	271 62.73	78 67.83	166 51.08	3 100.00	862 57.54
C injury, possible	68 17.22	15 13.04	9 7.96	62 14.35	15 13.04	39 12.00	0 0.00	208 13.89
B injury, not incapacitating	45 11.39	8 6.96	16 14.16	29 6.71	10 8.70	37 11.38	0 0.00	145 9.68
A injury, incapacitating	18 4.56	6 5.22	4 3.54	16 3.70	5 4.35	21 6.46	0 0.00	70 4.67
Fatal injury	37 9.37	10 8.70	30 26.55	46 10.65	6 5.22	45 13.85	0 0.00	174 11.62
Injured, severity unknown	2 0.51	0 0.00	0 0.00	0 0.00	0 0.00	2 0.62	0 0.00	4 0.27
Unknown if injured	4 1.01	3 2.61	4 3.54	8 1.85	1 0.87	15 4.62	0 0.00	35 2.34
TOTAL	395 100.00	115 100.00	113 100.00	432 100.00	115 100.00	325 100.00	3 100.00	1,498 100.00

Next, driver injury severity is considered for all TIFA 1990 straight trucks according to the principal point of impact on the truck. Table 4-13A below shows the frequencies for impact area versus injury severity, while Table 4-13B lists the percentage that each impact area comprised of each injury severity category. The front of the truck was the most common principal impact area (54.5%), followed by the rear (13.6%) and the right side (13.6%). Although non-collisions represented only 3.4% of all fatal involvements, they accounted for 22.4% of the cases in which the truck driver died.

TABLE 4-13A
Driver Injury Severity by Principal Impact Point for Straight Trucks—Frequencies TIFA 1990

Principal Impact Point	Driver Injury Severity							
	Not Injured	C	B	A	Fatal	Injured, severity unk	Unknown if injured	TOTAL
Noncollision	7	1	1	3	39	0	0	51
Right side	136	14	23	8	22	0	0	203
Rear	150	25	3	0	10	0	16	204
Left side	75	18	11	2	8	0	9	123
Front	424	144	98	54	85	4	8	817
Top	1	1	2	0	3	0	0	7
Undercarriage	49	4	0	3	5	0	1	62
Override	8	0	4	0	0	0	0	12
Unknown	12	1	3	0	2	0	1	19
TOTAL	862	208	145	70	174	4	35	1,498

TABLE 4-13B
Driver Injury Severity by Principal Impact Point for Straight Trucks—Column Percentages TIFA 1990

Principal Impact Point	Driver Injury Severity							
	Not Injured	C	B	A	Fatal	Injured, sev unk	Unk if injured	TOTAL
Noncollision	0.81%	0.48%	0.69%	4.29%	22.41%	0.00%	0.00%	3.40%
Right side	15.78	6.73	15.86	11.43	12.64	0.00	0.00	13.55
Rear	17.40	12.02	2.07	0.00	5.75	0.00	45.71	13.62
Left side	8.70	8.65	7.59	2.86	4.60	0.00	25.71	8.21
Front	49.19	69.23	67.59	77.14	48.85	100.00	22.86	54.54
Top	0.12	0.48	1.38	0.00	1.72	0.00	0.00	0.47
Undercar.	5.68	1.92	0.00	4.29	2.87	0.00	2.86	4.14
Override	0.93	0.00	2.76	0.00	0.00	0.00	0.00	0.80
Unknown	1.39	0.48	2.07	0.00	1.15	0.00	2.86	1.27
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

The stacked bar graph below represents the proportion that each injury severity level (excluding the unknown if injured and injured, severity unknown categories) comprised of each impact area. Non-collisions were characterized by the highest proportion of driver fatalities (76%), and resulted in driver casualties in 86% of the cases. The category with the next highest percentage of truck driver casualties was front area impacts (47%). Involvements in which the principal impact area was the rear of the truck were among the safest for the truck driver. The driver was uninjured in 80% of these cases.

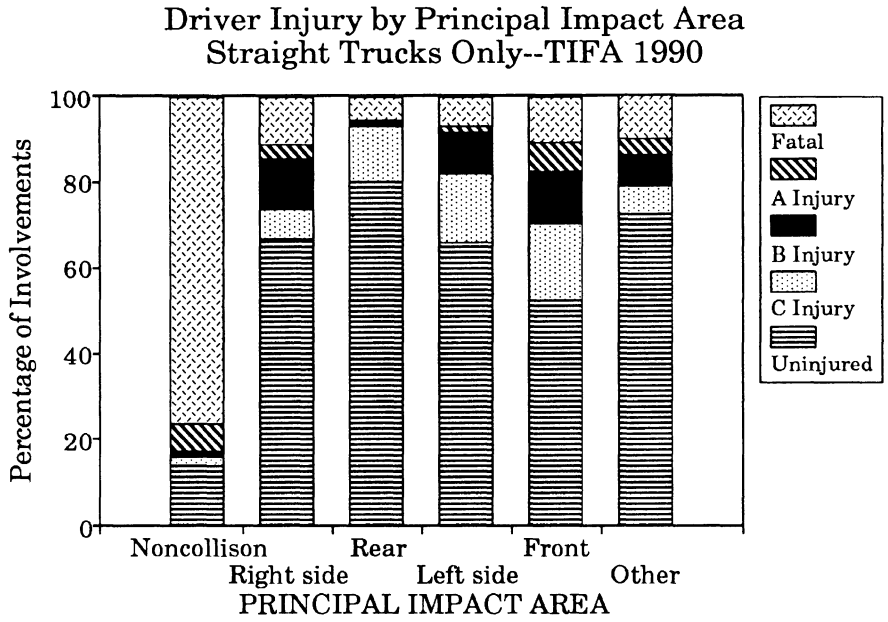


Figure 4-13

In the final set of tabulations for straight trucks, levels of driver injury severity are compared across a variable that indicates whether or not the truck experienced a rollover or fire or whether the driver was ejected. This variable was based on the three FARS variables that record the occurrence of each of these events. Table 4-14A on the following page presents the frequencies of the driver injury severity variable versus the rollover/fire/ejection variable. Table 4-14B lists the percentages that the latter comprised of each of the injury severity categories.

In 80% of the straight-truck involvements, there was no rollover, fire, or ejection. In 9% of the cases, the truck experienced a rollover only, and in the remainder there was a fire, ejection, or some combination of all three. Among the accidents in which the truck driver died, only 21% did not include a rollover, fire, or ejection. In 28% of the truck driver fatals, there was a rollover and the driver was ejected; in 26% there was a rollover only; and in 16% there was an ejection only. At the other extreme, among the cases where the truck driver was not injured, there was no rollover, fire, or ejection in 95%.

TABLE 4-14A
Driver Injury Severity by Rollover/Fire/Ejection for Straight Trucks—Frequencies
TIFA 1990

Occurrence of Rollover/Fire/Ejection	Driver Injury Severity							
	Not Injured	C	B	A	Fatal	Injured, severity unk	Unknown if injured	TOTAL
None	821	175	115	50	37	4	1	1,203
Rollover only	27	27	24	13	45	0	0	136
Fire only	14	2	1	1	11	0	1	30
Ejection only	0	1	0	1	28	0	0	30
Rollover/Fire	0	3	4	0	4	0	0	11
Rollover/Ejection	0	0	1	5	48	0	0	54
Rollover/Fire/Ejection	0	0	0	0	1	0	0	1
Unknown	0	0	0	0	0	0	33	33
TOTAL	862	208	145	70	174	4	35	1,498

TABLE 4-14B
Driver Injury Severity by Rollover/Fire/Ejection for Straight Trucks—Column Percentages
TIFA 1990

Occurrence of Rollover/Fire/Ejection	Driver Injury Severity							
	Not Injured	C	B	A	Fatal	Injured, sev unk	Unk if injured	TOTAL
None	95.24%	84.13%	79.31%	71.43%	21.26%	100.00%	2.86%	80.31%
Rollover only	3.13	12.98	16.55	18.57	25.86	0.00	0.00	9.08
Fire only	1.62	0.96	0.69	1.43	6.32	0.00	2.86	2.00
Ejection only	0.00	0.48	0.00	1.43	16.09	0.00	0.00	2.00
Rollover/Fire	0.00	1.44	2.76	0.00	2.30	0.00	0.00	0.73
Roll/Eject	0.00	0.00	0.69	7.14	27.59	0.00	0.00	3.60
Roll/Fire/Eject	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.07
Unknown	0.00	0.00	0.00	0.00	0.00	0.00	94.29	2.20
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

The following figure displays the driver injury severity outcome for each of the categories of rollover/fire/ejection occurrence. In collisions when none of those events took place, the driver was uninjured 69% of the time. This was true of only 48% of the cases when only a fire took place, 20% when only a rollover occurred, and never when the driver was ejected. As one would expect, combinations of these events, although rare, proved especially hazardous to the driver.

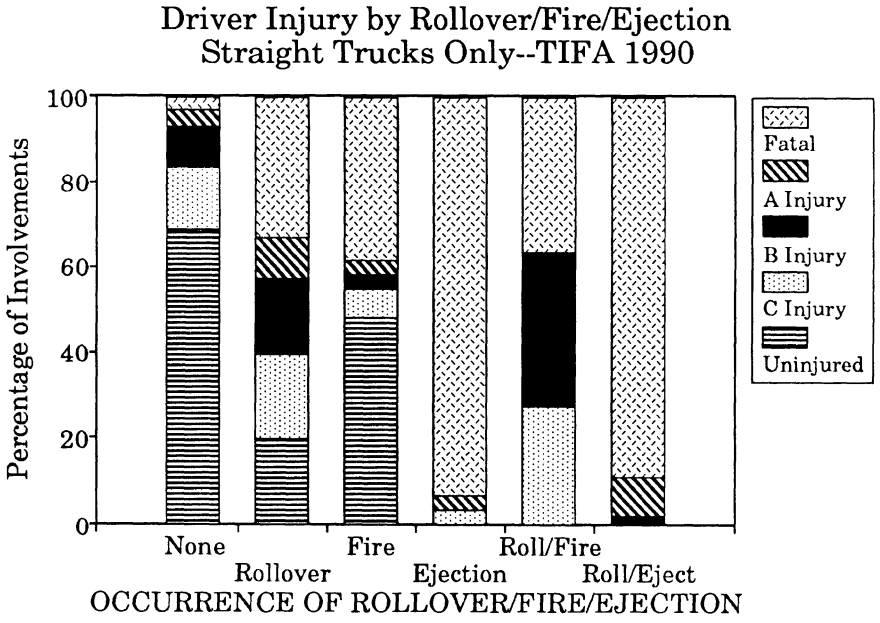


Figure 4-14

TRACTOR-COMBINATION FATAL ACCIDENT INVOLVEMENTS IN 1990

This section focuses exclusively on the fatal accident experience of tractor combinations in 1990. Bobtails, singles, and doubles are all included in this section. Most of the distributions are presented according to either the trailer body style or cab style of the tractors. As in the last section on straight trucks, many of the variables presented describe detailed physical information about the trucks that is not available in the FARS files.

Since tractors were involved in 70% of the fatal large-truck accidents in 1990, a greater number of variables is discussed for the tractors than was the case for the straight trucks. The configuration of the involved tractors is characterized according to cab style, trailer body style, number of trailers, weight, axle configuration, and cargo type. Following that are descriptions of the use of the tractors, including carrier type, trip type, road class, land use, and light condition. Next is a series of collision type distributions, including the occurrence of rollovers and jackknifes according to gross combination weight. The final portion of the section concerns the injury experience of the tractor drivers.

Configuration

Cab style is coded in TIFA as either conventional or cabover/cab-forward. The proportion of conventional cab tractors, for the cases in which cab style was known, has increased from 50% in 1987 to 60% in 1990. The distributions for the number of trailers hauled by these two cab styles are illustrated in the graph on the right. The two distributions are virtually identical.

