Center for
National Truck Statistics

TRUCKS INVOLVED IN FATAL ACCIDENTS

FACTBOOK 1991

Kathleen P. Sullivan

Dawn L. Massie

UMTRI
The University of Michigan
Transportation Research Institute

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16. Abstract

This report contains a series of distributions of variables from UMTRI's file of Trucks Involved in Fatal Accidents, 1991. 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 1991 TIFA dataset contains 4,404 cases, down 12 percent from the 5,003 in 1990.

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 1991. The next section provides an overview of the fatal involvements in 1991, 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).

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TIFA Summary Facts and Figures

- From 1980 through 1991, 61,349 medium and heavy trucks were involved in fatal accidents. This is an average of 5,112 fatal involvements per year.
- The total number of fatal involvements for large trucks in 1991 was 4,404, compared with 5,003 in 1990, a decrease of 12%.
- 2,989 (67.9%) of the large trucks involved in fatal accidents in 1991 had a tractor as the power unit, and 1,408 (32%) were straight trucks.
- Tractor-semitrailers were involved in 2,659 fatal accidents in 1991. Doubles (tractors hauling a semi and a full trailer) were involved in 167 fatal accidents. There were no triples involved in fatal accidents in 1991[1].
- A total of 8,650 vehicles were involved in large-truck fatal accidents in 1991.
- These accidents resulted in 4,955 fatalities, 549 (11.1%) of whom were truck drivers.
- The 1991 figure for fatally injured truck drivers represents an 8% decrease from the 1990 total and a drop of 41% since 1980.
- About 61% of all of the 1991 large-truck fatal involvements occurred during the daytime, 36% at night, and 3% during the dawn and dusk periods.
- 27% of the 1991 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 1991 fatal accidents and covered with snow or ice in 5%.
- 66% of the 1991 fatal involvements took place in rural areas, compared with 34% in urban areas.
- Of all the large-truck fatal involvements in 1991, 22% occurred at intersections.

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[1] There was one tractor with three trailers in the 1991 TIFA file; it 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 original survey combined 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 (FHWA) 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 form was revised for the 1991 data year. The changes include the addition of alpha fields to record the actual cargo, truck model, truck configuration, and cargo body style. The other additions to the survey form are new levels of the variables for cargo type and cargo body style, and new variables to record lift axles on each unit in the combination. As a result of these changes to the survey form, the 1991 TIFA file offers even more detail on the physical characteristics of trucks involved in fatal accidents.

The TIFA survey has been conducted continuously since 1981 and is currently complete for accident years 1980 through 1992. 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.

This is the last TIFA Factbook in this series. The 1992 TIFA data will be incorporated into a new truck and bus accident factbook, which will report on all truck and bus accidents in FHWA's Safetynet data system. Reportable accidents are those that result in a fatality, or a injured party transported from the scene for medical attention, or at least one vehicle towed, or a hazardous spill. Since the next factbook includes both fatal and nonfatal accidents, it will provide the first comprehensive look at all truck and bus accidents.

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, configuration, and some information on cargo body style and number of axles. There are no variables in the FARS file concerning 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.

Interstate carriers of goods are required to file reports with OMC on accidents resulting in fatality, in an injury treated away from the scene, or in property damage of at least $4,400. The OMC fatal accident reports are matched with FARS cases and then a follow-up telephone survey is conducted to collect a detailed physical description of the involved truck. It is the objective of the TIFA survey to enhance the detail of the MCS 50-T information for all large trucks involved in fatal accidents, by obtaining weights and lengths of the

individual units, actual cargo, and other descriptive information not required on the MCS 50-T form.

The survey procedure (illustrated in the flow chart below) begins by matching OMC fatal accident reports with FARS cases. For cases that cannot be matched, the OMC reports are discarded. Then all FARS cases are matched with police accident reports (PARs), and sampling is done (see page 5). Telephone interviews are then conducted to obtain company and vehicle descriptions of the trucks. If the case is a match with an MCS 50-T fatal report, the company representative who completed the form is contacted for an interview. With the remaining FARS cases, 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. These reports, 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. Extensive editing and consistency checking are performed on all information obtained both by interview and from the MCS 50-T reports. 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

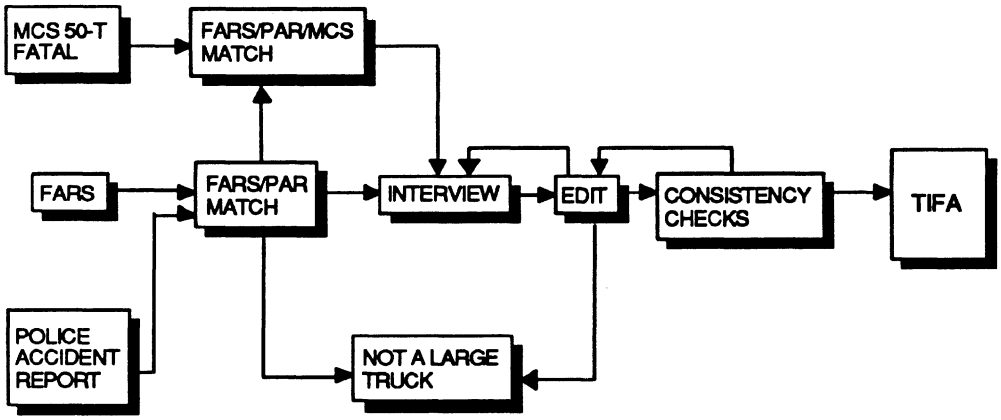

Figure 1-1

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 percent for most specific factors of interest, an exceptionally low rate for this kind of data.

Sampling and the 1991 File

The 1991 version of TIFA is the fifth 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 1991 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 34.2% ± 1.7. The proportion of cases with fires is 5.0% ± 0.7. Six other representative proportions were checked. The widest confidence interval for any of the proportions was ± 1.7%.

Confidence intervals were also calculated using a technique that treats the 1991 file *as if* it were a census file, or a simple random sample of all 4,404 cases.[2] The confidence intervals for the stratified random sample are only about 21% 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 ± 1.4 rather than ± 1.7. 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 1991 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 0.34, 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 1991 file are comparable to figures from previous TIFA files.

Conventions Followed

Most of this Factbook concerns the 1991 TIFA file, which was the fifth year in which sampling was conducted. All of the statistics presented in this document for 1991 are based on *weighted* frequencies from the file. Therefore, the 1991 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 1980-1991 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 1991 TIFA file contains 72 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 72 to 7. Power unit type comparisons are made for straight-trucks versus tractor combinations, with the seven unknown cases excluded, in the section entitled *Overview of Large-Truck Accident Involvements in 1991.* 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 72 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 no triples involved in fatal accidents in 1991. An "other" category includes 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, 1980-1991* section, the geographic distributions portion of the *Overview* section, and the *Multiple-Trailer Fatal Accident Involvements in 1991* section. The power unit type coding from FARS, with seven 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, 1980-1991

The twelve 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, including 17 tractors with over 500 pounds of cargo, which would not have been classified as bobtails in previous years), 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, 4,404, occurred in 1991. The previous low occurred in 1982, which corresponded 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 19.4%, from the 1988 total of 5,467, to 4,404 in 1991.

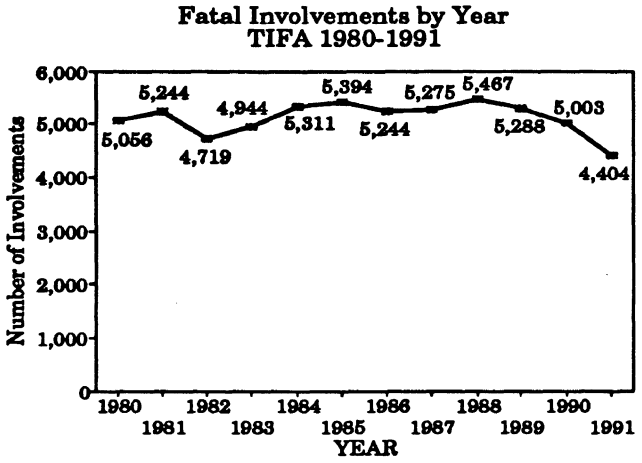


Figure 2-1

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

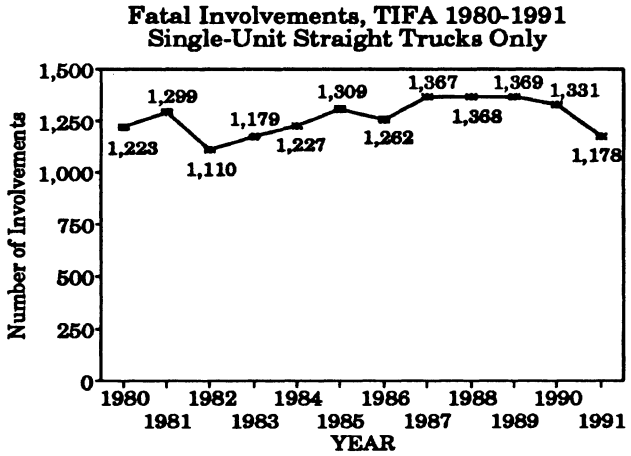


Figure 2-2

Single-unit straight-truck involvements correspond closely to the overall trend. The 1991 figure of 1,178 is 3.7% lower than the 1980 figure and it is a decline of 11.5% from the previous year.

While the number of fatal involvements overall has shown a decline in the last several years, the number of fatal accidents involving straight trucks with one trailer has increased 36.3% from 132 in 1989 to 180 in 1991. The current year, 1991, is the new peak. This configuration type, however, comprises a very small proportion of the large-truck population.

Fatal Involvements, TIFA 1980-1991
Straight Trucks with One Trailer Only

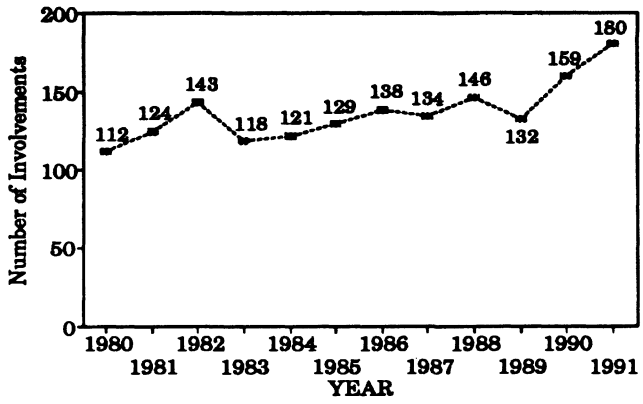


Figure 2-3

Fatal Involvements, TIFA 1980-1991
Bobtails Only

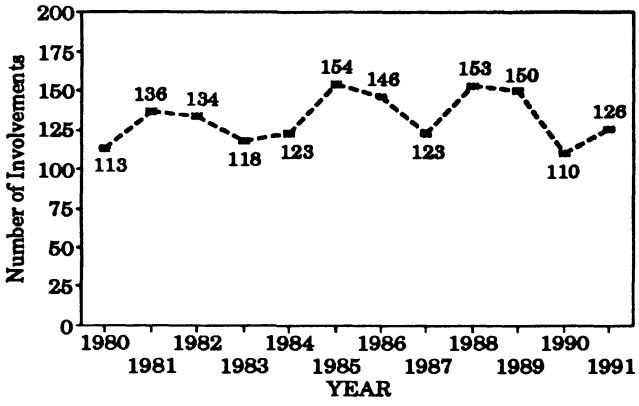


Figure 2-4

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. The 1991 total (126) was 14.5% higher than the 1990 figure; however, as mentioned earlier, this figure includes the 17 tractors with cargo.

The twelve-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 2,659 involvements in 1991 represent a drop of 13.3% from 1990 and is the lowest in the twelve years of data.