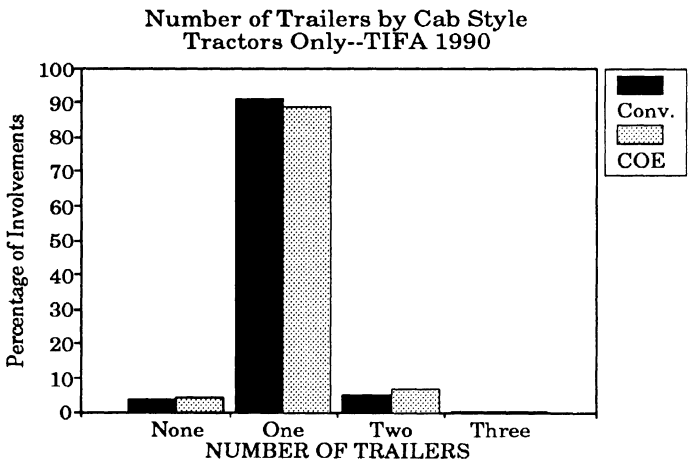


Figure 5-1

TABLE 5-1
Number of Trailers by Cab Style
Tractors Only
TIFA 1990

Number of Trailers	Conventional		Cabover/ Cab-forward		Unknown		TOTAL	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
No trailers	77	3.75%	56	4.16%	0	0.00%	133	3.80%
One trailer	1,870	91.13	1,196	88.92	12	12.12	3,078	88.04
Two trailers	103	5.02	92	6.84	4	4.04	199	5.69
Three trailers	2	0.10	1	0.07	0	0.00	3	0.09
Unknown	0	0.00	0	0.00	83	83.84	83	2.37
TOTAL	2,052	100.00%	1,345	100.00%	99	100.00%	3,496	100.00%

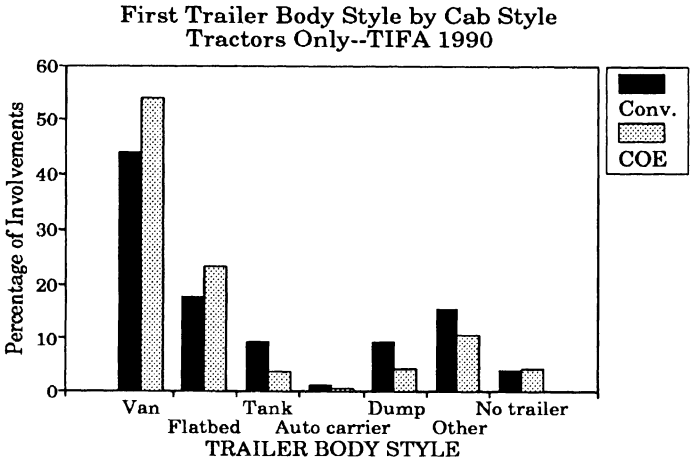


Figure 5-2

The graph at left shows the distributions of the first trailer body style according to the cab style of the involved tractors. Of the known cases of trailer body style, cabovers were more likely to be hauling a van (54%) or a flatbed (23%) as the first trailer. Conventionals had higher proportions of tanks and dumps as the first trailer than did the cabovers.

TABLE 5-2
First Trailer Body Style by Cab Style
Tractors Only
TIFA 1990

First Trailer Body Style	Conventional		Cabover/ Cab-forward		Unknown		TOTAL	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Van	903	44.01%	724	53.83%	3	3.03%	1,630	46.62%
Flatbed	363	17.69	310	23.05	0	0.00	673	19.25
Tank	186	9.06	47	3.49	0	0.00	233	6.66
Auto carrier	20	0.97	7	0.52	0	0.00	27	0.77
Dump	188	9.16	54	4.01	0	0.00	242	6.92
Other	313	15.25	142	10.56	0	0.00	455	13.01
No first trailer	77	3.75	56	4.16	0	0.00	133	3.80
Unknown	2	0.10	5	0.37	96	96.97	103	2.95
TOTAL	2,052	100.00%	1,345	100.00%	99	100.00%	3,496	100.00%

Table 5-2 above indicates the relative proportions of the different first trailer body styles for the TIFA 1990 tractors. If the cases are restricted to those where there was a first trailer and its body style was known, then 50.0% of the involved tractors were hauling a van as the first trailer, 20.6% a flatbed, 7.1% a tank, 0.8% an auto carrier, 7.4% a dump, and the remaining 13.9% were hauling some other type of trailer. Many of the distributions presented in the rest of this section are given according to the first trailer body style, using the categories of van, flatbed, tank, auto carrier, and dump, so the proportion that each trailer type comprises out of the total should be kept in mind.

The graph at right illustrates GVWR distributions for the 1990 TIFA tractors. The GVWR pertains to only the power unit, so in this case it indicates the rated weight capacity of the axles of the tractor itself. For the cases where GVWR was known, over 94% of the tractors involved in fatal accidents in 1990 were class 8 (over 33,000 pounds). An even higher proportion of tractors hauling flatbeds, tanks, or dumps as the first trailer were class 8 vehicles. Class 8 tractors pulled slightly fewer vans (92%) and auto carriers (89%).

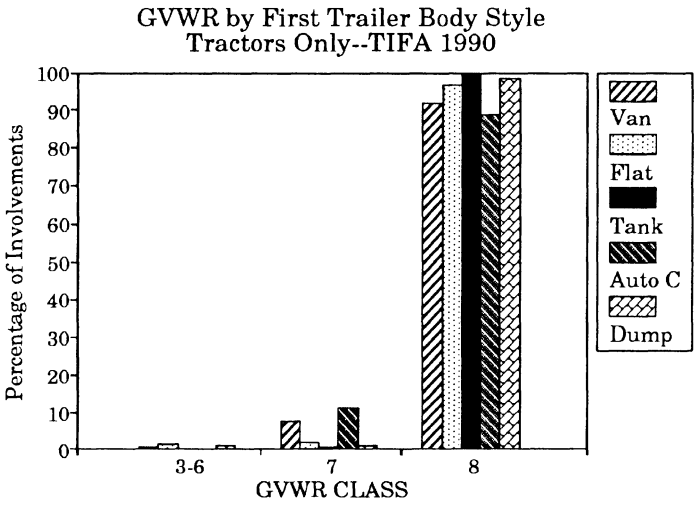


Figure 5-3

TABLE 5-3
GVWR by First Trailer Body Style
Tractors Only
TIFA 1990

GVWR Class/ Weight Range	BODY STYLE (Frequencies and Column Percents)							
	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unknown/ No Trailer	TOTAL
3 10,001–14,000	0 0.00	1 0.15	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 0.03
5 16,001–19,500	0 0.00	2 0.30	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	2 0.06
6 19,501–26,000	8 0.49	5 0.74	0 0.00	0 0.00	2 0.83	0 0.00	1 0.42	16 0.46
7 26,001–33,000	125 7.67	13 1.93	1 0.43	3 11.11	2 0.83	14 3.08	15 6.33	173 4.95
8 33,001+	1,479 90.74	644 95.69	230 98.71	24 88.89	237 97.93	432 94.95	186 78.48	3,232 92.45
Unknown	18 1.10	8 1.19	2 0.86	0 0.00	1 0.41	9 1.98	34 14.35	72 2.06
TOTAL	1,630 100.00	673 100.00	233 100.00	27 100.00	242 100.00	455 100.00	236 100.00	3,496 100.00

Table 5-4 on the following page shows the gross combination weight distributions of the involved tractors by first trailer body style. The gross combination weight refers to the total weight of the tractor, any trailers, and any cargo that was being hauled at the time of the accident. The GCW distributions show variation from one trailer body style to another. GCWs of at least 70,000 pounds represented over 60% of tanks (of all known cases), 43% of flatbeds, 43% of dumps, 37% of auto carriers, and just 30% of vans.

Following the table is a cumulative frequency diagram (Figure 5-4) of GCW according to percentage of involvements. In general the lower lines represent trailer body styles with heavier gross combination weights. Thus, tank combinations typically had the highest GCWs.

TABLE 5-4
Gross Combination Weight by First Trailer Body Style
Tractors Only
TIFA 1990

Gross Weight (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unknown/ No Trailer	TOTAL
< 20,000	3 0.18	3 0.45	0 0.00	0 0.00	0 0.00	5 1.10	107 45.34	118 3.38
20,000	203 12.45	143 21.45	35 15.02	0 0.00	53 21.90	97 21.32	19 8.05	550 15.73
30,000	341 20.92	85 12.63	34 14.59	6 22.22	57 23.55	56 12.31	2 0.85	581 16.62
40,000	185 11.35	39 5.79	7 3.00	5 18.52	5 2.07	6 1.32	2 0.85	249 7.12
50,000	171 10.49	32 4.75	7 3.00	3 11.11	8 3.31	19 4.18	0 0.00	240 6.86
60,000	190 11.66	67 9.96	5 2.15	3 11.11	7 2.89	26 5.71	1 0.42	299 8.55
70,000	416 25.52	228 33.88	93 39.91	7 25.95	65 26.86	163 35.82	1 0.42	973 27.83
80,000+	47 2.88	49 7.28	42 18.03	3 11.11	32 13.22	64 14.07	0 0.00	237 6.78
Unknown	74 4.54	27 4.01	10 4.29	0 0.00	15 6.20	19 4.18	104 44.07	249 7.12
TOTAL	1,630 100.00	673 100.00	233 100.00	27 100.00	242 100.00	455 100.00	236 100.00	3,496 100.00

NOTE: The figures in the left column indicate the low end of each gross weight range.

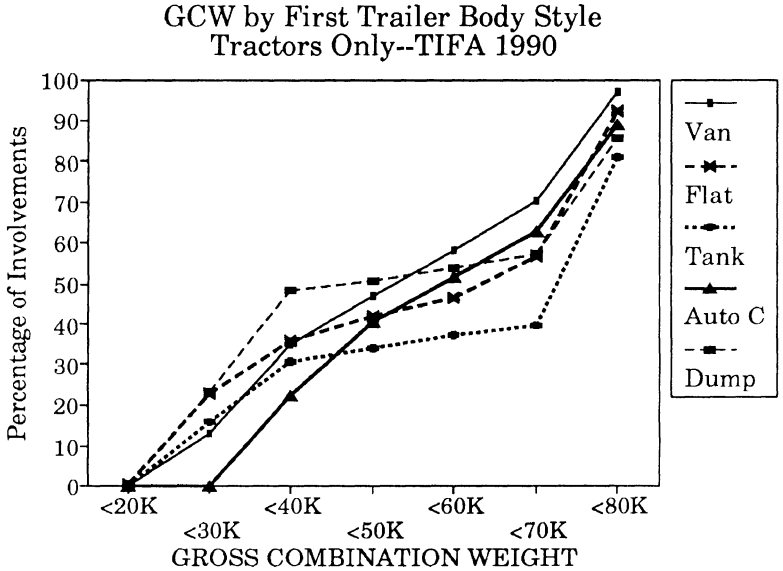


Figure 5-4

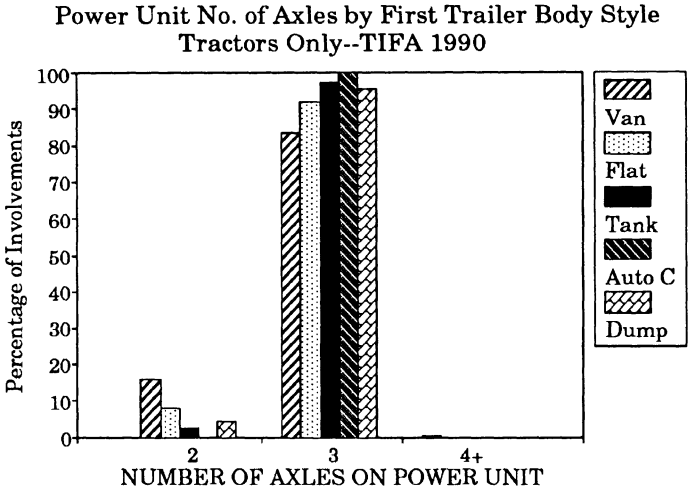


Figure 5-5

The graph at left depicts the number of axles on the tractor according to the first trailer body style. The vast majority of the five trailer body categories were hauled by three-axle tractors. The highest percentage of two-axle tractors was found among the van (16%) trailers.

TABLE 5-5
Number of Axles on Power Unit by First Trailer Body Style
Tractors Only
TIFA 1990

Power Unit No. of Axles (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unknown/ No Trailer	TOTAL
2	261 16.01	53 7.88	6 2.58	0 0.00	11 4.55	59 12.97	25 10.59	415 11.87
3	1,359 83.37	620 92.12	227 97.42	27 100.00	231 95.45	392 86.15	115 48.73	2,971 84.98
4+	4 0.25	0 0.00	0 0.00	0 0.00	0 0.00	3 0.66	0 0.00	7 0.20
Unknown	6 0.37	0 0.00	0 0.00	0 0.00	0 0.00	1 0.22	96 40.68	103 2.95
TOTAL	1,630 100.00	673 100.00	233 100.00	27 100.00	242 100.00	455 100.00	236 100.00	3,496 100.00

The next table indicates the unit and axle configurations of the 1990 TIFA tractors according to cab style. The tractors are split into those with no trailer, with one, two or three trailers, and tractors hauling an unknown number of trailers. For the purposes of this table, "one" represents a tractor hauling a trailer, which is usually, but not always, a semitrailer. Similarly "two" indicates a tractor hauling two trailers, which are usually, but not always, a semitrailer and a full trailer, and "three" indicates a tractor hauling three trailers, which are usually, but not always, a semitrailer and two full trailers. The table indicates the number of axles on the tractor and on each of the trailers (if any). The most common axle configuration

among both the conventional and cabover cab styles was a three-axle tractor hauling a two-axle trailer. Among the doubles, the 2/1/2 axle configuration was the most prevalent. In addition to these typical configurations, the table indicates that both single trailer and double trailer combinations were characterized by a wide variety of axle configurations.

TABLE 5-6
Axle Configuration by Cab Style
Tractors Only
TIFA 1990

Number of Trailers	Axle Config.	Cab Style							
		Conventional		Cabover/ Cab-forward		Unknown		TOTAL	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
None	2	10	0.49%	13	0.97%	0	0.00%	23	0.66%
	3	67	3.27	43	3.20	0	0.00	110	3.15
One	2/1	52	2.53%	19	1.41%	0	0.00%	71	2.03%
	2/2	109	5.31	56	4.16	0	0.00	165	4.72
	2/3	0	0.00	4	0.30	0	0.00	4	0.11
	3/1	7	0.34	6	0.45	0	0.00	13	0.37
	3/2	1,612	78.56	1,077	80.07	0	0.00	2,689	76.92
	3/3	66	3.22	23	1.71	0	0.00	89	2.55
	Other*	19	0.93	5	0.37	0	0.00	24	0.69
	Unknown	5	0.24	6	0.45	12	12.12	23	0.66
Two	2/1/2	71	3.46%	66	4.91%	0	0.00%	137	3.92%
	2/2/2	2	0.10	8	0.59	0	0.00	10	0.29
	3/1/2	11	0.54	8	0.59	0	0.00	19	0.54
	3/2/2	10	0.49	5	0.37	0	0.00	15	0.43
	Other**	9	0.44	5	0.37	0	0.00	14	0.40
	Unknown	0	0.00	0	0.00	4	4.04	4	0.11
Three	***	2	0.10%	1	0.07%	0	0.00%	3	0.09%
Unknown No.	of Trailers	0	0.00%	0	0.00%	83	83.84%	83	2.37%
TOTAL		2,052	100.00%	1,345	100.00%	99	100.00%	3,496	100.00%

NOTE: Number of axles is given for each unit, e.g., 2/1/2 is a two-axle tractor hauling a one-axle trailer followed by a two-axle trailer.
* Includes 2,3/4+ and 4+/2,3,4+.
** Includes 2/1/1; 3/2/3,4+; 3/3/2,4+; and 3/4+/2,4+.
*** Includes 3/2/2/2; 2/1/2/2.

The table on the next page presents cargo type distributions by first trailer body style. Of all the cases of known cargo type, almost 30% of the tractors, including the bobtails, were empty at the time of the accident.

TABLE 5-7
Cargo Type by First Trailer Body Style
Tractors Only
TIFA 1990

Cargo Type (Frequencies and Col. Pcts.)	No Trailer	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unknown	TOTAL
General freight	0 0.00	846 51.90	46 6.84	0 0.00	0 0.00	0 0.00	7 1.54	1 0.97	900 25.74
Household goods	0 0.00	43 2.64	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	43 1.23
Metal	0 0.00	19 1.17	136 20.21	0 0.00	0 0.00	1 0.41	9 1.98	1 0.97	166 4.75
Heavy machinery	0 0.00	8 0.49	107 15.90	0 0.00	0 0.00	0 0.00	12 2.64	1 0.97	128 3.66
Motor vehicles	0 0.00	0 0.00	5 0.74	0 0.00	20 74.07	0 0.00	0 0.00	0 0.00	25 0.72
Driveaway/tow	23 17.29	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 0.22	0 0.00	24 0.69
Gases in bulk	0 0.00	0 0.00	0 0.00	8 3.43	0 0.00	0 0.00	0 0.00	0 0.00	8 0.23
Solids in bulk	0 0.00	45 2.76	42 6.24	0 0.00	0 0.00	119 49.17	95 20.88	0 0.00	301 8.61
Liquids in bulk	0 0.00	0 0.00	0 0.00	153 65.67	0 0.00	0 0.00	0 0.00	0 0.00	153 4.38
Explosives	0 0.00	2 0.12	2 0.30	0 0.00	0 0.00	0 0.00	1 0.22	0 0.00	5 0.14
Logs/lumber	0 0.00	4 0.25	97 14.41	0 0.00	0 0.00	0 0.00	95 20.88	0 0.00	196 5.61
Empty	110 82.71	335 20.55	206 30.61	71 30.47	7 25.93	112 46.28	154 33.85	2 1.94	997 28.52
Refrig. food	0 0.00	259 15.89	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	259 7.41
Mobile home	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	7 1.54	0 0.00	7 0.20
Farm products	0 0.00	38 2.33	21 3.12	0 0.00	0 0.00	10 4.13	73 16.04	2 1.94	144 4.12
Other	0 0.00	2 0.12	7 1.04	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	9 0.26
Unknown	0 0.00	29 1.78	4 0.59	1 0.43	0 0.00	0 0.00	1 0.22	96 93.20	131 3.75
TOTAL	133 100.00	1,630 100.00	673 100.00	233 100.00	27 100.00	242 100.00	455 100.00	103 100.00	3,496 100.00

As was the case for the straight trucks, some of the tractor trailer body styles are rather limited in the possible types of cargo they haul. The tankers were carrying liquids or gases in bulk at the time of the accident; all of the auto carriers were hauling motor vehicles; and the dumps were usually carrying solids in bulk. Vans and flatbeds, as illustrated in the pie graphs below, had a more varied range of cargo types. The cases with unknown cargo were not included in the pie graphs.

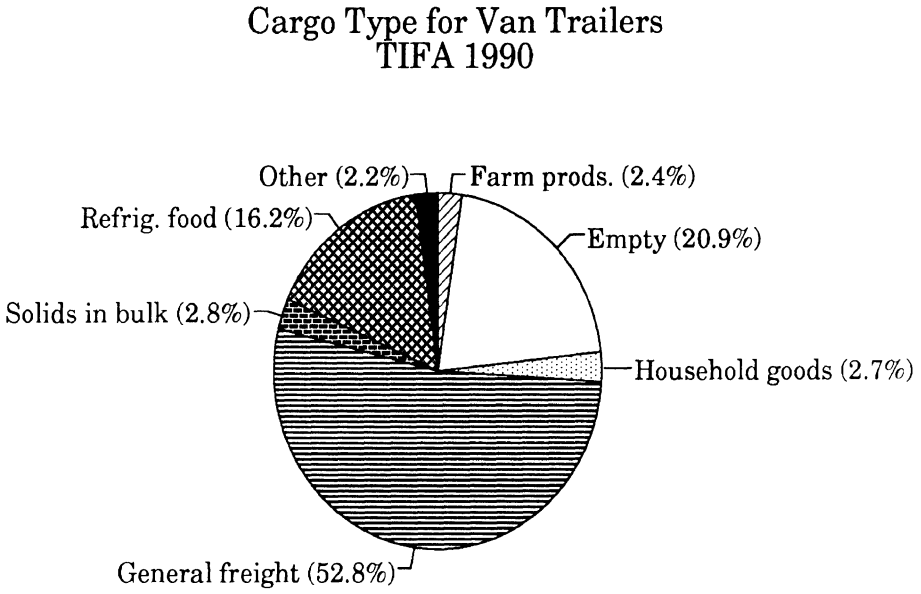


Figure 5-7a

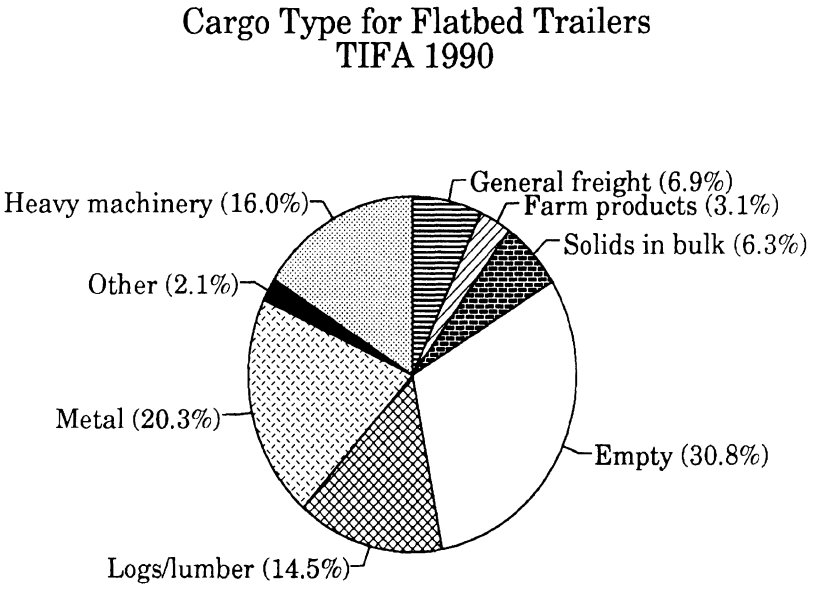


Figure 5-7b

The overwhelming majority of tractors involved in fatal accidents in 1990 used diesel fuel, as indicated in the table below.

TABLE 5-8
Fuel Type by Cab Style
Tractors Only
TIFA 1990

Fuel Type	Conventional		Cabover/ Cab-forward		Unknown		TOTAL	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Gasoline	8	0.39%	2	0.15%	0	0.00%	10	0.29%
Diesel	2,029	98.88	1,338	99.48	0	0.00	3,367	96.31
L.P.G./Other	4	0.19	1	0.07	0	0.00	5	0.14
Unknown	11	0.54	4	0.30	99	100.00	114	3.26
TOTAL	2,052	100.00%	1,345	100.00%	99	100.00%	3,496	100.00%

Use

Next is a series of variables that pertain to the use of the involved tractors. The graph at right shows the distributions of carrier type by first trailer body style. Intrastate private and for-hire have been combined in the graph but are listed separately in the table on the next page. One difference among the five trailer body styles is in the proportion of intrastate carriers. Of the known cases, 41% of the involved dumps were intrastate carriers, but this percentage was only 0-13% for each of the other four trailer body styles. Tanks had the highest proportion of interstate private carriers (34% of the known cases), while auto carriers had the highest proportion of interstate authorized carriers (89%). In this as in other distributions, the percentages for auto carriers may be more affected by problems of sample size than the percentages for the other trailer types, since only 27 fatal accidents involving auto carriers took place in 1990.

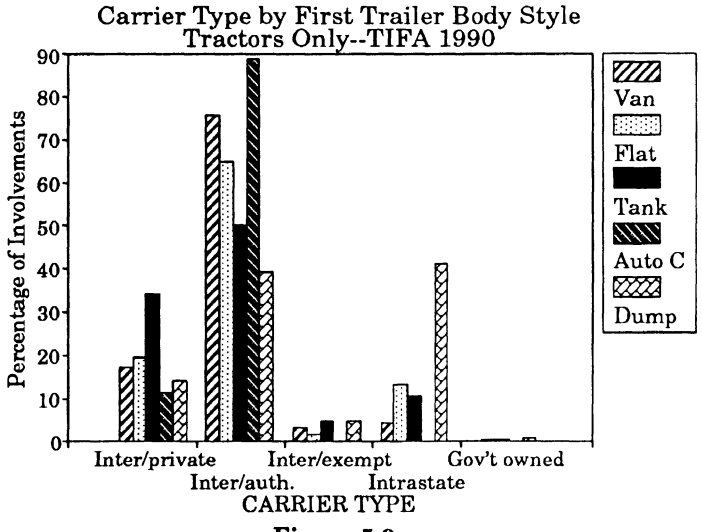


Figure 5-9

TABLE 5-9
Carrier Type by First Trailer Body Style
Tractors Only
TIFA 1990

Carrier Type (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unknown/ No Trailer	TOTAL
Interstate private	270 16.56	130 19.32	79 33.91	3 11.11	33 13.64	79 17.36	14 5.93	608 17.39
Interstate authorized	1,204 73.87	427 63.45	115 49.36	24 88.89	93 38.43	135 29.67	86 36.44	2,084 59.61
Interstate exempt	50 3.07	12 1.78	11 4.72	0 0.00	11 4.55	53 11.65	2 0.85	139 3.98
Intrastate private	36 2.21	58 8.62	19 8.15	0 0.00	25 10.33	94 20.66	9 3.81	241 6.89
Intrastate for hire	34 2.09	28 4.16	5 2.15	0 0.00	72 29.75	79 17.36	18 7.63	236 6.75
Government owned	1 0.06	4 0.59	1 0.43	0 0.00	2 0.83	0 0.00	0 0.00	8 0.23
Daily rental	4 0.25	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	2 0.85	6 0.17
Unknown	31 1.90	14 2.08	3 1.29	0 0.00	6 2.48	15 3.30	105 44.49	174 4.98
TOTAL	1,630 100.00	673 100.00	233 100.00	27 100.00	242 100.00	455 100.00	236 100.00	3,496 100.00

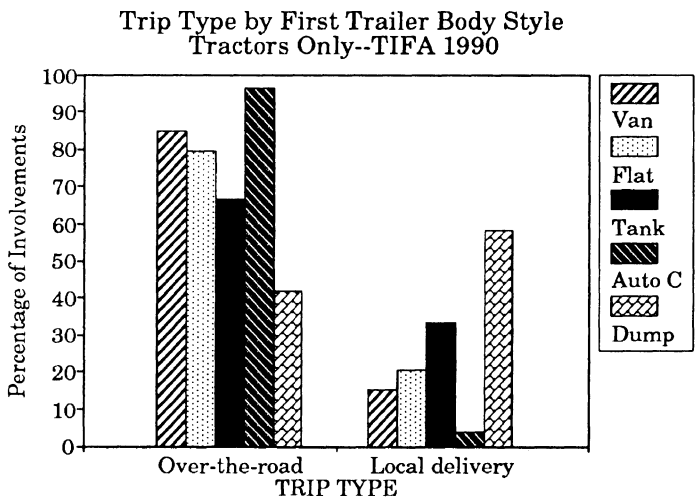


Figure 5-10

There is a close correspondence between the percentage of interstate authorized carriers from the last graph and the percentage of over-the-road trips in the graph to the left. The trailer types with the highest proportion of interstate authorized carriers had the highest proportion of trucks making over-the-road trips at the time of the accident. Of the known cases, 96% of the auto carriers were conducting over-the-road

trips, followed by vans (85%), flatbeds (80%), tanks (67%), and dumps (42%). This same order of trailer body styles was observed when calculating the proportions of interstate authorized carriers. Note also that dumps, which had by far the highest percentage of intrastate carriers, also had by far the highest percentage of trucks making local deliveries at the time of the accident.