Fatal Involvements, TIFA 1980-1991
Tractor-Semitrailers Only

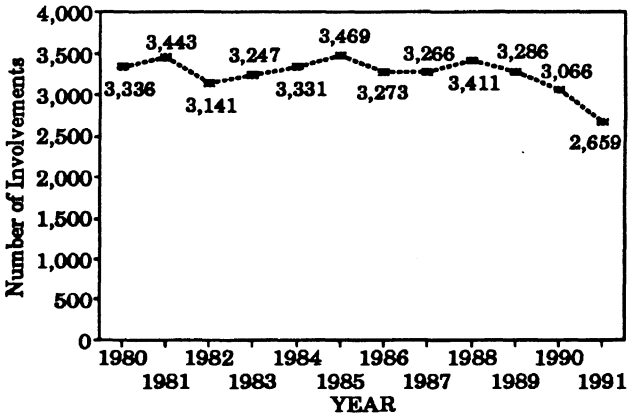


Figure 2-5

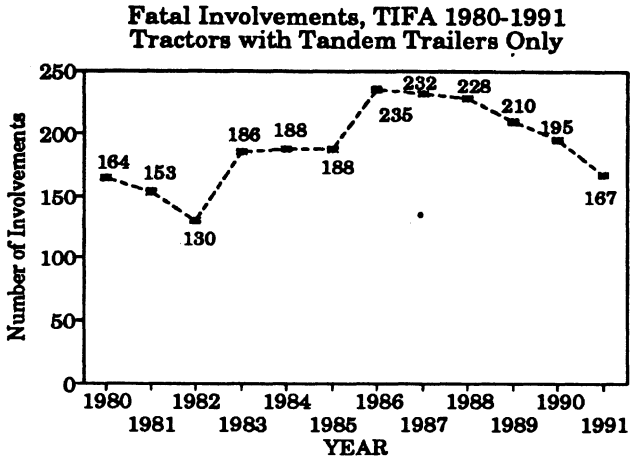


Figure 2-6

The number of fatal involvements for doubles rose over the period 1982-1986 and has been gradually declining since then. The 1991 figure of 167 represents a drop of 14.4% 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 1991 with 4,955. The number of fatalities in 1991 represents a decrease of 11.8% from the previous year. The 1991 total is 12.2% lower than the figure for 1980.

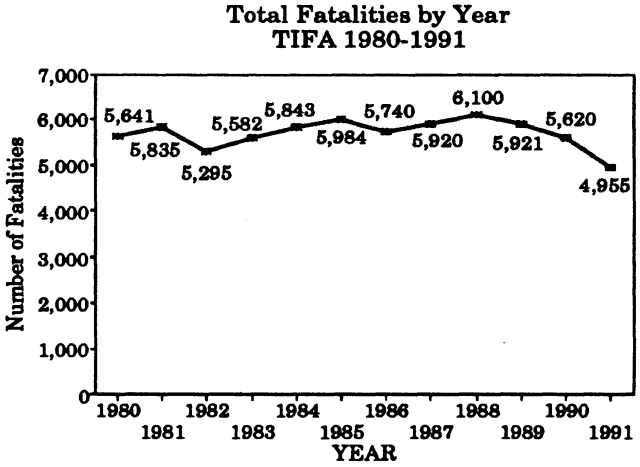


Figure 2-7

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

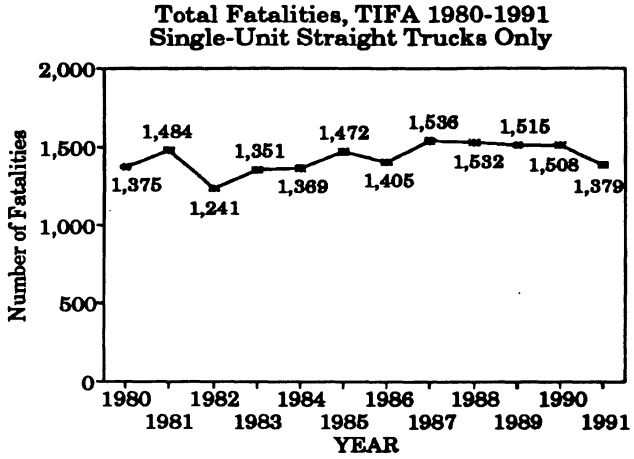


Figure 2-8

The number of fatalities resulting from straight-truck accidents rose 9% between 1986 and 1987, and remained virtually unchanged for several years. In 1991 the total was 1,379, an 8.5% decrease from the previous year.

The annual number of fatalities resulting from accidents involving straight trucks with one trailer has ranged from 132 in 1984 to 206 in 1991. The 1991 total was a 9.0% increase from the previous year.

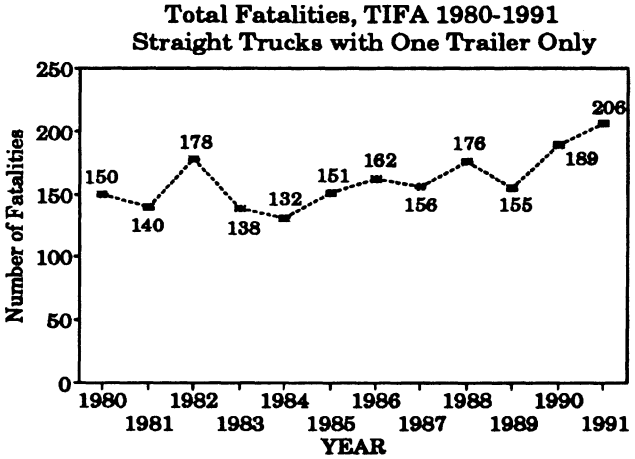


Figure 2-9

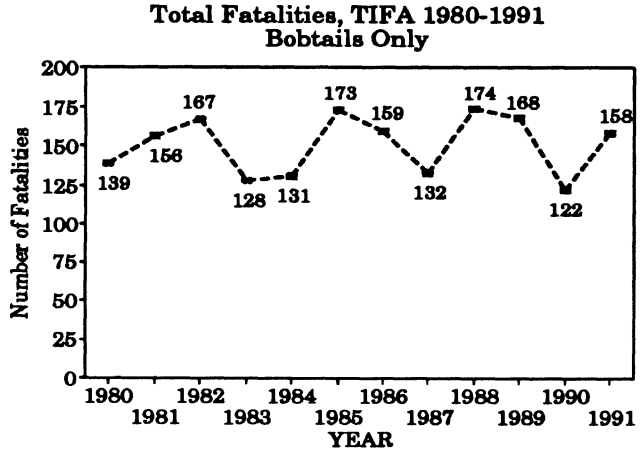


Figure 2-10

In 1991 the number of fatalities resulting from bobtail involvements was 158, an increase of 29.5% from 122 in 1990.

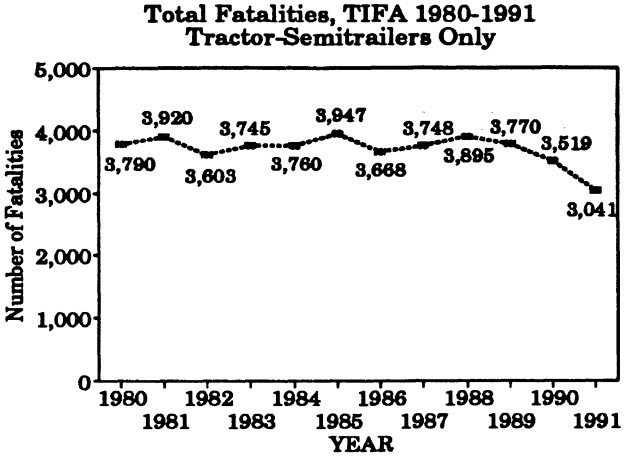


Figure 2-11

The number of fatalities resulting from singles involvements remained relatively stable throughout the decade, 1980-1989. The 1990 figure represented a drop of 6.7% from 1989. In 1991 the number of fatalities decreased to 3,041, a 13.6% drop from the previous year. The 1991 total was the lowest in the twelve years of data.

In contrast, fatalities resulting from doubles involvements increased during the years 1982 - 1986. 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 declined slightly in each of the subsequent years. The 1991 figure of 203 fatalities represents a drop of almost 26% from the 1986 total.

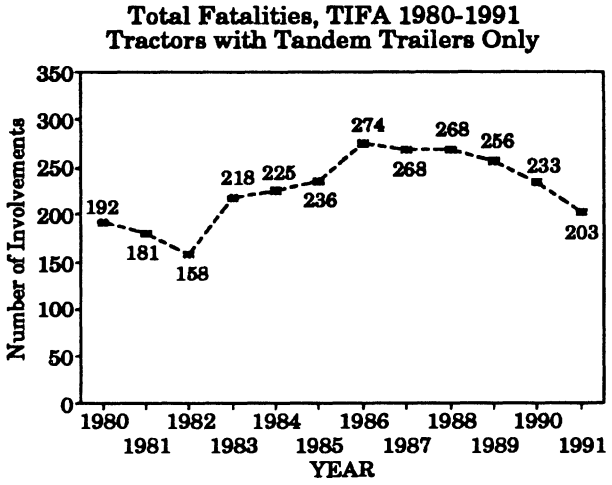


Figure 2-12

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 1989 and a drop off in the last two years, the number of truck driver fatalities has shown a general decline during this time period. The 1991 figure of 549 represents a 7.7% decrease from the previous year, and it is over 38% 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 12.5% in 1991. 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.

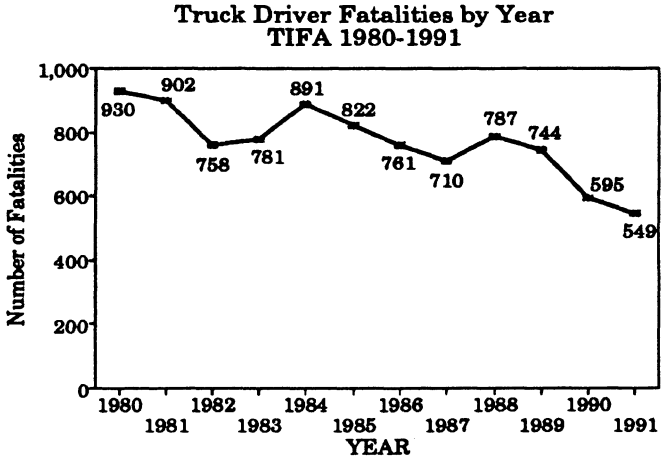


Figure 2-13

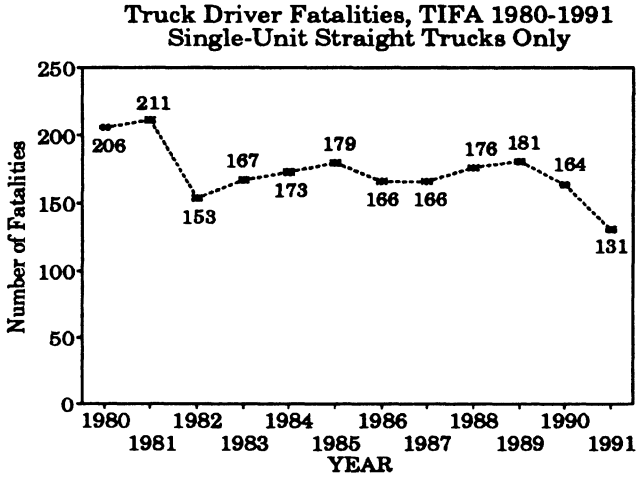


Figure 2-14

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 181 in 1989 to 131 in 1991. In 1991 the total dropped 21.3% from the previous year.

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 in the subsequent two years then jumped to 23 in 1991.