TABLE 5-10
Trip Type by First Trailer Body Style
Tractors Only
TIFA 1990

Trip Type (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unknown/ No Trailer	TOTAL
Over-the-road	1,350 82.82	520 77.27	149 63.95	26 96.30	100 41.32	243 53.41	78 33.05	2,466 70.54
Local delivery	246 15.09	134 19.91	75 32.19	1 3.70	139 57.44	197 43.30	53 22.46	845 24.17
Unknown	34 2.09	19 2.82	9 3.86	0 0.00	3 1.24	15 3.30	88 37.29	174 4.98
TOTAL	1,630 100.00	673 100.00	233 100.00	27 100.00	242 100.00	455 100.00	236 100.00	3,496 100.00

For all trailer body styles except auto carriers, the majority of tractor involvements took place on major arteries. The main differences in the road class distributions among the different trailer body styles are in the proportions of involvements that took place on limited access versus other classes of roads. Almost 60% of the auto-carriers involvements occurred on limited access routes, followed by 39% of vans, 27% of flatbeds, 27% of tanks, and 15% of dumps. A nearly reverse order held for other road class involvements, with dumps having the highest proportion, followed by flatbeds, tanks, vans, and auto carriers.

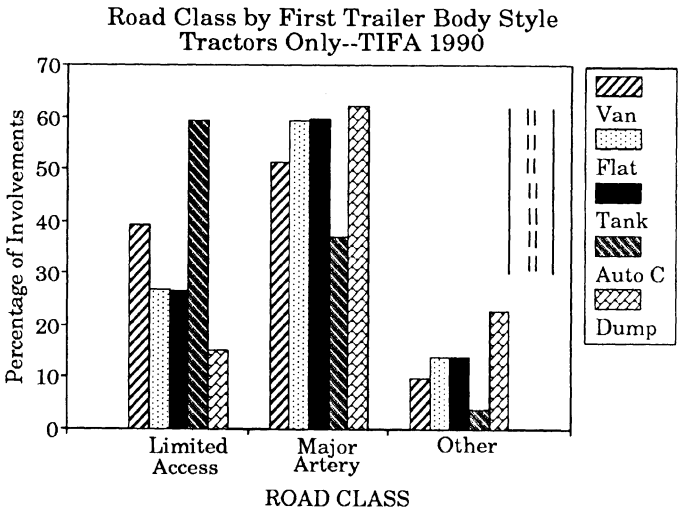


Figure 5-11

TABLE 5-11
Road Class by First Trailer Body Style
Tractors Only
TIFA 1990

Road Class (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unknown/ No Trailer	TOTAL
Limited Access	638 39.14	181 26.89	62 26.61	16 59.26	36 14.88	75 16.48	65 27.54	1,073 30.69
Major Artery	832 51.04	398 59.14	139 59.66	10 37.04	150 61.98	303 66.59	129 54.66	1,961 56.09
Other	157 9.63	94 13.97	32 13.73	1 3.70	55 22.73	77 16.92	42 17.80	458 13.10
Unknown	3 0.18	0 0.00	0 0.00	0 0.00	1 0.41	0 0.00	0 0.00	4 0.11
TOTAL	1,630 100.00	673 100.00	233 100.00	27 100.00	242 100.00	455 100.00	236 100.00	3,496 100.00

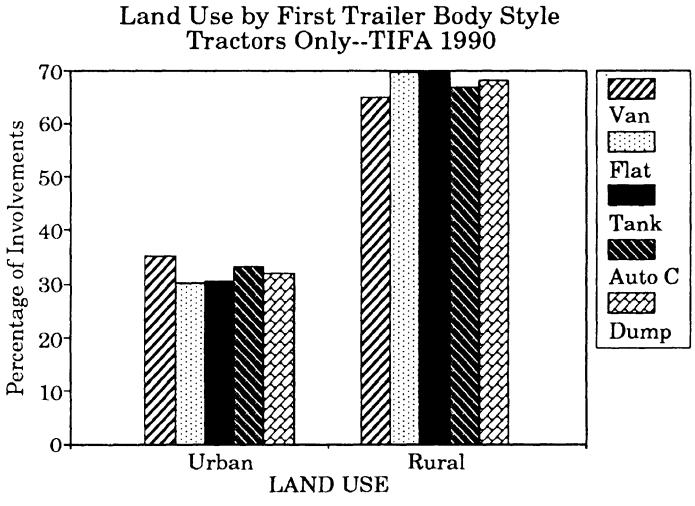


Figure 5-12

The land use distributions are very stable from one trailer body style to another. For vans, flatbeds, tanks, auto carriers and dumps, the proportion of involvements in urban areas ranged from 30% to 35%, while the proportion in rural areas varied from 65% to 70%.

TABLE 5-12
Land Use by First Trailer Body Style
Tractors Only
TIFA 1990

Land Use (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unknown/ No Trailer	TOTAL
Urban	570 34.97	203 30.16	71 30.47	9 33.33	76 31.40	95 20.88	80 33.90	1,104 31.58
Rural	1,055 64.72	467 69.39	162 69.53	18 66.67	162 66.94	360 79.12	156 66.10	2,380 68.08
Unknown	5 0.31	3 0.45	0 0.00	0 0.00	4 1.65	0 0.00	0 0.00	12 0.34
TOTAL	1,630 100.00	673 100.00	233 100.00	27 100.00	242 100.00	455 100.00	236 100.00	3,496 100.00

The light condition at the time of the accident is indicated for the five different trailer body styles in the graph below. Dumps had the highest proportion of daylight involvements and the lowest proportion of involvements taking place in the dark. On the other hand, 46% of the van involvements occurred at night as did 44% of the tank, 39% of the flatbed and 33% of the auto-carrier involvements. The typical travel schedules of the different trailer types probably account in large part for the differences in light condition at the time of the accident.

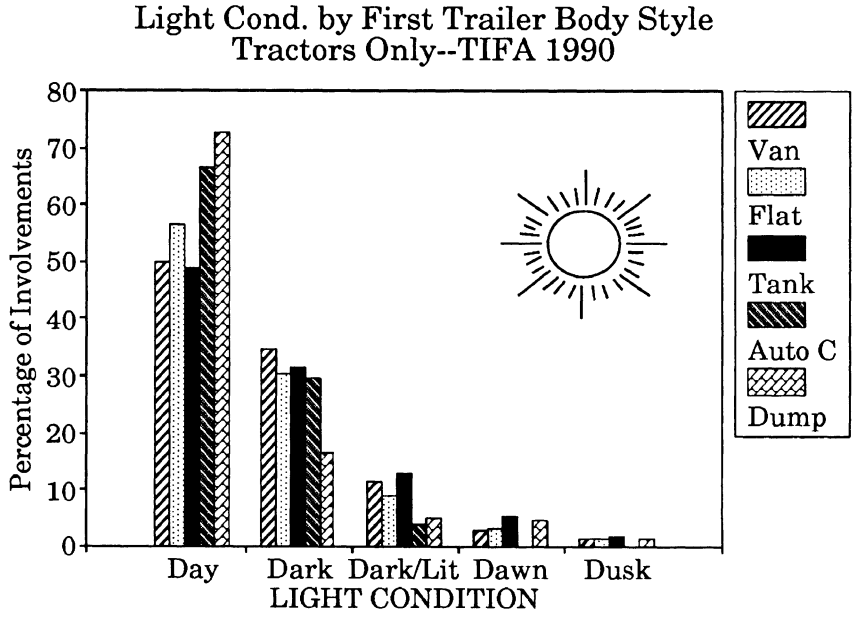


Figure 5-13

TABLE 5-13
Light Condition by First Trailer Body Style
Tractors Only
TIFA 1990

Light Condition (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unknown/ No Trailer	TOTAL
Daylight	812 49.82	379 56.32	114 48.93	18 66.67	176 72.73	304 66.81	126 53.39	1,929 55.18
Dark, not lighted	564 34.60	204 30.31	73 31.33	8 29.63	40 16.53	101 22.20	78 33.05	1,068 30.55
Dark, but lighted	188 11.53	59 8.77	30 12.88	1 3.70	12 4.96	21 4.62	15 6.36	326 9.32
Dawn	45 2.76	22 3.27	12 5.15	0 0.00	11 4.55	19 4.18	11 4.66	120 3.43
Dusk	20 1.23	8 1.19	4 1.72	0 0.00	3 1.24	8 1.76	6 2.54	49 1.40
Unknown	1 0.06	1 0.15	0 0.00	0 0.00	0 0.00	2 0.44	0 0.00	4 0.11
TOTAL	1,630 100.00	673 100.00	233 100.00	27 100.00	242 100.00	455 100.00	236 100.00	3,496 100.00

Accidents

The variables pertaining to the accidents that the tractors were involved in are discussed in this subsection. The graph to the right illustrates the distributions for the first harmful event in the accident according to first trailer body style. The distributions are relatively stable from one type of trailer to the next. The great majority of all the fatal accidents involved a collision with another motor vehicle in transport. This event ranged from 73% of the tank involvements to 93% of the auto-

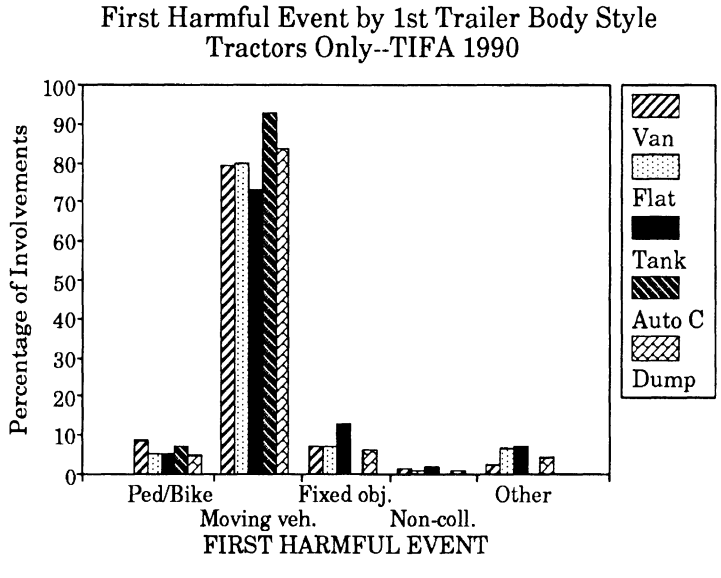


Figure 5-14

carrier involvements. Vans experienced relatively more pedestrian involvements, while tanks had higher percentages of collisions with fixed objects and non-collisions (rollovers, explosions, and fires) than did the other trailer body styles.

TABLE 5-14
First Harmful Event by First Trailer Body Style
Tractors Only
TIFA 1990

First Harmful Event (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unknown/ No Trailer	TOTAL
Pedestrian	128 7.85	29 4.31	12 5.15	2 7.41	8 3.31	26 5.71	22 9.32	227 6.49
Pedalcyclist	17 1.04	5 0.74	0 0.00	0 0.00	4 1.65	3 0.66	1 0.42	30 0.86
Train	2 0.12	3 0.45	4 1.72	0 0.00	2 0.83	2 0.44	0 0.00	13 0.37
Animal	0 0.00	1 0.15	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 0.03
Moving vehicle	1,298 79.63	538 79.94	170 72.96	25 92.59	202 83.47	363 79.78	169 71.61	2,765 79.09
Parked vehicle	14 0.86	2 0.30	0 0.00	0 0.00	0 0.00	1 0.22	0 0.00	17 0.49
Other non-fixed object	9 0.55	0 0.00	0 0.00	0 0.00	0 0.00	5 1.10	1 0.42	15 0.43
Fixed object	119 7.30	48 7.13	30 12.88	0 0.00	15 6.20	23 5.05	30 12.71	265 7.58
Non-collision	43 2.64	47 6.98	17 7.30	0 0.00	11 4.55	32 7.03	13 5.51	163 4.66
TOTAL	1,630 100.00	673 100.00	233 100.00	27 100.00	242 100.00	455 100.00	236 100.00	3,496 100.00

The graph on the right illustrates the most harmful event for 1990 TIFA tractors by the first trailer body style. The major differences between the most harmful and the first harmful event for tractors are the large drop in collisions with fixed objects and the increase in non-collisions as the most harmful event for vans, flatbeds, tanks, and dumps.