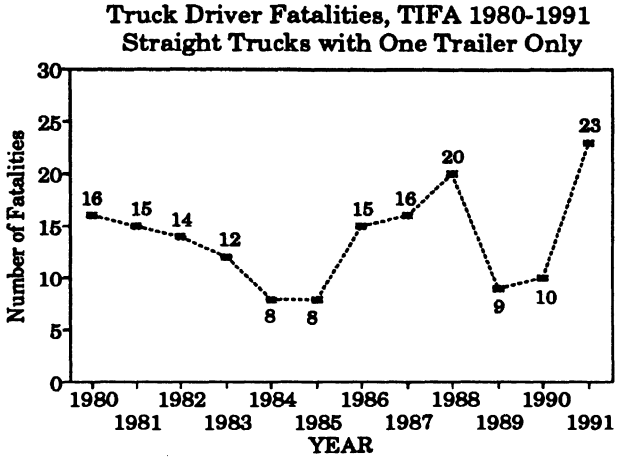


Figure 2-15

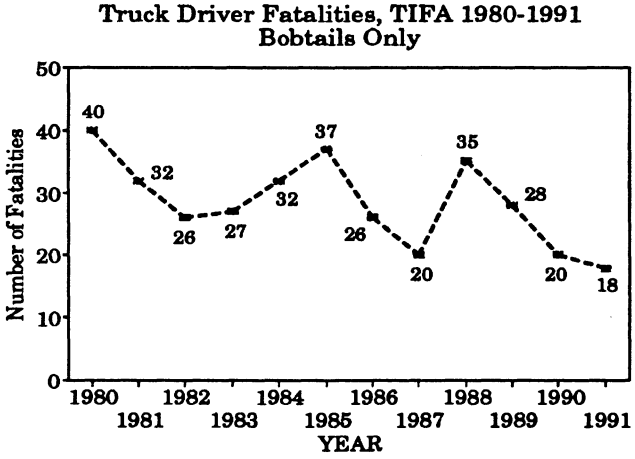


Figure 2-16

The annual number of fatalities for bobtail drivers has also fluctuated from year to year. The highest number of fatalities (40) was reached in 1980, while the low of 18 occurred in 1991.

The fatality trend for singles drivers closely matches the overall trend for all drivers of large trucks. The number of fatalities for tractor-semitrailer drivers dropped over 25% in the years between 1984 and 1987. In 1988 the number increased 9.4% from the previous year, and declined only slightly in 1989. In 1990 there was another drop of over 25% to 355. The 1991 total of 349 represents a drop of just 1.7% from the 1990 figure.

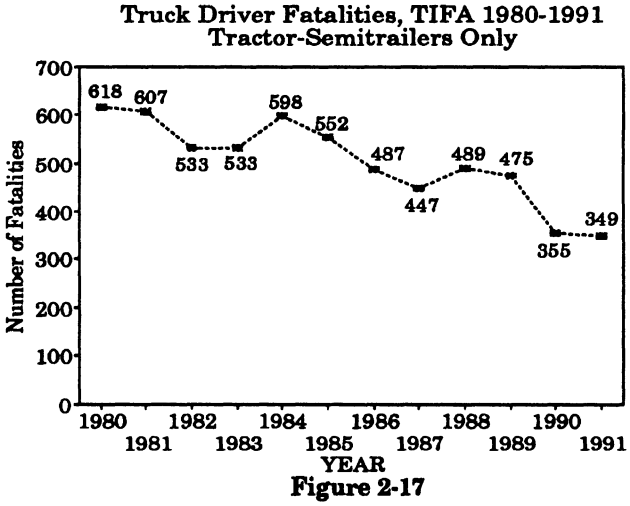


Figure 2-17

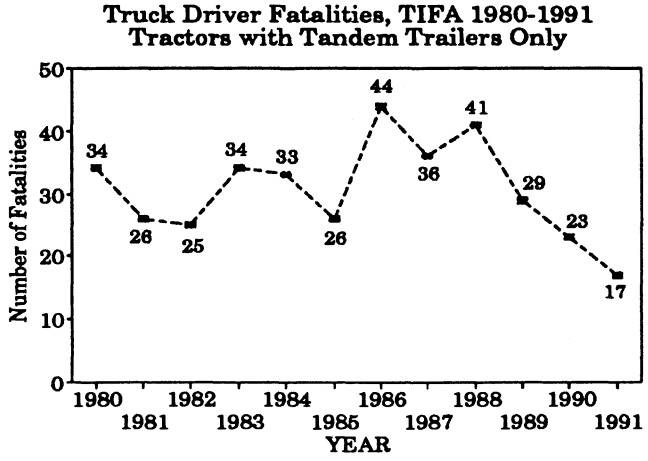


Figure 2-18

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 17 fatalities occurred in 1991, and was a decrease of over 26% from the previous year.

OVERVIEW OF LARGE-TRUCK FATAL ACCIDENT INVOLVEMENTS IN 1991

The information in this section characterizes the general fatal accident experience of medium and heavy trucks in 1991. 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 this 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 1991. 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

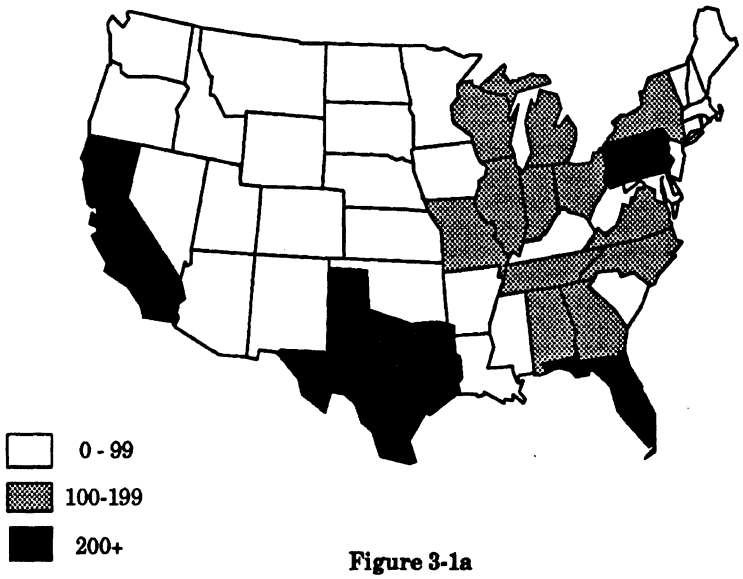


Figure 3-1a

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 167 fatal accidents involving doubles in 1991, 64 took place in California, 10 in Oregon , and 7 in Missouri. These three states accounted for 48% of the total number of doubles involvements, and California alone accounted for 38%.

Trucks Involved in Fatal Accidents by State
Singles Only

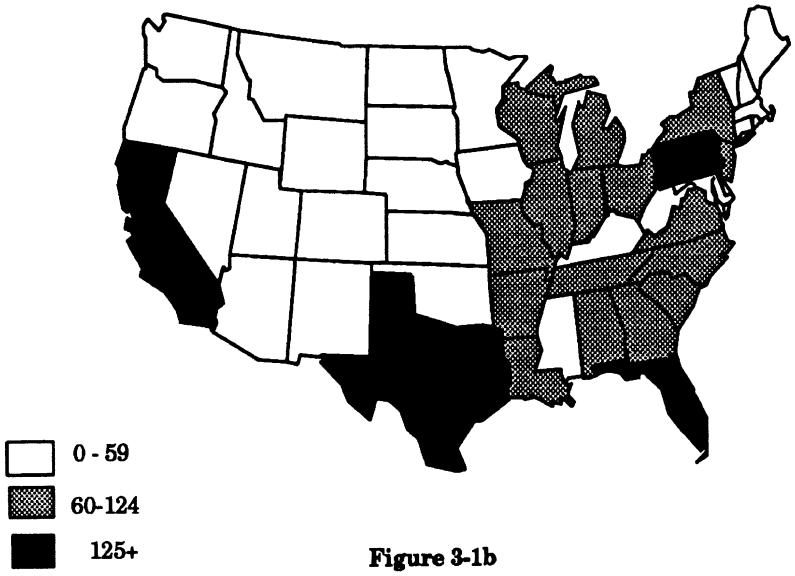


Figure 3-1b

Trucks Involved in Fatal Accidents by State
Doubles Only

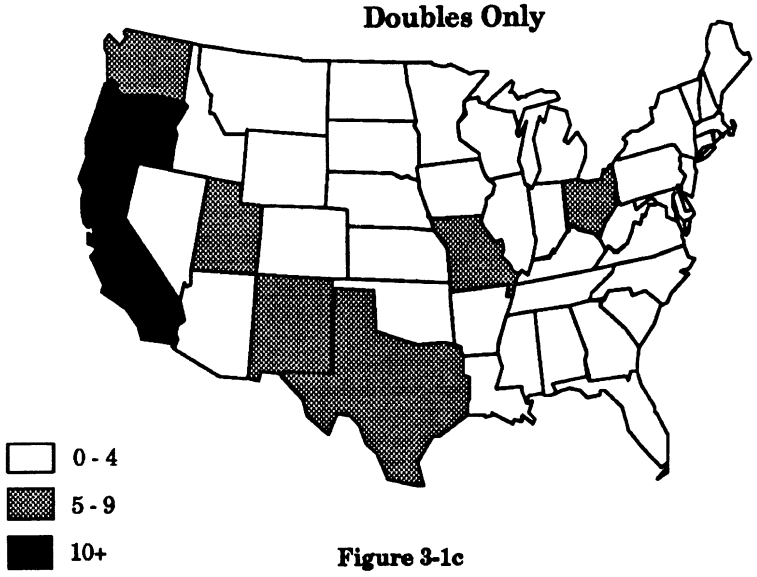


Figure 3-1c

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 (404), followed by Texas (325), and Florida (247). Together these three states accounted for 22% of the fatal involvements in 1991.

TABLE 3-1A
Distribution of Trucks in Fatal Accidents by State and Type of Truck, TIFA 1991

State	Total Number	Straight Truck Alone	Straight Truck w/Trailer	Bobtail	Single	Double	Other	Unknown Truck Type
Alabama	129	33	1	4	87	2	1	1
Arizona	63	16	4	1	35	4	2	1
Arkansas	93	16	1	2	71	3	0	0
California	404	95	37	10	195	64	2	1
Colorado	37	10	2	1	23	1	0	0
Connecticut	26	18	0	1	6	1	0	0
Delaware	17	3	0	0	14	0	0	0
District of Columbia	3	2	0	1	0	0	0	0
Florida	247	76	4	6	156	3	0	2
Georgia	161	50	10	3	96	2	0	0
Idaho	24	7	5	0	9	3	0	0
Illinois	163	41	9	7	101	2	0	3
Indiana	137	26	4	3	99	3	2	0
Iowa	77	14	2	2	56	3	0	0
Kansas	44	14	3	0	27	0	0	0
Kentucky	98	35	2	1	57	2	1	0
Louisiana	95	14	0	1	80	0	0	0
Maine	23	7	0	0	16	0	0	0
Maryland	64	30	0	2	30	1	0	1
Massachusetts	25	13	1	0	11	0	0	0
Michigan	128	51	7	1	67	2	0	0
Minnesota	69	17	4	1	45	1	1	0
Mississippi	73	0	0	0	6	2	0	65
Missouri	133	26	8	1	91	7	0	0
Montana	23	4	0	3	13	3	0	0
Nebraska	43	16	0	0	25	2	0	0
Nevada	19	3	2	1	13	0	0	0
New Hampshire	6	1	0	0	5	0	0	0
New Jersey	92	25	2	3	60	2	0	0
New Mexico	55	8	0	2	40	5	0	0
New York	190	87	6	3	91	1	1	1
North Carolina	175	53	7	9	103	2	1	0
North Dakota	12	4	0	0	8	0	0	0
Ohio	170	49	2	6	108	5	0	0
Oklahoma	66	16	1	8	40	1	0	0
Oregon	70	12	8	7	33	10	0	0
Pennsylvania	216	65	2	3	138	2	6	0
Rhode Island	6	3	0	0	3	0	0	0
South Carolina	92	10	7	0	74	1	0	0
South Dakota	20	8	1	1	9	1	0	0
Tennessee	112	22	6	3	79	2	0	0
Texas	325	75	13	15	213	7	2	0
Utah	32	3	2	0	21	6	0	0
Vermont	13	5	0	1	7	0	0	0
Virginia	110	34	3	6	63	4	0	0
Washington	56	11	5	3	31	6	0	0
West Virginia	42	12	1	2	27	0	0	0
Wisconsin	108	38	4	1	64	1	0	0
Wyoming	18	0	4	1	13	0	0	0
TOTAL	4,404	1,178	180	126	2,659	167	19	75