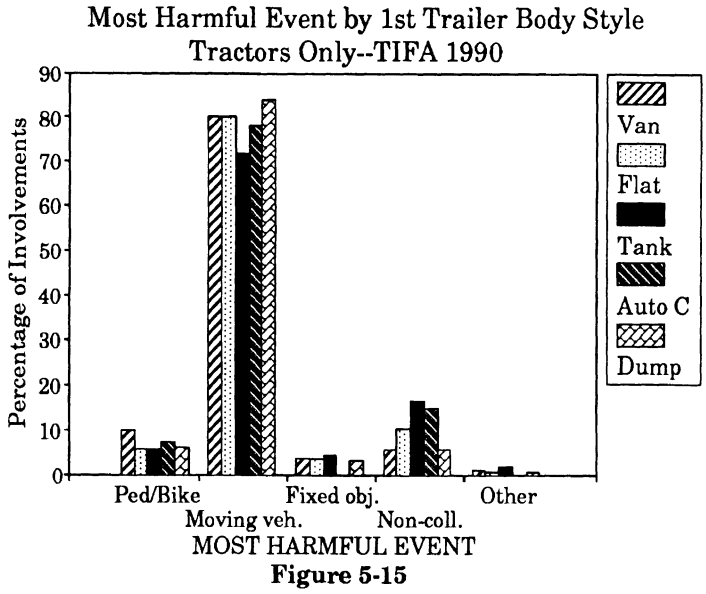


Figure 5-15

TABLE 5–15
Most Harmful Event by First Trailer Body Style
Tractors Only
TIFA 1990

Most Harmful Event (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unknown/ No Trailer	TOTAL
Pedestrian	139 8.53	32 4.75	13 5.58	2 7.41	11 4.55	26 5.71	23 9.75	246 7.04
Pedalcyclist	17 1.04	5 0.74	0 0.00	0 0.00	4 1.65	3 0.66	1 0.42	30 0.86
Train	1 0.06	3 0.45	4 1.72	0 0.00	2 0.83	2 0.44	0 0.00	12 0.34
Animal	1 0.06	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 0.03
Moving vehicle	1,308 80.25	538 79.94	167 71.67	21 77.78	203 83.88	355 78.02	169 71.61	2,761 78.98
Parked vehicle	7 0.43	1 0.15	0 0.00	0 0.00	0 0.00	3 0.66	0 0.00	11 0.31
Other non-fixed object	6 0.37	0 0.00	0 0.00	0 0.00	0 0.00	7 1.54	0 0.00	13 0.37
Fixed object	61 3.74	25 3.71	10 4.29	0 0.00	8 3.31	10 2.20	17 7.20	131 3.75
Non-collision	90 5.52	69 10.25	39 16.74	4 14.81	14 5.79	49 10.77	26 11.02	291 8.32
TOTAL	1,630 100.00	673 100.00	233 100.00	27 100.00	242 100.00	455 100.00	236 100.00	3,496 100.00

The graph and table on this page illustrate the manner of collision for the 2,765 tractors, that were coded "collision with another motor vehicle in transport" as the first harmful event in FARS. There is some variation among the different first trailer body styles. For example, flatbeds had the highest proportion of rear-end collisions, auto carriers the highest percentage of head-ons, and tanks and dumps the highest percentages of angle collisions. Overall, angle collisions were the most common collision type, representing almost 41% of all tractor involvements, followed by head-ons (27.5%) and rear-ends (24.3%).

Manner of Collision by 1st Trailer Body Style
for Crashes with Another Motor Vehicle
Tractors Only--TIFA 1990

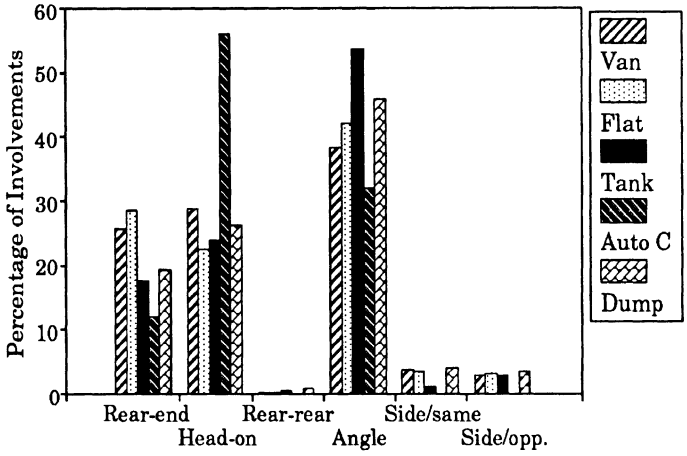


Figure 5-16

TABLE 5-16
Manner of Collision by First Trailer Body Style
for Crashes with Another Motor Vehicle
Tractors Only
TIFA 1990

Manner of Collision (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unknown/ No Trailer	TOTAL
Rear-end	334 25.73	151 28.07	30 17.65	3 12.00	39 19.31	82 22.59	33 19.53	672 24.30
Head-on	373 28.74	119 22.12	41 24.12	14 56.00	53 26.24	110 30.30	51 30.18	761 27.52
Rear-to-rear	2 0.15	2 0.37	1 0.59	0 0.00	2 0.99	0 0.00	6 3.55	13 0.47
Angle	497 38.29	223 41.45	91 53.53	8 32.00	93 46.04	155 42.70	65 38.46	1,132 40.94
Sideswipe, same dir.	48 3.70	19 3.53	2 1.18	0 0.00	8 3.96	2 0.55	8 4.73	87 3.15
Sideswipe, opp. dir.	37 2.85	17 3.16	5 2.94	0 0.00	7 3.47	13 3.58	6 3.55	85 3.07
Unknown	7 0.54	7 1.30	0 0.00	0 0.00	0 0.00	1 0.28	0 0.00	15 0.54
TOTAL	1,298 100.00	538 100.00	170 100.00	25 100.00	202 100.00	363 100.00	169 100.00	2,765 100.00

TABLE 5-17
Gross Combination Weight by Rollover Occurrence
Tractors Only
TIFA 1990

Gross Weight	Rollover Occurrence							
	None		First Event		Subsequent Event		TOTAL	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
< 20,000	96	81.36%	8	6.78%	14	11.86%	118	100.00%
20,000	528	96.00	4	0.73	18	3.27	550	100.00
30,000	563	96.90	2	0.34	16	2.75	581	100.00
40,000	234	93.98	4	1.61	11	4.42	249	100.00
50,000	215	89.58	7	2.92	18	7.50	240	100.00
60,000	250	83.61	14	4.68	35	11.71	299	100.00
70,000	779	80.06	69	7.09	125	12.85	973	100.00
80,000+	179	75.53	22	9.28	36	15.19	237	100.00
Unknown	232	93.17	6	2.41	11	4.42	249	100.00
TOTAL	3,076	87.99%	136	3.89%	284	8.12%	3,496	100.00%

NOTE: The figures in the left column indicate the low end of each gross weight range.

The next two distributions concern the gross combination weight of the tractors. The table above and the figure below present distributions of rollover occurrence according to GCW categories. The lightest (<20,000 pounds) and the two heaviest (70,000-79,999 and 80,000+ pounds) GCW categories had the highest proportions of first-event rollovers, with 6.8%, 7.1% and 9.3% respectively. Subsequent-event rollovers were also more common among these three GCW categories. Only 5% of the 20,000-69,999 pound combinations experienced subsequent-event rollovers, compared to over 13% for the lightest (many of which were bobtails) and the two heaviest GCW categories.

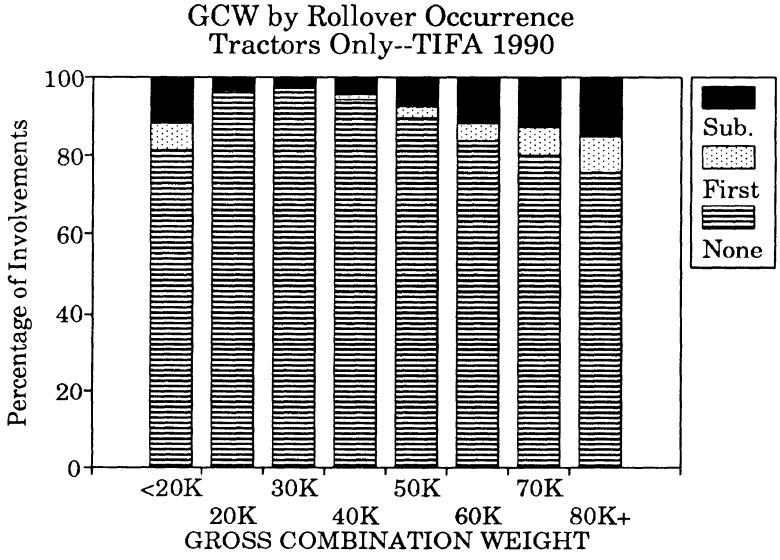


Figure 5-17

TABLE 5-18
Gross Combination Weight by Jackknife Occurrence
Tractors Only
TIFA 1990

Gross Weight	Jackknife Occurrence									
	None		First Event		Subsequent Event		Not articulated/ Unknown		TOTAL	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
< 20,000	31	19.25%	0	0.00%	2	1.24%	85	52.80%	118	100.00%
20,000	418	70.37	21	3.54	39	6.57	72	12.12	550	100.00
30,000	455	70.22	20	3.09	39	6.02	67	10.34	581	100.00
40,000	194	71.06	3	1.10	16	5.86	36	13.19	249	100.00
50,000	195	74.43	3	1.15	11	4.20	31	11.83	240	100.00
60,000	252	77.54	6	1.85	8	2.46	33	10.15	299	100.00
70,000	808	81.45	10	1.01	35	3.53	120	12.10	973	100.00
80,000+	207	87.34	3	1.27	10	4.22	17	7.17	237	100.00
Unknown	144	52.75	1	0.37	4	1.47	100	36.63	249	100.00
TOTAL	2,704	71.82%	67	1.78%	164	4.36%	561	14.90%	3,496	100.00%

NOTE: The figures in the left column indicate the low end of each gross weight range.

On this page are the distributions of jackknife occurrence according to gross combination weight. In general, jackknifes were more common as a subsequent event in the accident (4.4% of all tractor involvements) rather than the primary event (1.8%). The tractor combinations with a GCW of 20,000-39,999 pounds had a higher incidence of jackknifes than the heavier combinations. This is particularly true for subsequent-event jackknifes. Over 6.5% of the tractors in the 20,000-29,999 pound group and 6.0% in the 30,000-39,999 group jackknifed as the subsequent event in the accident. This compares with 3.5% in the 70,000-79,999 pound group and 4.2% of the tractors in the 80,000+ pound category. These figures are consistent with the common belief that empty or lightly loaded trailers are more likely to jackknife than heavier combinations.

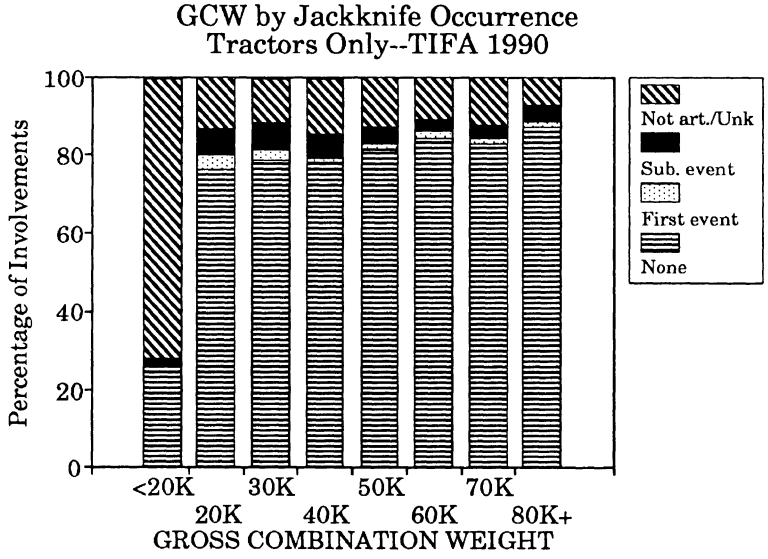


Figure 5-18

Driver Injury

This section on tractor involvements concludes with several distributions concerning the injury experience of the truck drivers. The graph at right shows injury severity distributions according to first trailer body style. Auto carriers had the highest proportion of uninjured drivers (67%) and tanks had the lowest proportion of uninjured drivers (51%), compared with the overall average of 59%. Tanks had the highest proportion of fatalities among drivers at 22%, compared with 12% overall. In general, however, the injury severity distributions are similar among the different trailer body styles.