TABLE 3-1B
Distribution of Trucks in Fatal Accidents by State and Type of Truck, TIFA 1991
Column Percents

State	Total	Straight Truck Alone	Straight Truck w/Trailer	Bobtail	Single	Double	Other	Unknown Truck Type
Alabama	2.93%	2.80%	0.56%	3.17%	3.27%	1.20%	5.26%	1.33%
Arizona	1.43	1.36	2.22	0.79	1.32	2.40	10.53	1.33
Arkansas	2.11	1.36	0.56	1.59	2.67	1.80	0.00	0.00
California	9.17	8.06	20.56	7.94	7.33	38.32	10.53	1.33
Colorado	0.84	0.85	1.11	0.79	0.86	0.60	0.00	0.00
Connecticut	0.59	1.53	0.00	0.79	0.23	0.60	0.00	0.00
Delaware	0.39	0.25	0.00	0.00	0.53	0.00	0.00	0.00
Dist. of Columbia	0.07	0.17	0.00	0.79	0.00	0.00	0.00	0.00
Florida	5.61	6.45	2.22	4.76	5.87	1.80	0.00	2.67
Georgia	3.66	4.24	5.56	2.38	3.61	1.20	0.00	0.00
Idaho	0.54	0.59	2.78	0.00	0.34	1.80	0.00	0.00
Illinois	3.70	3.48	5.00	5.56	3.80	1.20	0.00	4.00
Indiana	3.11	2.21	2.22	2.38	3.72	1.80	10.53	0.00
Iowa	1.75	1.19	1.11	1.59	2.11	1.80	0.00	0.00
Kansas	1.00	1.19	1.67	0.00	1.02	0.00	0.00	0.00
Kentucky	2.23	2.97	1.11	0.79	2.14	1.20	5.26	0.00
Louisiana	2.16	1.19	0.00	0.79	3.01	0.00	0.00	0.00
Maine	0.52	0.59	0.00	0.00	0.60	0.00	0.00	0.00
Maryland	1.45	2.55	0.00	1.59	1.13	0.60	0.00	1.33
Massachusetts	0.57	1.10	0.56	0.00	0.41	0.00	0.00	0.00
Michigan	2.91	4.33	3.89	0.79	2.52	1.20	0.00	0.00
Minnesota	1.57	1.44	2.22	0.79	1.69	0.60	5.26	0.00
Mississippi	1.66	0.00	0.00	0.00	0.23	1.20	0.00	86.67
Missouri	3.02	2.21	4.44	0.79	3.42	4.19	0.00	0.00
Montana	0.52	0.34	0.00	2.38	0.49	1.80	0.00	0.00
Nebraska	0.98	1.36	0.00	0.00	0.94	1.20	0.00	0.00
Nevada	0.43	0.25	1.11	0.79	0.49	0.00	0.00	0.00
New Hampshire	0.14	0.08	0.00	0.00	0.19	0.00	0.00	0.00
New Jersey	2.09	2.12	1.11	2.38	2.26	1.20	0.00	0.00
New Mexico	1.25	0.68	0.00	1.59	1.50	2.99	0.00	0.00
New York	4.31	7.39	3.33	2.38	3.42	0.60	5.26	1.33
North Carolina	3.97	4.50	3.89	7.14	3.87	1.20	5.26	0.00
North Dakota	0.27	0.34	0.00	0.00	0.30	0.00	0.00	0.00
Ohio	3.86	4.16	1.11	4.76	4.06	2.99	0.00	0.00
Oklahoma	1.50	1.36	0.56	6.35	1.50	0.60	0.00	0.00
Oregon	1.59	1.02	4.44	5.56	1.24	5.99	0.00	0.00
Pennsylvania	4.90	5.52	1.11	2.38	5.19	1.20	31.58	0.00
Rhode Island	0.14	0.25	0.00	0.00	0.11	0.00	0.00	0.00
South Carolina	2.09	0.85	3.89	0.00	2.78	0.60	0.00	0.00
South Dakota	0.45	0.68	0.56	0.79	0.34	0.60	0.00	0.00
Tennessee	2.54	1.87	3.33	2.38	2.97	1.20	0.00	0.00
Texas	7.38	6.37	7.22	11.90	8.01	4.19	10.53	0.00
Utah	0.73	0.25	1.11	0.00	0.79	3.59	0.00	0.00
Vermont	0.30	0.42	0.00	0.79	0.26	0.00	0.00	0.00
Virginia	2.50	2.89	1.67	4.76	2.37	2.40	0.00	0.00
Washington	1.27	0.93	2.78	2.38	1.17	3.59	0.00	0.00
West Virginia	0.95	1.02	0.56	1.59	1.02	0.00	0.00	0.00
Wisconsin	2.45	3.23	2.22	0.79	2.41	0.60	0.00	0.00
Wyoming	0.41	0.00	2.22	0.79	0.49	0.00	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" includes single unit straight trucks, as well as those hauling trailers. "Tractors" refers 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 1,408 straight trucks and 2,989 tractors involved in fatal accidents in 1991.

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 month, the greatest numbers of fatal involvements took place in August and October. The most were recorded in October (463), while the fewest took place in March (287).

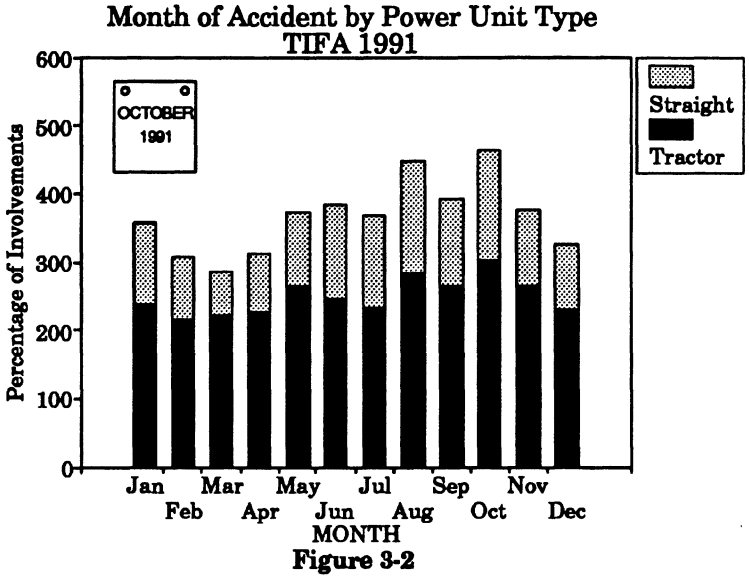


Figure 3-2

TABLE 3-2
Month of Accident by Power Unit Type
TIFA 1991

Month	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
January	120	8.52%	239	8.00%	359	8.16%
February	91	6.46	216	7.23	307	6.98
March	65	4.62	222	7.43	287	6.53
April	87	6.18	226	7.56	313	7.12
May	108	7.67	265	8.87	373	8.48
June	139	9.87	245	8.20	384	8.73
July	135	9.59	233	7.80	368	8.37
August	166	11.79	282	9.43	448	10.19
September	128	9.09	265	8.87	393	8.94
October	161	11.43	302	10.10	463	10.53
November	113	8.03	263	8.80	376	8.55
December	95	6.75	231	7.73	326	7.41
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 cases of unknown power unit type are excluded from this table.

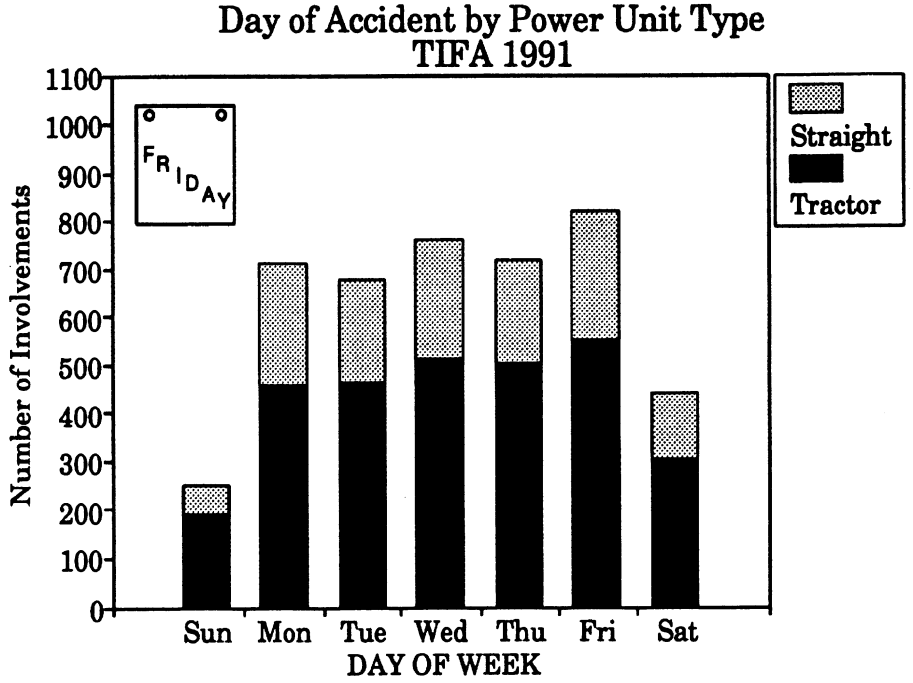


Figure 3-3

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 1991

Day	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Sunday	60	4.26%	192	6.42%	252	5.73%
Monday	253	17.97	460	15.39	713	16.22
Tuesday	217	15.41	464	15.52	681	15.49
Wednesday	253	17.97	512	17.13	765	17.40
Thursday	216	15.34	505	16.90	721	16.40
Friday	272	19.32	552	18.47	824	18.74
Saturday	137	9.73	304	10.17	441	10.03
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 cases of unknown power unit type are excluded from this table.

Time of Accident by Power Unit Type
TIFA 1991

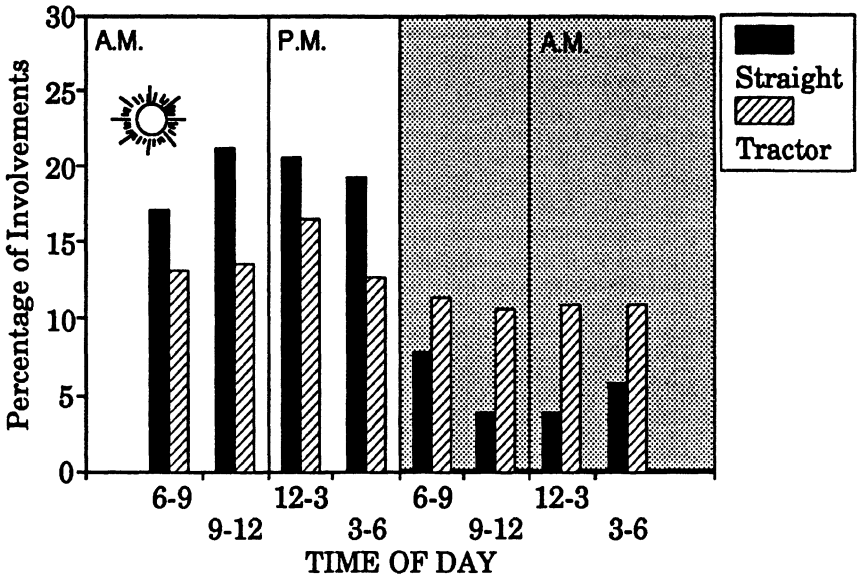


Figure 3-4

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. Over 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 1991

Time of Day	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
6–9 a.m.	242	17.19%	392	13.11%	634	14.42%
9 a.m.–12 p.m.	299	21.24	406	13.58	705	16.03
12–3 p.m.	292	20.74	494	16.53	786	17.88
3–6 p.m.	272	19.32	382	12.78	654	14.87
6–9 p.m.	111	7.88	338	11.31	449	10.21
9 p.m.–12 a.m.	54	3.84	320	10.71	374	8.51
12–3 a.m.	55	3.91	327	10.94	382	8.69
3–6 a.m.	82	5.82	326	10.91	408	9.28
Unknown	1	0.07	4	0.13	5	0.11
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 1991. Tractor involvements were especially likely to occur in rural areas; 69% took place there.

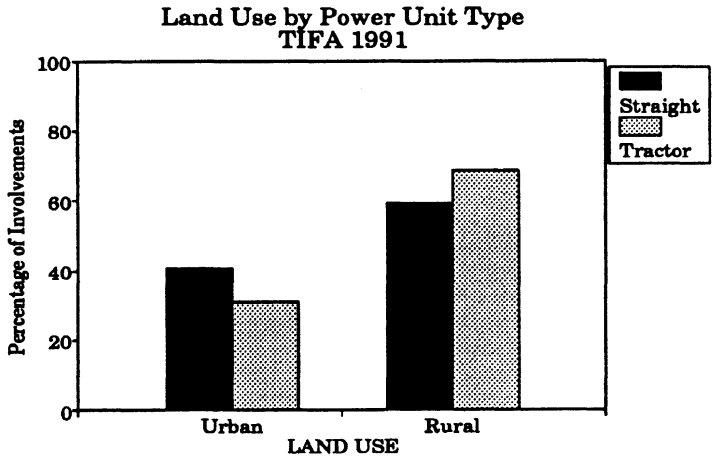


Figure 3-5

TABLE 3-5
Land Use by Power Unit Type
TIFA 1991

Land Use	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Urban	574	40.77%	930	31.11%	1,504	34.21%
Rural	833	59.16	2,053	68.69	2,886	65.64
Unknown	1	0.07	6	0.20	7	0.16
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 77.3% of the straight-truck involvements took place during daylight, only 53.9% 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.

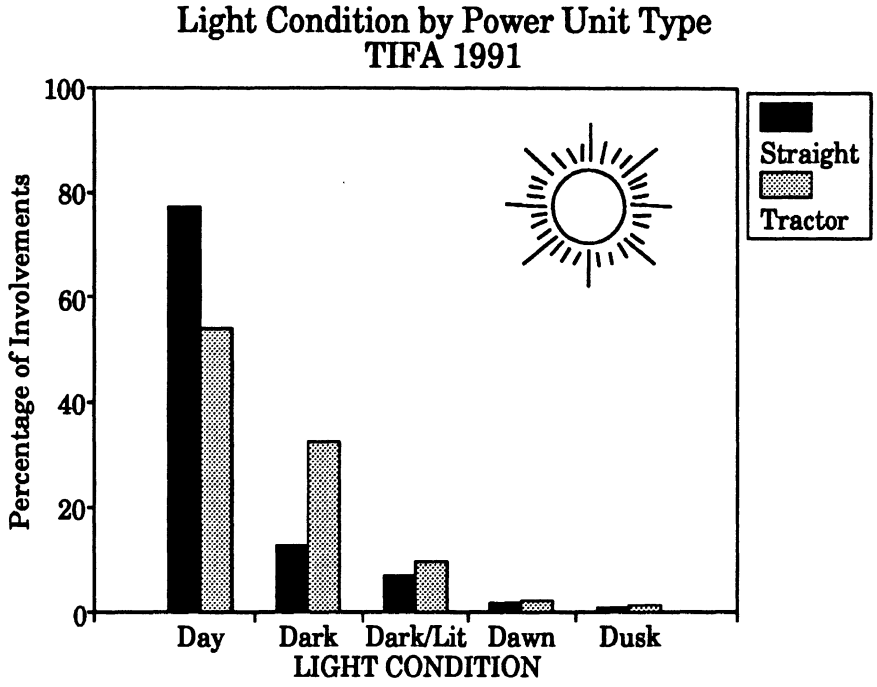


Figure 3-6

TABLE 3-6
Light Condition by Power Unit Type
TIFA 1991

Light Condition	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Daylight	1,088	77.27%	1,611	53.90%	2,699	61.38%
Dark, not lighted	184	13.07	962	32.18	1,146	26.06
Dark, but lighted	98	6.96	296	9.90	394	8.96
Dawn	27	1.92	70	2.34	97	2.21
Dusk	11	0.78	42	1.41	53	1.21
Unknown	0	0.00	8	0.27	8	0.18
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 very similar in terms of the road surface condition in 1991. Overall, 78% of the accidents took place under dry conditions, and 16% occurred on wet roadways.

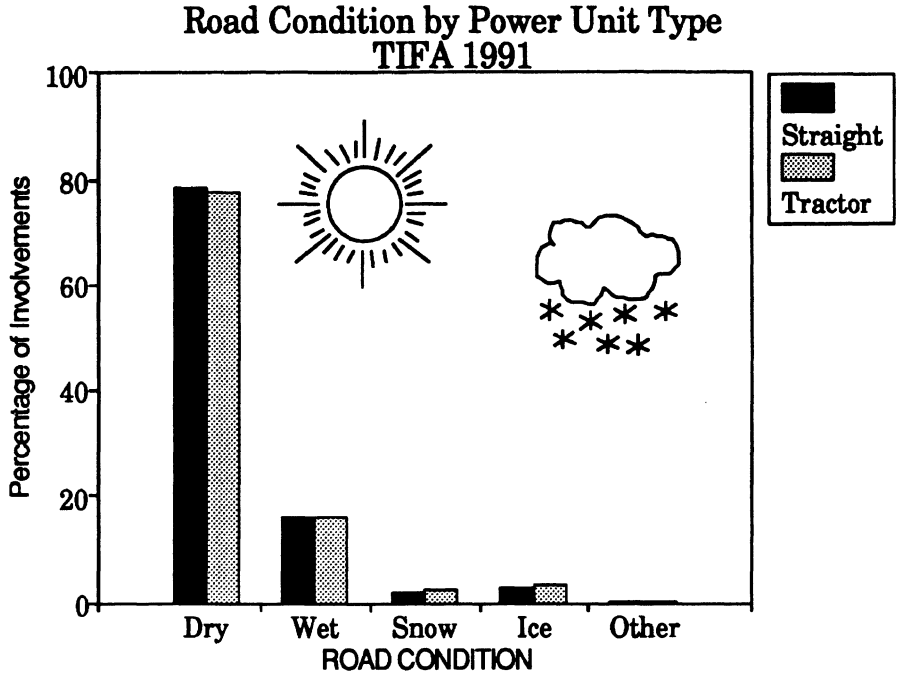


Figure 3-7

TABLE 3-7
Road Surface Condition by Power Unit Type
TIFA 1991

Road Surface Condition	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Dry	1,101	78.20%	2,322	77.68%	3,423	77.85%
Wet	230	16.34	485	16.23	715	16.26
Snow/Slush	29	2.06	74	2.48	103	2.34
Ice	40	2.84	93	3.11	133	3.02
Sand/Dirt/Oil	4	0.28	5	0.17	9	0.20
Other	2	0.14	4	0.13	6	0.14
Unknown	4	0.28	10	0.33	14	0.32
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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.

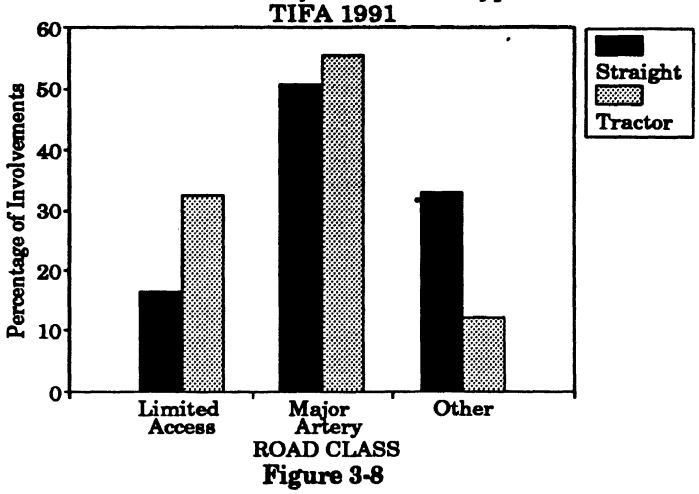


Figure 3-8

The majority of both straight-truck and tractor fatal involvements took place on major arteries in 1991. The main difference between the two distributions is in the proportion of involvements that occurred on limited-access and on other roads. Over 32% of tractor involvements were on limited-access highways, compared with 16% of straight-truck involvements. On the other hand, 33% of straight-truck fatal accidents occurred on other roads, as opposed to 12% 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 1991

Road Class	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Limited Access	231	16.41%	968	32.39%	1,199	27.27%
Major Artery	712	50.57	1,656	55.40	2,368	53.85
Other	462	32.81	360	12.04	822	18.69
Unknown	3	0.21	5	0.17	8	0.18
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 1991. The largest share of tractor involvements was on limited-access routes and the least on other roads. Conversely, 45% of straight-truck involvements occurred on other roads and 25% on limited access routes.

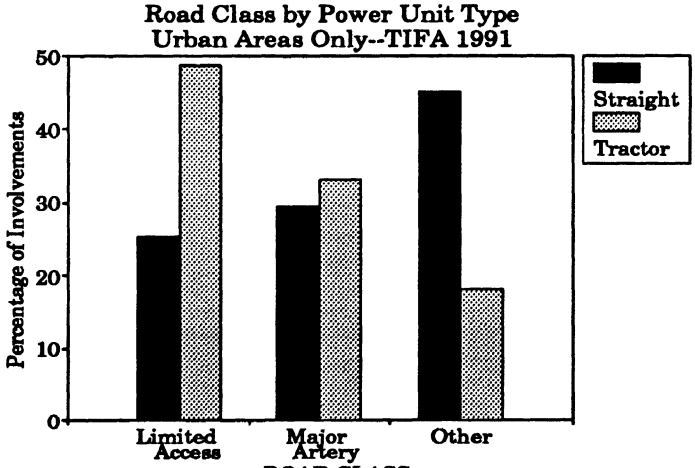


Figure 3-9

TABLE 3-9
Road Class by Power Unit Type
Urban Areas Only
TIFA 1991

Road Class	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Limited Access	145	25.26%	453	48.71%	598	39.76%
Major Artery	169	29.44	308	33.12	477	31.72
Other	258	44.95	169	18.17	427	28.39
Unknown	2	0.35	0	0.00	2	0.13
TOTAL	574	100.00%	930	100.00%	1,504	100.00%

NOTE: The 4 cases of unknown power unit type are excluded from this table.