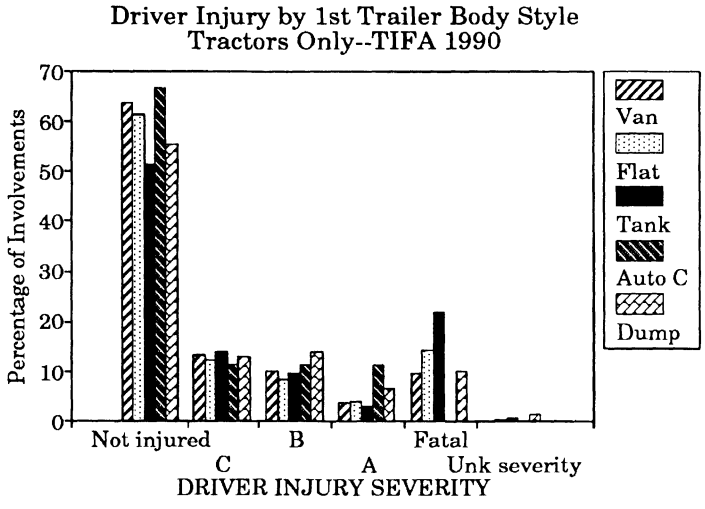


Figure 5-19

TABLE 5-19
Truck Driver Injury Severity by First Trailer Body Style
Tractors Only
TIFA 1990

Injury Severity (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Auto Carrier	Dump	Other	Unk/ No Trail	TOTAL
Not injured	1,022 62.70	407 60.48	119 51.07	18 66.67	133 54.96	264 58.02	112 47.46	2,075 59.35
C injury, possible	212 13.01	82 12.18	32 13.73	3 11.11	31 12.81	55 12.09	41 17.37	456 13.04
B injury, not incapacitating	158 9.69	54 8.02	22 9.44	3 11.11	33 13.64	43 9.45	32 13.56	345 9.87
A injury, incapacitating	57 3.50	26 3.86	7 3.00	3 11.11	16 6.61	29 6.37	5 2.12	143 4.09
Fatal injury	154 9.45	93 13.82	51 21.89	0 0.00	24 9.92	57 12.53	41 17.37	420 12.01
Injured, severity unknown	2 0.12	1 0.15	1 0.43	0 0.00	3 1.24	1 0.22	0 0.00	8 0.23
Unknown if injured	23 1.41	10 1.49	1 0.43	0 0.00	2 0.83	6 1.32	5 2.12	47 1.34
TOTAL	1,628 100.00	673 100.00	233 100.00	27 100.00	242 100.00	455 100.00	236 100.00	3,494 100.00

NOTE: Two cases coded "died prior to accident" in FARS have been excluded from this table.

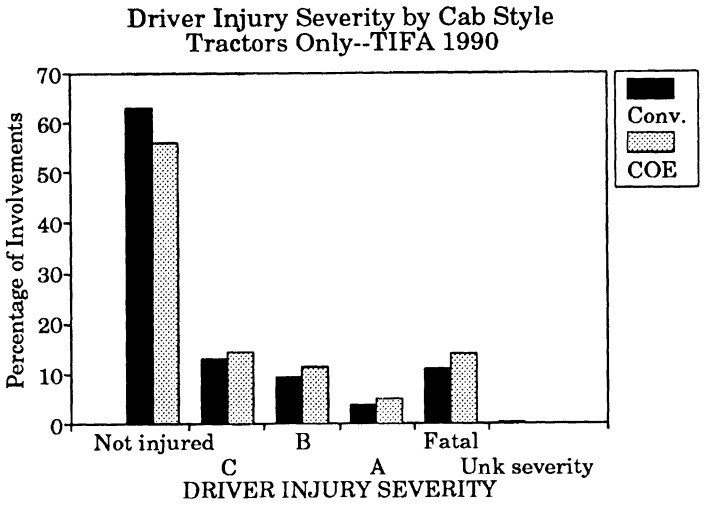


Figure 5-20

Here the truck-driver injury severity distributions are compared according to the cab style of the tractor. While the differences between the injury distributions are not great, it appears that the drivers of cabovers experienced more injuries than the drivers of conventional cabs. The conventional cab drivers had higher proportions of no injuries, while the cabover drivers had higher percentages of "C" (possible), "B" (non-incapacitating), "A" (incapacitating), and fatal injuries.

TABLE 5-20
Truck Driver Injury Severity by Cab Style
Tractors Only
TIFA 1990

Injury Severity	Conventional		Cabover/ Cab-forward		Unknown		TOTAL	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Not injured	1,272	62.05%	745	55.39%	58	58.59%	2,075	59.39%
C injury	259	12.63	187	13.90	10	10.10	456	13.05
B injury	189	9.22	147	10.93	9	9.09	345	9.87
A injury	75	3.66	67	4.98	1	1.01	143	4.09
Fatal injury	222	10.83	183	13.61	15	15.15	420	13.02
Injured, severity unknown	8	0.39	0	0.00	0	0.00	8	0.23
Unknown if injured	25	1.22	16	1.19	6	6.06	47	1.35
TOTAL	2,050	100.00%	1,345	100.00%	99	100.00%	3,494	100.00%

NOTE: Two cases coded "died prior to accident" in FARS have been excluded from this table.

The two tables on the following page list the driver injury severity distributions according to the principal point of impact on the truck. In over half of the involvements, the principal point of impact was the front of the truck. For involvements that resulted in non-fatal injuries to the driver, the front of the truck was the principal point of impact in over 68% of the cases. Non-collisions accounted for 3% of all involvements but 22% of the involvements that were fatal to the truck driver.

TABLE 5-21A
Driver Injury Severity by Principal Impact Point for Tractors—Frequencies
TIFA 1990

Principal Impact Point	Driver Injury Severity							
	Not Injured	C	B	A	Fatal	Injured, severity unk	Unknown if injured	TOTAL
Noncollision	7	2	3	2	92	0	0	106
Right side	236	55	36	16	48	1	3	395
Rear	360	60	31	4	8	1	20	484
Left side	312	28	15	5	18	0	9	387
Front	972	291	242	110	220	6	10	1,851
Top	6	3	5	2	11	0	0	27
Undercarriage	128	7	4	0	5	0	4	148
Override	21	9	5	2	0	0	0	37
Unknown	33	1	4	2	18	0	1	59
TOTAL	2,075	456	345	143	420	8	47	3,494

NOTE: Two cases coded "died prior to accident" in FARS have been excluded from this table.

TABLE 5-21B
Driver Injury Severity by Principal Impact Point for Tractors—Column Percentages
TIFA 1990

Principal Impact Point	Driver Injury Severity							
	Not Injured	C	B	A	Fatal	Injured, sev unk	Unk if injured	TOTAL
Noncollision	0.34%	0.44%	0.87%	1.40%	21.90%	0.00%	0.00%	3.03%
Right side	11.37	12.06	10.43	11.19	11.43	12.50	6.38	11.30
Rear	17.35	13.16	8.99	2.80	1.90	12.50	42.55	13.84
Left side	15.04	6.14	4.35	3.50	4.29	0.00	19.15	11.07
Front	46.84	63.82	70.14	76.92	52.38	75.00	21.28	53.00
Top	0.29	0.66	1.45	1.40	2.62	0.00	0.00	0.77
Undercar.	6.17	1.54	1.16	0.00	1.19	0.00	8.51	4.23
Override	1.01	1.97	1.45	1.40	0.00	0.00	0.00	1.06
Unknown	1.59	0.22	1.16	1.40	4.29	0.00	2.13	1.69
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

NOTE: Two cases coded "died prior to accident" in FARS have been excluded from this table.

The stacked bar graph on the next page shows the truck driver injury severity distributions for each of six principal impact area categories. Collisions in which the left side or the rear of the truck was struck were the safest for the truck driver. The driver was uninjured in close to 80% of the known cases in these categories. On the other hand, 87% of the non-collisions resulted in the death of the driver, and the driver was uninjured in only 7% of these cases.

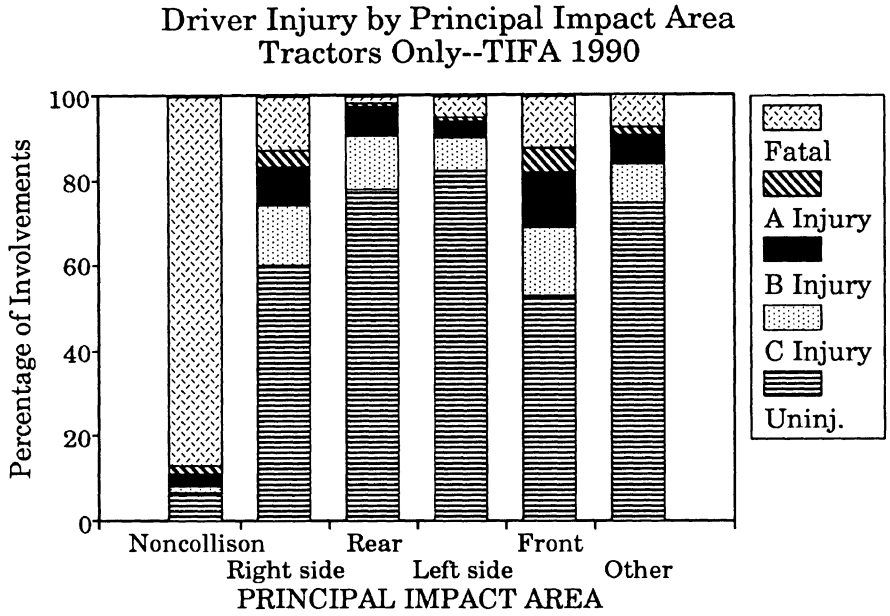


Figure 5-21

Finally, driver injury severity is compared across the levels of the variable that indicates whether or not the truck experienced a rollover or fire or whether the driver was ejected. As Tables 5-22A and 5-22B indicate, almost 82% of the involvements did not include any of these events. Rollovers alone occurred in 8.5% of the involvements but accounted for 13.3% of the cases of drivers with "B" injuries, 23.8% of those with "A" injuries, and 34.3% of those with fatal injuries. Ejections alone took place in 1.7% of the involvements but represented 11.4% of the cases in which the driver was killed. Only 1.9% of the involvements included both a rollover and the ejection of the driver, but 14% of the cases in which the driver was killed fell into this category.

TABLE 5-22A
Driver Injury Severity by Rollover/Fire/Ejection for Tractors—Frequencies
TIFA 1990

Occurrence of Rollover/Fire/Ejection	Driver Injury Severity							
	Not Injured	C	B	A	Fatal	Injured, severity unk	Unknown if injured	TOTAL
None	1,998	404	254	89	92	8	17	2,862
Rollover only	35	35	46	34	144	0	0	294
Fire only	32	17	23	11	27	0	1	111
Ejection only	2	0	6	3	48	0	0	59
Rollover/Fire	4	0	6	1	34	0	0	45
Fire/Ejection	1	0	0	2	5	0	0	8
Rollover/Ejection	0	0	6	1	59	0	0	66
Rollover/Fire/Ejection	0	0	2	1	10	0	0	13
Unknown	3	0	2	1	1	0	29	36
TOTAL	2,075	456	345	143	420	8	47	3,494

NOTE: Two cases coded "died prior to accident" in FARS have been excluded from this table.

TABLE 5-22B
Driver Injury Severity by Rollover/Fire/Ejection for Tractors—Column Percentages
TIFA 1989

Occurrence of Rollover/Fire/ Ejection	Driver Injury Severity							
	Not Injured	C	B	A	Fatal	Injured, sev unk	Unk if injured	TOTAL
None	96.29%	88.60%	73.62%	62.24%	21.90%	100.00%	36.17%	81.86%
Rollover only	1.69	7.68	13.33	23.78	34.29	0.00	0.00	8.47
Fire only	1.54	3.73	6.67	7.69	6.43	0.00	2.13	3.18
Ejection only	0.10	0.00	1.74	2.10	11.43	0.00	0.00	1.69
Rollover/Fire	0.19	0.00	1.74	0.70	8.10	0.00	0.00	1.29
Fire/Ejection	0.05	0.00	0.00	1.40	1.19	0.00	0.00	0.23
Roll/Eject	0.00	0.00	1.74	0.70	14.05	0.00	0.00	1.89
Roll/Fire/Eject	0.00	0.00	0.58	0.70	2.38	0.00	0.00	0.37
Unknown	0.14	0.00	0.58	0.70	0.24	0.00	61.70	1.03
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

NOTE: Two cases coded "died prior to accident" in FARS have been excluded from this table.

The figure below illustrates the driver injury severity distributions for each category of the rollover/fire/ejection variable. The driver was uninjured in 70% of the cases where none of these events took place. This compares with 29% of the cases when a fire alone occurred, 12% of the cases when a rollover alone took place, and 3% of the cases when there was only an ejection. Not surprisingly, combinations of these events generally proved more perilous to the driver. In 62.5% of the cases in which there was a fire and an ejection, and 89% of the cases in which there was a rollover and an ejection, the crash resulted in the death of the driver.

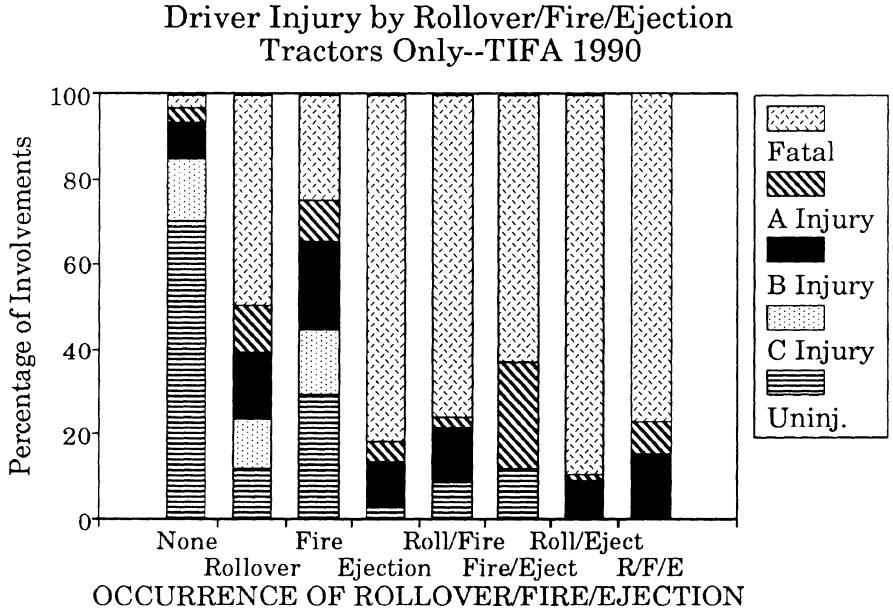
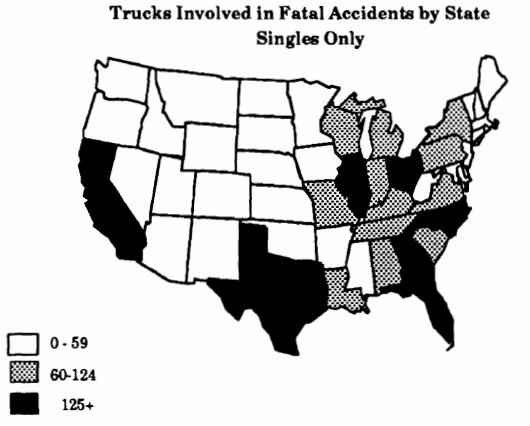


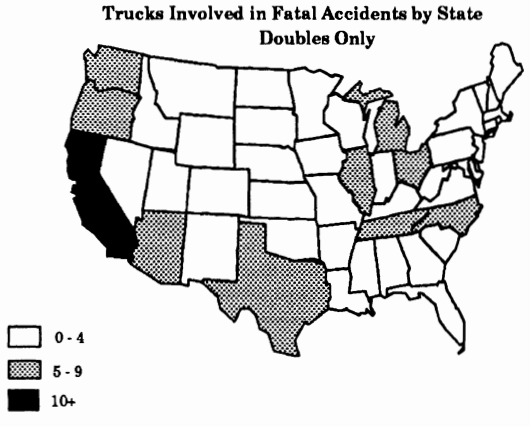
Figure 5-22

MULTIPLE-TRAILER FATAL ACCIDENT INVOLVEMENTS IN 1990

The final section of the 1990 TIFA Factbook, examines the fatal accident experience of multiple-trailer combinations. These vehicles are limited to those with a tractor as the power unit. Straight trucks with multiple trailers are rare; there was one straight truck with two trailers involved a fatal accident in 1990. The section begins with a series of comparisons between singles and doubles. Throughout this section a single refers to a tractor hauling a semitrailer, and a double indicates a tractor hauling a semitrailer and a full trailer. In 1990 there were 3,066 fatal accidents involving singles and 195 involving doubles. The maps illustrating the distributions of singles and doubles involvements across the country are repeated below.

Previously in the Factbook, singles and doubles have been considered only as part of all tractor combinations in general. Because of the sheer size of these two configurations, and the fact that they account for a large share of the mileage accumulated by the trucking industry, there is a great deal of interest in their accident experience. This section describes the singles and doubles that were involved in fatal accidents in 1990 and the similarities and differences between them. The distributions presented in this section concern variables relating to the physical characteristics and usage of the trucks. All of these variables have been discussed earlier in comparisons based on the power unit type of the involved vehicles. The section concludes with a description of the fatal accident experience of longer combination vehicles (LCVs).





Singles versus Doubles

The first comparison between singles and doubles concerns the cab style of the involved trucks. Singles were more likely to have a conventional cab than doubles; 61% of the singles and 52% of the doubles had conventional cabs.

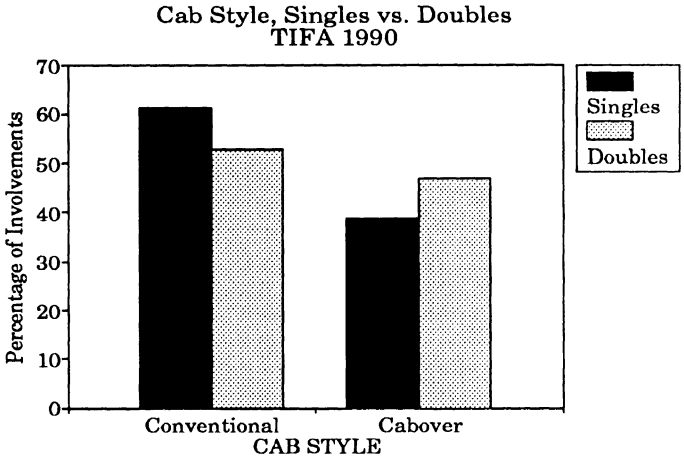


Figure 6-1

TABLE 6-1
Cab Style, Singles vs. Doubles
TIFA 1990

Cab Style	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Conventional	1,868	60.93%	101	51.79%	1,969	60.38%
Cabover/Cab-forward	1,186	38.68	90	46.15	1,276	39.13
Unknown	12	0.39	4	2.05	16	0.49
TOTAL	3,066	100.00%	195	100.00%	3,261	100.00%

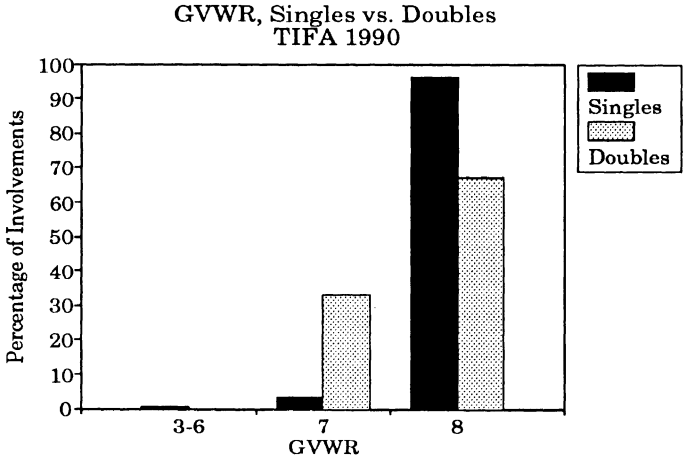


Figure 6-2

The graph at left shows the distributions for the gross vehicle weight ratings of the involved singles and doubles. More than 96% of the singles with a known GVWR were class 8 (over 33,000 lbs.), while only 67% of the known cases of doubles were class 8.

TABLE 6-2
GVWR, Singles vs. Doubles
TIFA 1990

GVWR Class	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
3	1	0.03%	0	0.00%	1	0.03%
5	2	0.07	0	0.00	2	0.06
6	15	0.49	0	0.00	15	0.46
7	95	3.10	59	30.26	154	4.72
8	2,922	95.30	119	61.03	3,041	93.25
Unknown	31	1.01	17	8.72	48	1.47
TOTAL	3,066	100.00%	195	100.00%	3,261	100.00%

Next are the distributions for gross combination weight—the total combined weight of the tractor, trailer(s), and cargo at the time of the accident. The graph at right indicates that the GCWs of the involved doubles were more spread out over the spectrum than the GCWs of the singles. The GCW distribution for singles is bimodal, presumably representing empty and loaded vehicles. Over 36% of the known cases are included in the 20,000-39,999 pound weight range, while another 32% of the cases fall into a peak representing the 70,000-79,999 pound category. In contrast, only 23% of the involved doubles had a GCW of 20,000-39,999 pounds. Half of the known doubles cases fall into the three heaviest GCW categories, indicating weights of 60,000 pounds and above.

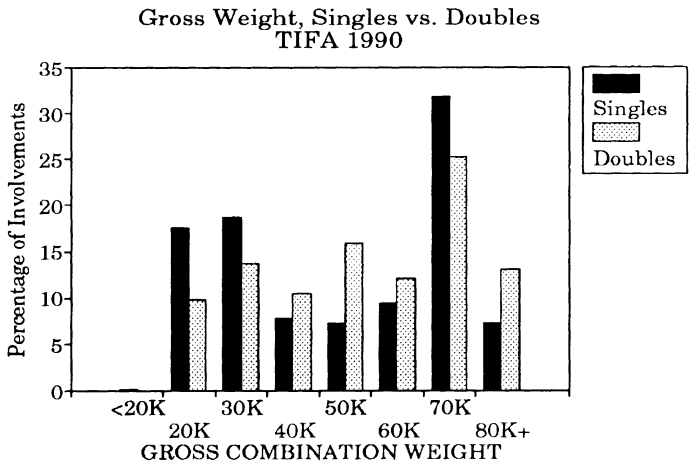


Figure 6-3

TABLE 6-3
Gross Combination Weight, Singles vs. Doubles
TIFA 1990

Gross Weight	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
< 20,000	6	0.20%	0	0.00%	6	0.18%
20,000	511	16.67	18	9.23	529	16.22
30,000	548	17.87	25	12.82	573	17.57
40,000	228	7.44	19	9.74	247	7.57
50,000	211	6.88	29	14.87	240	7.36
60,000	277	9.03	22	11.28	299	9.17
70,000	926	30.20	46	23.59	972	29.81
80,000+	211	6.88	24	12.31	235	7.21
Unknown	148	4.83	12	6.15	160	4.91
TOTAL	3,066	100.00%	195	100.00%	3,261	100.00%

NOTE: The figures in the left column indicate the low end of each gross weight range.

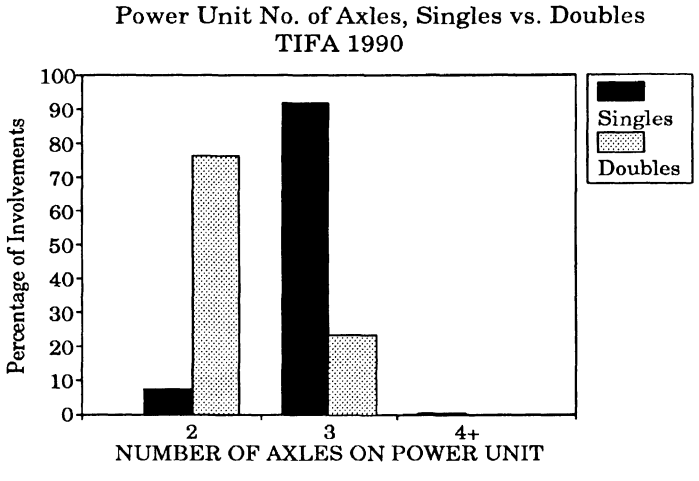


Figure 6-4

This graph illustrates the distributions of the number of axles on the tractor for the involved singles and doubles. Not surprisingly, most of the singles were hauled by three-axle tractors, while the majority of the doubles were hauled by two-axle tractors. As was noted earlier, the most common axle configuration for singles was a three-axle tractor hauling a two-axle trailer, while for doubles it was a two-axle tractor, followed by a one-axle semitrailer and a two-axle full trailer.

TABLE 6-4
Power Unit Number of Axles, Singles vs. Doubles
TIFA 1990

Power Unit No. of Axles	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
2	232	7.57%	146	74.87%	378	11.59%
3	2,811	91.68	45	23.08	2,856	87.58
4+	7	0.23	0	0.00	7	0.21
Unknown	16	0.52	4	2.05	20	0.61
TOTAL	3,066	100.00%	195	100.00%	3,261	100.00%

The main difference between the carrier type distributions for singles and doubles is the percentage of interstate and intrastate carriers. Of the known cases of carrier type, 86.3% of the involved singles and 72.5% of the doubles were interstate carriers. Conversely, 13.3% of the involved singles and 27.5% of the doubles were intrastate carriers.