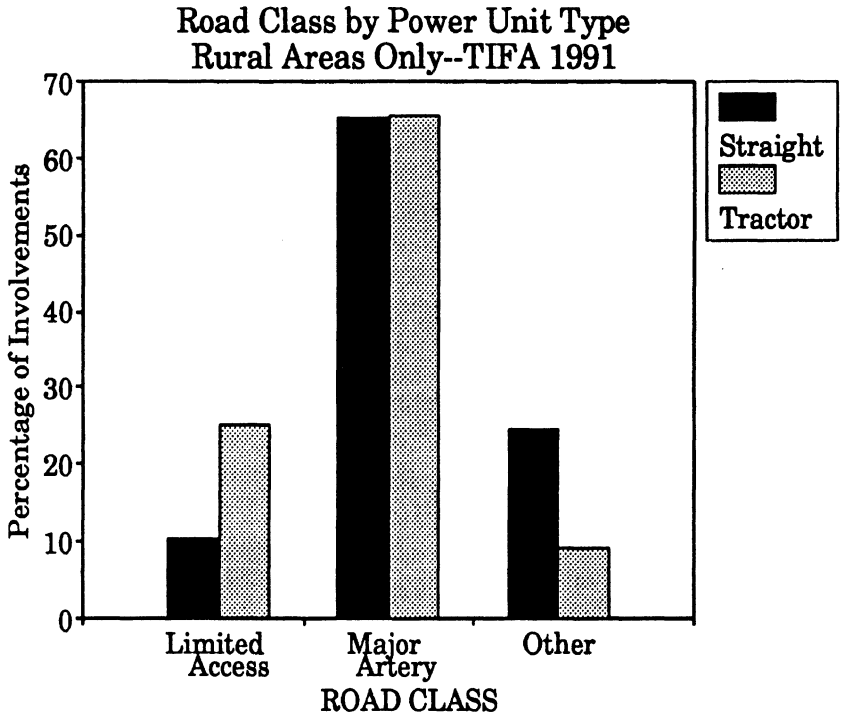


Figure 3-10

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 1991

Road Class	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Limited Access	86	10.32%	514	25.04%	600	20.79%
Major Artery	543	65.19	1,346	65.56	1,889	65.45
Other	204	24.49	191	9.30	395	13.69
Unknown	0	0.00	2	0.10	2	0.07
TOTAL	833	100.00%	2,053	100.00%	2,886	100.00%

NOTE: The 3 cases of unknown power unit type are excluded from this table.

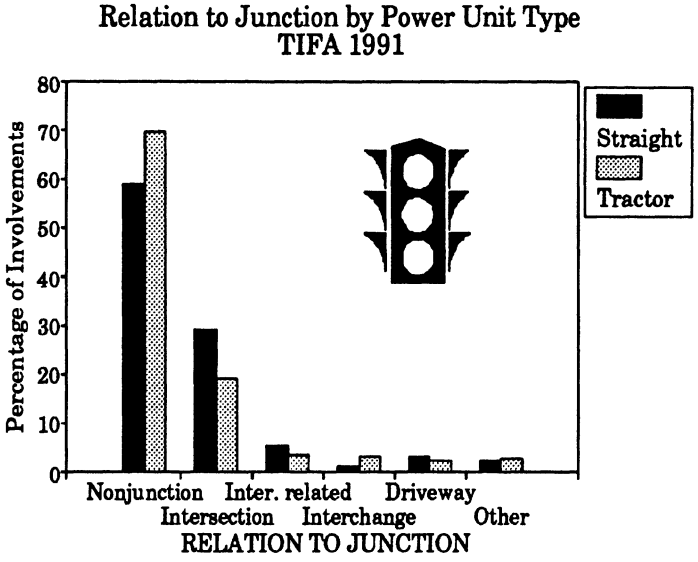


Figure 3-11

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 1991 reveals some interesting differences between straight trucks and tractors, which probably reflect their respective travel patterns. For example, 29% of straight-truck involvements took place at intersections, compared with 19% for tractors. In contrast, almost 70% of tractor involvements occurred at nonjunctions, compared with 59% 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 1991

Relation to Junction	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Nonjunction	829	58.88%	2,081	69.62%	2,910	66.18%
Intersection	410	29.12	571	19.10	981	22.31
Intersection related	77	5.47	101	3.38	178	4.05
Interchange area	15	1.07	88	2.94	103	2.34
Driveway/alley, etc.	43	3.05	67	2.24	110	2.50
Entrance/exit ramp	17	1.21	55	1.84	72	1.64
Rail grade crossing	14	0.99	14	0.47	28	0.64
In crossover	3	0.21	10	0.33	13	0.30
Unknown	0	0.00	2	0.07	2	0.05
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 cases of unknown power unit type are excluded from this table.

In 1991, a total of 981 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.

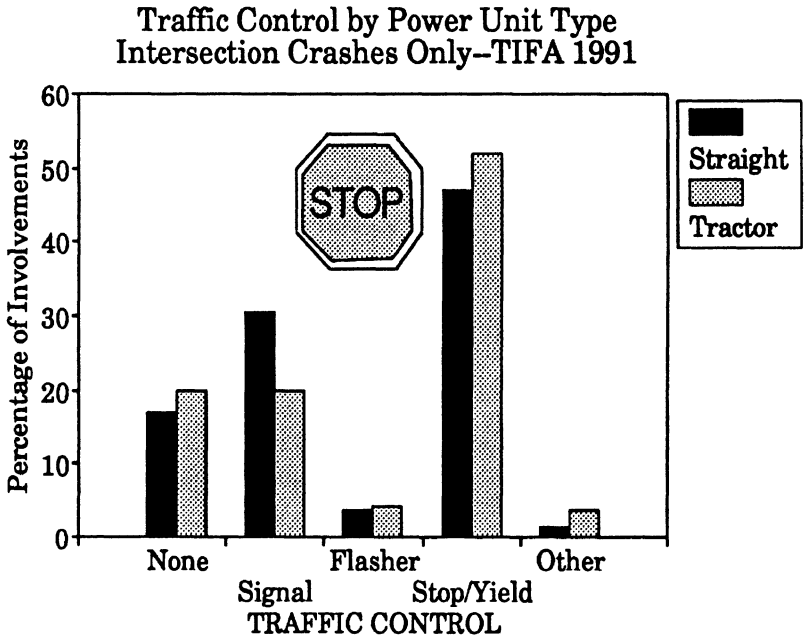


Figure 3-12

TABLE 3-12
Traffic Control at Intersection Crashes by Power Unit Type
TIFA 1991

Traffic Control	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
None	70	17.07%	114	19.96%	184	18.76%
Automated traffic signal	126	30.73	114	19.96	240	24.46
Flasher/other signal	15	3.66	25	4.38	40	4.08
Stop or yield sign	193	47.07	297	52.01	490	49.95
Warning/other sign	6	1.46	21	3.68	27	2.75
TOTAL	410	100.00%	571	100.00%	981	100.00%

NOTE: The 1 case of unknown power unit type is 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: 60% for tractors and 52% for straight trucks. A higher proportion of tractor involvements (15%) than straight-truck involvements (6%) 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.

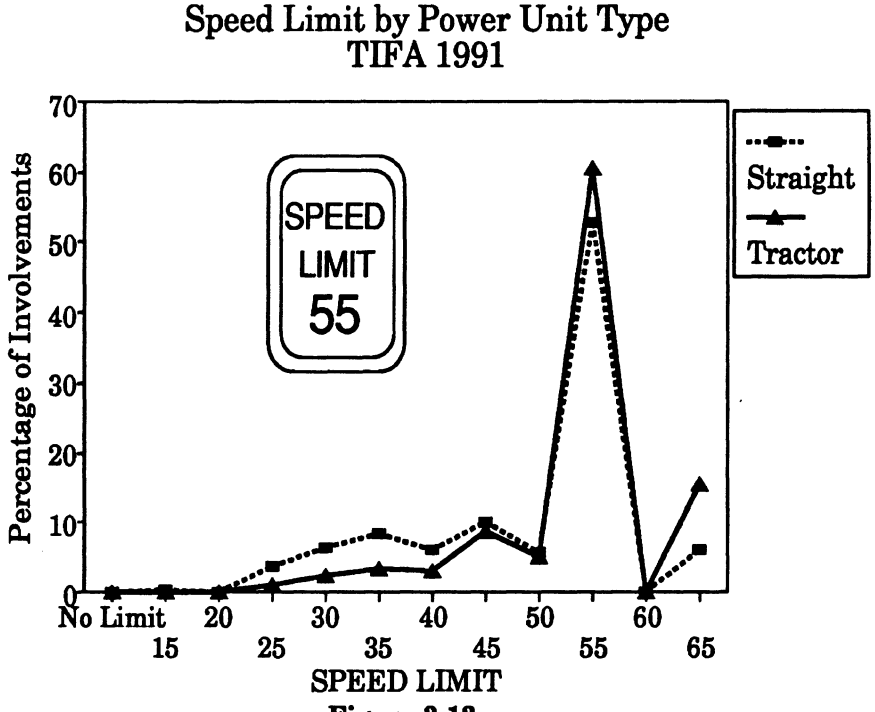


Figure 3-13

TABLE 3-13
Speed Limit by Power Unit Type
TIFA 1991

Speed Limit	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
No statutory limit	0	0.00%	1	0.03%	1	0.02%
15 mph	5	0.36	2	0.07	7	0.16
20 mph	2	0.14	4	0.13	6	0.14
25 mph	53	3.76	27	0.90	80	1.82
30 mph	90	6.39	66	2.21	156	3.55
35 mph	117	8.31	96	3.21	213	4.84
40 mph	84	5.97	94	3.14	178	4.05
45 mph	138	9.80	260	8.70	398	9.05
50 mph	79	5.61	152	5.09	231	5.25
55 mph	728	51.70	1,793	59.99	2,521	57.33
60 mph	0	0.00	3	0.10	3	0.07
65 mph	83	5.89	464	15.52	547	12.44
Unknown	29	2.06	27	0.90	56	1.27
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 noncollisions, collisions with fixed objects, and collisions with nonfixed objects. All of the noncollisions, 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 nonfixed objects, such as a motor vehicle in transport or a pedestrian, are represented separately here. The remaining nonfixed 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 1991 were collisions with another motor vehicle in transport. These collisions accounted for 76% of the straight-truck and 77% of the tractor involvements. The remaining distributions for first harmful event are also very similar for tractors and straight trucks.

First Harmful Event by Power Unit Type
TIFA 1991

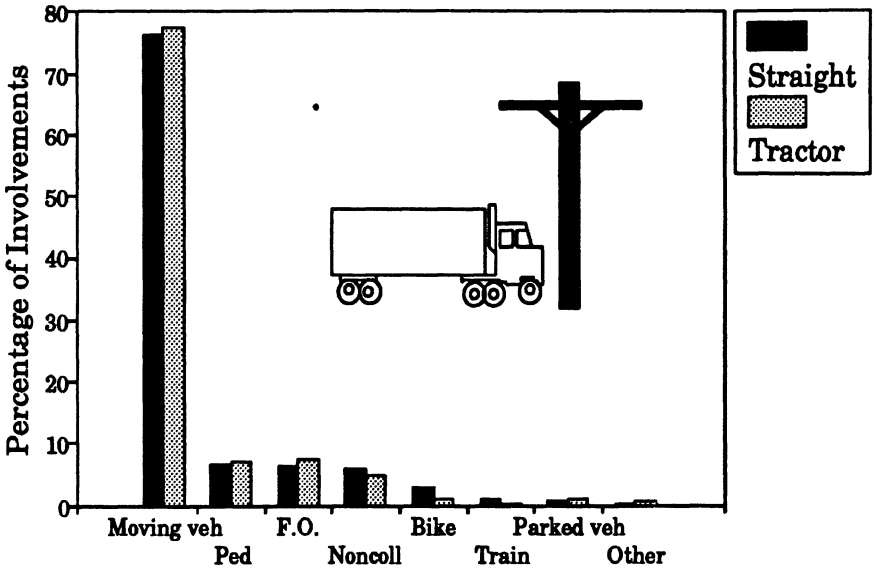


Figure 3-14

TABLE 3-14
First Harmful Event by Power Unit Type
TIFA 1991

Collision with:	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Pedestrian	95	6.75%	207	6.93%	302	6.87%
Pedalcyclist	38	2.70	34	1.14	72	1.64
Train	12	0.85	14	0.47	26	0.59
Animal	2	0.14	7	0.23	9	0.20
Moving vehicle	1,075	76.35	2,316	77.48	3,391	77.12
Parked vehicle	9	0.64	28	0.94	37	0.84
Other nonfixed object	3	0.21	11	0.37	14	0.32
Fixed object	92	6.53	225	7.53	317	7.21
Noncollision	82	5.82	147	4.92	229	5.21
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 cases of unknown power unit type are excluded from this table.

A total of 3,391 of the fatal accidents involving large trucks in 1991 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 (41%), followed by head-ons (30%), and rear-end collisions (23%). 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.

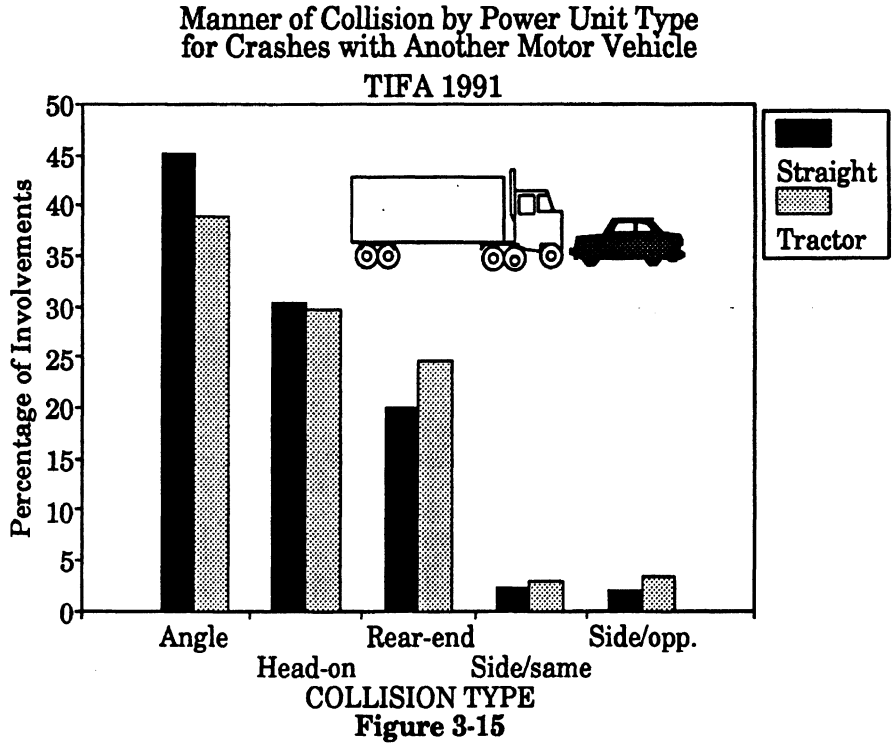


Figure 3-15

TABLE 3–15
Manner of Collision by Power Unit Type
for Crashes with Another Motor Vehicle
TIFA 1991

Manner of Collision	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Rear-end	215	19.98%	569	24.57%	784	23.11%
Head-on	328	30.48	685	29.58	1,013	29.86
Angle	486	45.17	901	38.90	1,387	40.89
Sideswipe, same dir.	23	2.14	70	3.02	93	2.74
Sideswipe, opp. dir.	22	2.04	80	3.45	102	3.01
Unknown	1	0.09	11	0.47	12	0.35
TOTAL	1,075	100.00%	2,316	100.00%	3,391	100.00%

NOTE: The 4 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 1991. In two-thirds of the total large-truck involvements, the truck was coded as the striking vehicle. However, 34% of the striking cases were head-on collisions (meaning both vehicles were coded as striking), and 21% represented single vehicle crashes other than collisions with pedestrians or bicyclists. In the remaining multivehicle crashes, the truck was only slightly more likely to be the striking vehicle as the struck vehicle. 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.

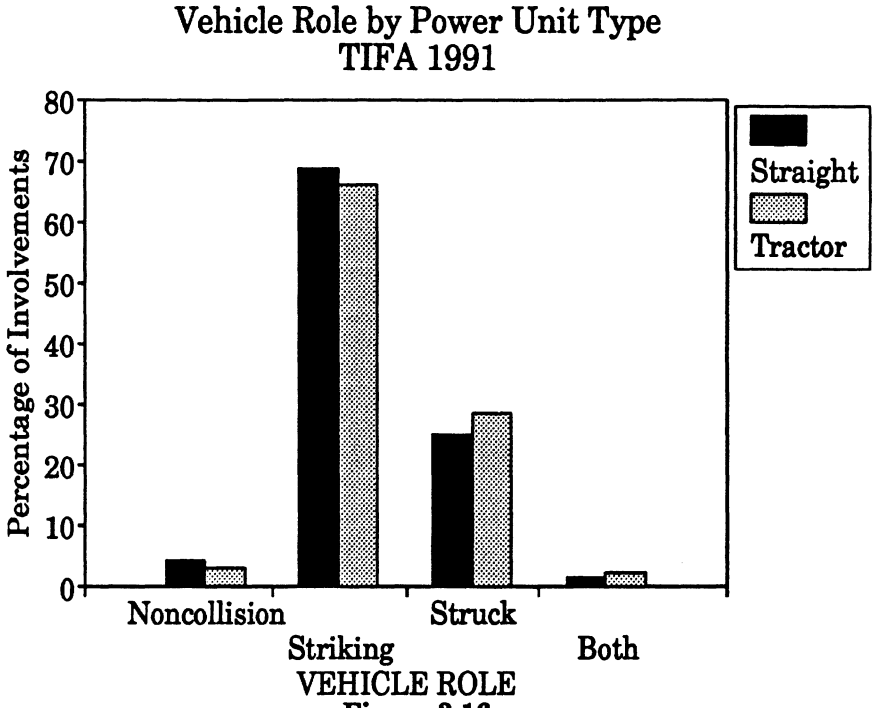


Figure 3-16

TABLE 3-16
Vehicle Role by Power Unit Type
TIFA 1991

Vehicle Role	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Noncollision	60	4.26%	90	3.01%	150	3.41%
Striking	971	68.96	1,974	66.04	2,945	66.98
Struck	353	25.07	856	28.64	1,209	27.50
Both	23	1.63	65	2.17	88	2.00
Unknown	1	0.07	4	0.13	5	0.11
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 1991 fatal involvements, the distribution of both first and subsequent event rollovers is virtually identical for straight trucks and tractors.

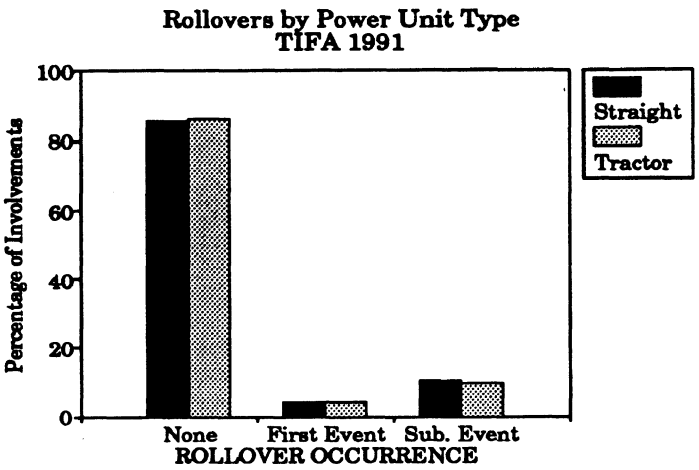


Figure 3-17

TABLE 3-17
Occurrence of Rollovers by Power Unit Type
TIFA 1991

Rollover	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
None	1,207	85.72%	2,571	86.02%	3,778	85.92%
First Event	58	4.12	131	4.38	189	4.30
Subsequent Event	143	10.16	287	9.60	430	9.78
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 cases of unknown power unit type are excluded from this table.

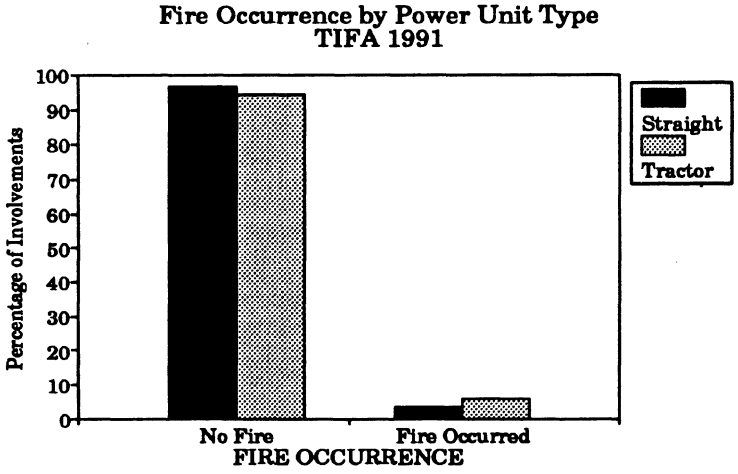


Figure 3-18

Another variable indicates whether a fire occurred on the vehicle during the accident. There was a fire on 3.6% of the straight trucks and 5.8% of the tractors involved in fatal accidents in 1991.

TABLE 3-18
Fire Occurrence by Power Unit Type
TIFA 1991

Fire	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
No Fire	1,358	96.45%	2,817	94.25%	4,175	94.95%
Fire Occurred	50	3.55	172	5.75	222	5.05
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 1991. 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, over 52% of the straight-truck drivers were 35 or younger, while 62% of the tractor drivers were over 35.