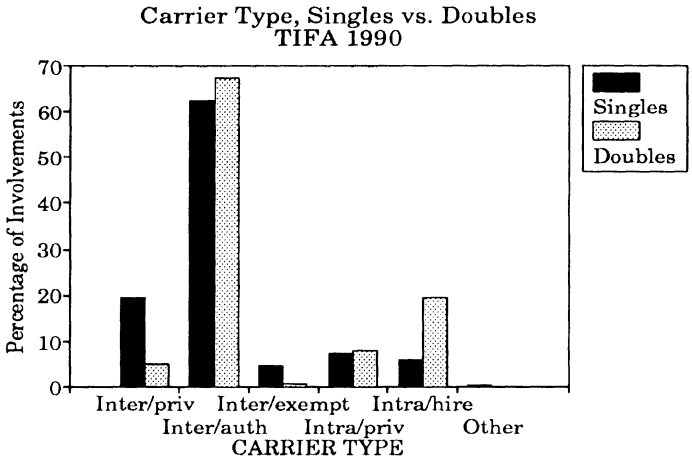


Figure 6-5

TABLE 6-5
Carrier Type, Singles vs. Doubles
TIFA 1990

Carrier Type	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Interstate private	581	18.95%	9	4.62%	590	18.09%
Interstate authorized	1,862	60.73	127	65.13	1,989	60.99
Interstate exempt	137	4.47	1	0.51	138	4.23
Intrastate private	215	7.01	15	7.69	230	7.05
Intrastate for hire	181	5.90	37	18.97	218	6.69
Government owned	8	0.26	0	0.00	8	0.25
Daily rental	4	0.13	0	0.00	4	0.12
Unknown	78	2.54	6	3.08	84	2.58
TOTAL	3,066	100.00%	195	100.00%	3,261	100.00%

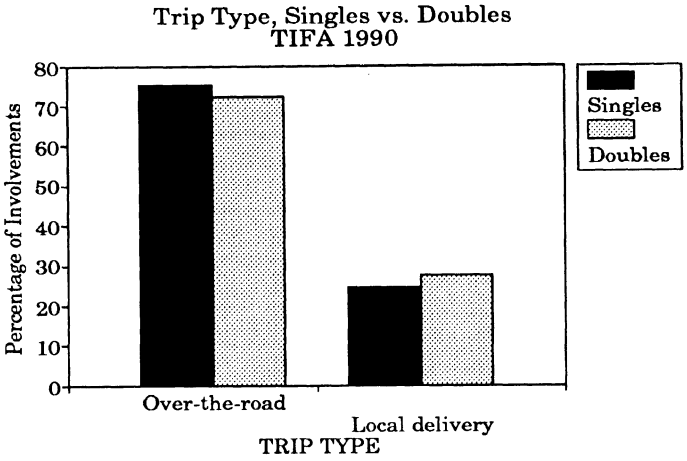


Figure 6-6

The majority of singles and doubles involved in accidents were making over-the-road trips at the time. Overall, for the cases when trip type was known, more than 75% were making over-the-road trips.

TABLE 6-6
Trip Type, Singles vs. Doubles
TIFA 1990

Trip Type	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Over-the-road	2,245	73.22%	136	69.74%	2,381	73.01%
Local delivery	733	23.91	52	26.67	785	24.07
Unknown	88	2.87	7	3.59	95	2.91
TOTAL	3,066	100.00%	195	100.00%	3,261	100.00%

The road class distributions are shown in the graph at right. Relatively more doubles involvements took place on other routes and fewer on major arteries compared with singles involvements. Of the known cases, 21% of the doubles accidents occurred on other roads and 42% occurred on major arteries. The respective figures for singles were 12% and 53%.

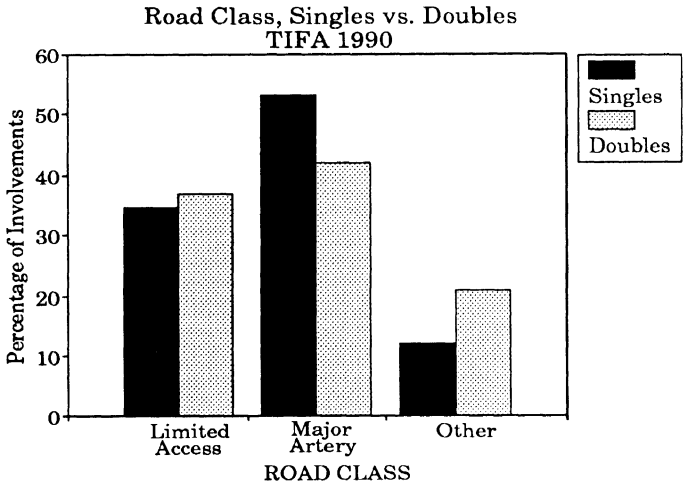


Figure 6-7

TABLE 6-7
Road Class, Singles vs. Doubles
TIFA 1990

Road Class	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Limited Access	1,063	34.67%	72	36.92%	1,135	34.81%
Major Artery	1,622	52.90	82	42.05	1,704	52.25
Other	374	12.20	41	21.03	415	12.73
Unknown	7	0.23	0	0.00	7	0.21
TOTAL	3,066	100.00%	195	100.00%	3,261	100.00%

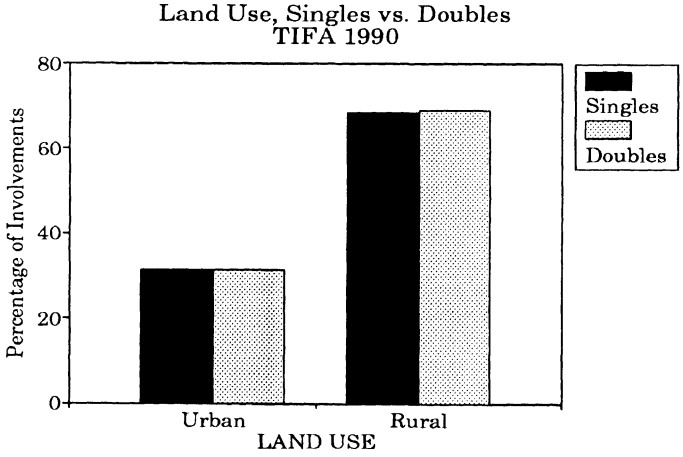


Figure 6-8

The land use distributions, whether the accident took place in a rural or urban area, are virtually identical for singles and doubles. Considering all singles and doubles combined, 68% of the involvements occurred in rural areas and 31% in urban areas.

TABLE 6-8
Land Use, Singles vs. Doubles
TIFA 1990

Land Use	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Urban	960	31.31%	61	31.28%	1,021	31.31%
Rural	2,094	68.30	134	68.72	2,228	68.32
Unknown	12	0.39	0	0.00	12	0.37
TOTAL	3,066	100.00%	195	100.00%	3,261	100.00%

The final comparison of singles and doubles concerns the light condition at the time of the accident. Although the distributions are similar, there is a higher incidence of nighttime accidents and lower incidence of daytime involvements for doubles compared with singles. Over 55% of the singles involvements occurred during daylight, compared with 49% of the doubles involvements. On the other hand, 45% of the doubles involvements took place at night, compared to 40% of the singles involvements. This probably reflects a larger proportion of nighttime travel for doubles compared to singles.

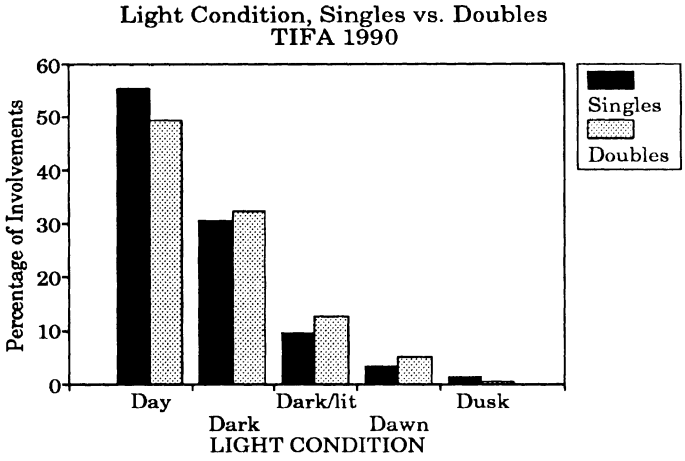


Figure 6-9

TABLE 6-9
Light Condition, Singles vs. Doubles
TIFA 1990

Light Condition	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Daylight	1,698	55.38%	96	49.23%	1,794	55.01%
Dark, not lighted	934	30.46	63	32.31	997	30.57
Dark, but lighted	290	9.46	25	12.82	315	9.66
Dawn	98	3.20	10	5.13	108	3.31
Dusk	42	1.37	1	0.51	43	1.32
Unknown	4	0.13	0	0.00	4	0.12
TOTAL	3,066	100.00%	195	100.00%	3,261	100.00%

Longer Combination Vehicles

This section on multiple-trailer combinations concludes with a brief discussion of the fatal accident involvement of longer combination vehicles (LCVs). In TIFA, LCVs are defined as tractor and multiple-trailer combinations with an overall length greater than 75 feet. The Surface Transportation Assistance Act (STAA) of 1982 required states to permit tractors with two 28 foot trailers on Interstate highways. As the graph on the right illustrates, while the number of STAA doubles involvements has been dropping since 1986, they still comprise the great majority of multiple-trailer combination vehicles. On the other hand, despite a decrease of almost 37% from 1989 to 1990 the number of LCV fatal accidents has shown a general increase during the decade.

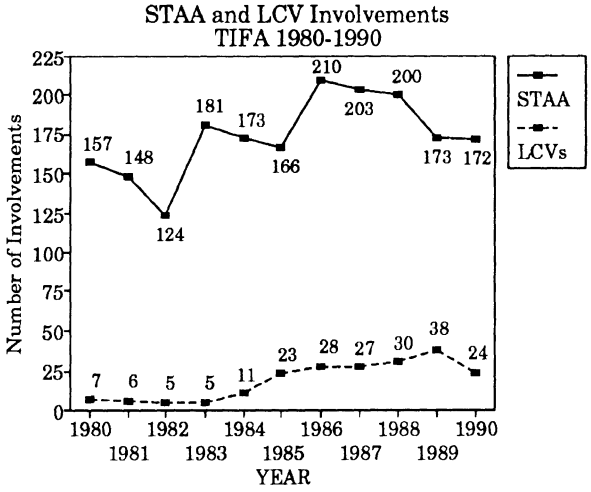


Figure 6-10

TABLE 6-11
Tractor Multiple-Trailer Combination Vehicles
by Configuration Type
TIFA 1990

Configuration Type						
STAA Doubles	Rocky Mtn. Doubles	Turnpike Doubles	Other LCV >75'	Other Double	Triples	Total
172	8	0	14	3	2	199

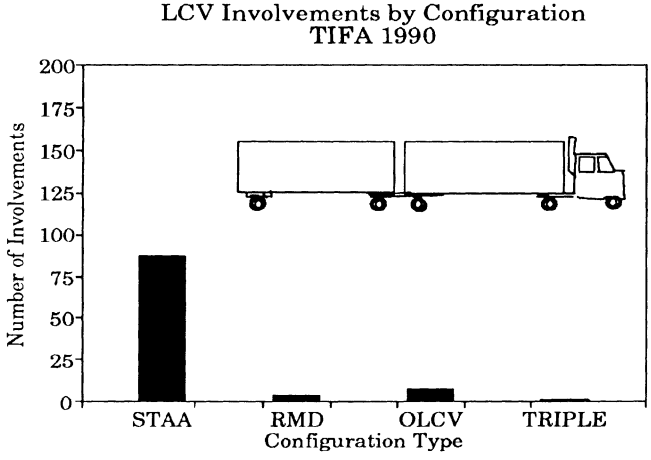


Figure 6-11

The table above and the graph on the left, illustrate the data on multiple-trailer combinations in the 1990 TIFA file. While STAA doubles are not considered LCVs they have been included in the graph as a basis for comparison. Rocky Mountain doubles (RMDs) have a first trailer from 40 to 48 feet long and a second trailer from 20 to 30 feet long. There were 8 RMD fatal involvements in

1990. Turnpike doubles (TPDs) have equal length trailers ranging from 40 to 48 feet. This configuration, by definition, accumulates most of its mileage on limited access roads, which are considered to be safer per mile traveled than the other road classes. TPDs were not involved in any fatal accidents in 1990. Other LCVs are doubles with lengths over 75 feet but which do not fall into the RMD or TPD categories, the majority of LCV fatal involvements (14) fell into this category. Two of these other LCVs are not typical tractor semi and full trailer combinations and were not included with the doubles in the earlier comparisons made in this section. The other doubles have unknown overall lengths and were excluded from the graph. The LCVs comprised just 12% of the tractor and multiple-trailer combinations in fatal accidents and less than 1% of all tractor involvements in 1990.

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