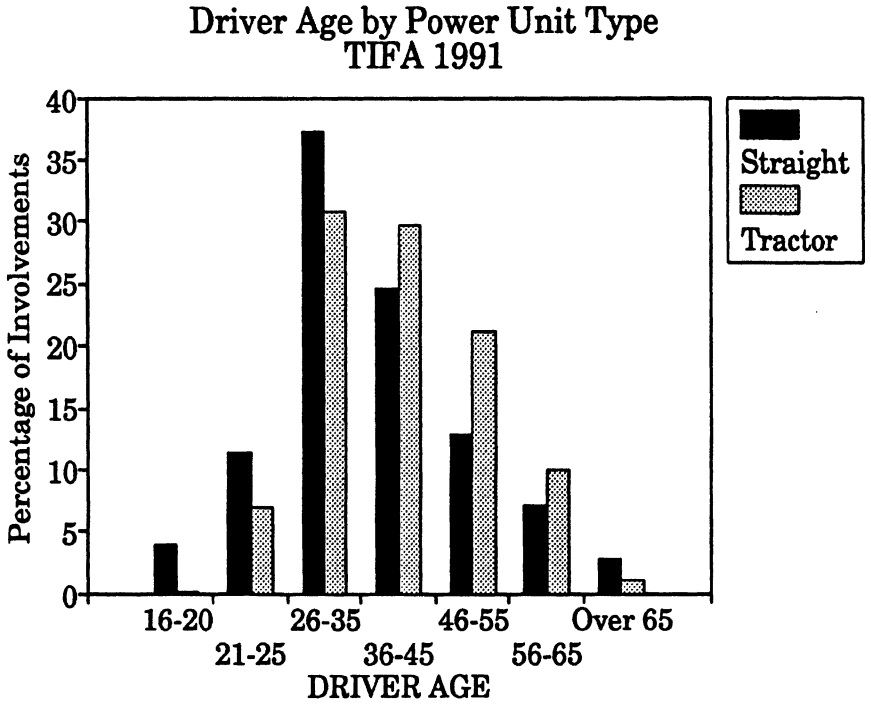


Figure 3-19

TABLE 3-19
Age of Truck Driver by Power Unit Type
TIFA 1991

Driver Age	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
16–20	54	3.84%	7	0.23%	61	1.39%
21–25	157	11.15	207	6.93	364	8.28
26–35	513	36.43	899	30.08	1,412	32.11
36–45	340	24.15	871	29.14	1,211	27.54
46–55	178	12.64	619	20.71	797	18.13
56–65	100	7.10	291	9.74	391	8.89
Over 65	38	2.70	31	1.04	69	1.57
Unknown	28	1.99	64	2.14	92	2.09
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 1991

Driver Gender	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Male	1,355	96.24%	2,888	96.62%	4,243	96.50%
Female	25	1.78	48	1.61	73	1.66
Unknown	28	1.99	53	1.77	81	1.84
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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, 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 56% of the tractor drivers were using some kind of restraint device, compared to only 43% of the straight-truck drivers. Note that the unknown cases are included in Figure 3-21.

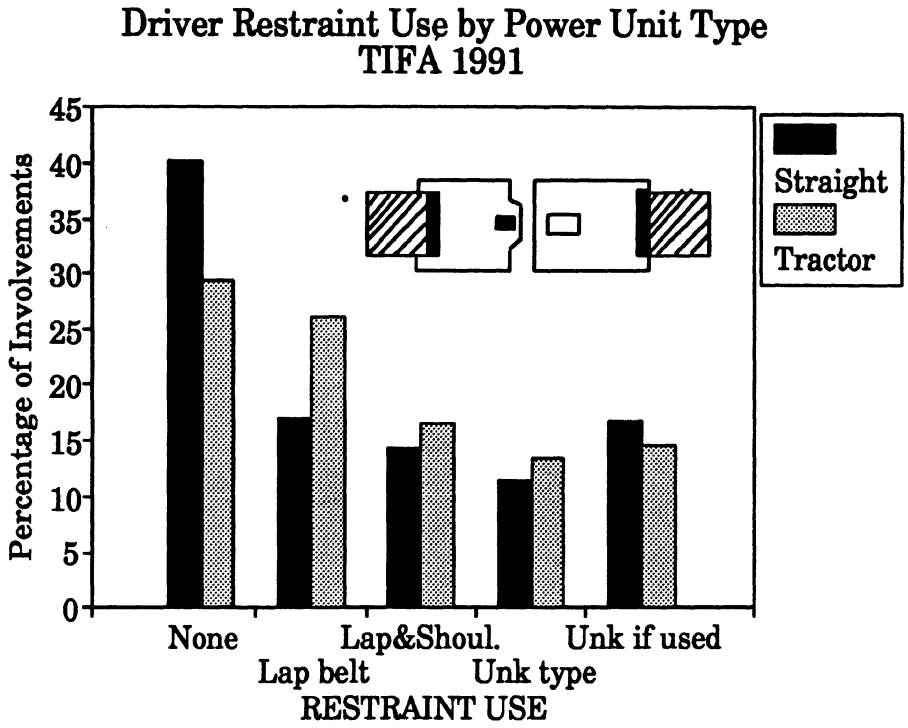


Figure 3-21

TABLE 3-21
Truck Driver Restraint Use by Power Unit Type
TIFA 1991

Driver Restraint Use	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
None used	567	40.27%	876	29.31%	1,443	32.82%
Lap belt	241	17.12	780	26.10	1,021	23.22
Lap and shoulder	201	14.28	499	16.69	700	15.92
Restraint used, type unknown	163	11.58	401	13.42	564	12.83
Unknown if used	236	16.76	433	14.49	669	15.21
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 the same for drivers of tractors and of straight-trucks.

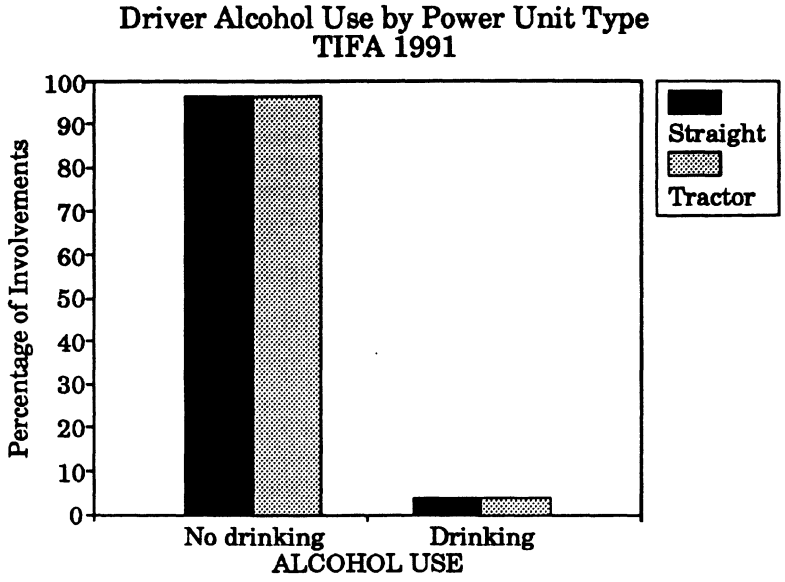


Figure 3-22

TABLE 3-22
Truck Driver Alcohol Use by Power Unit Type
TIFA 1991

Alcohol Use	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
No drinking	1,356	96.31%	2,878	96.29%	4,234	96.29%
Drinking	52	3.69	111	3.71	163	3.71
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 1991, the truck driver was totally ejected in 3.6% of the fatal involvements and partially ejected in just over 1%. The distributions were very similar for straight trucks and tractors.

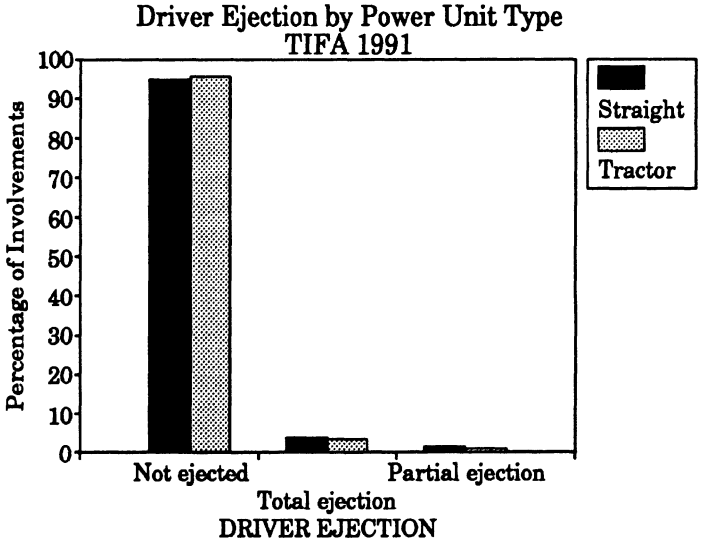


Figure 3-23

TABLE 3-23
Truck Driver Ejection by Power Unit Type
TIFA 1991

Driver Ejection	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Not ejected	1,302	92.47%	2,823	94.45%	4,125	93.81%
Totally ejected	56	3.98	104	3.48	160	3.64
Partially ejected	22	1.56	30	1.00	52	1.18
Unknown	28	1.99	32	1.07	60	1.36
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 cases of unknown power unit type are excluded from this table.

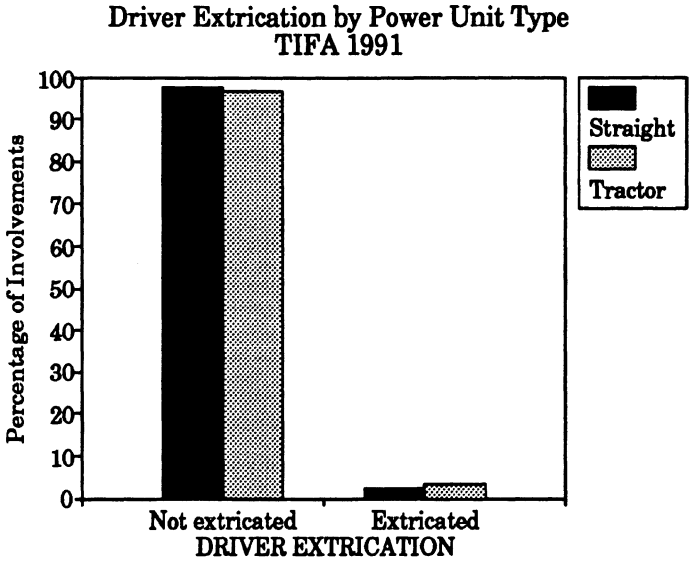


Figure 3-24

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 (3.3%) than among straight-truck involvements (2.3%).

TABLE 3-24
Truck Driver Extrication by Power Unit Type
TIFA 1991

Driver Extrication	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Not extricated	1,343	95.38%	2,838	94.95%	4,181	95.09%
Extricated	33	2.34	99	3.31	132	3.00
Unknown	32	2.27	52	1.74	84	1.91
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 12.5% of the cases. The injury severity distributions for straight-truck and tractor drivers were similar in 1991, with tractor drivers slightly more likely to be uninjured in the accident.

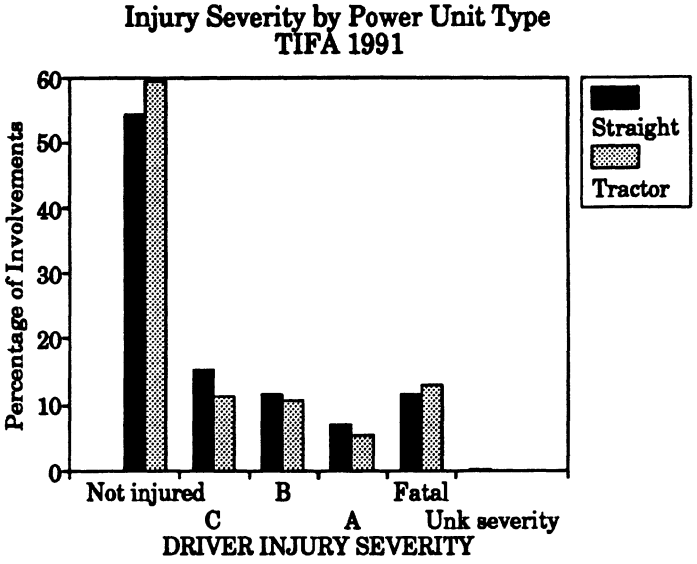


Figure 3-25

TABLE 3-25
Truck Driver Injury Severity by Power Unit Type
TIFA 1991

Injury Severity	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Not injured	750	53.27%	1,747	58.45%	2,497	56.79%
C injury	212	15.06	333	11.14	545	12.39
B injury	162	11.51	317	10.61	479	10.89
A injury	95	6.75	161	5.39	256	5.82
Fatal injury	160	11.36	389	13.01	549	12.49
Injured, severity unknown	3	0.21	0	0.00	3	0.07
Unknown if injured	26	1.85	42	1.41	68	1.55
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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.

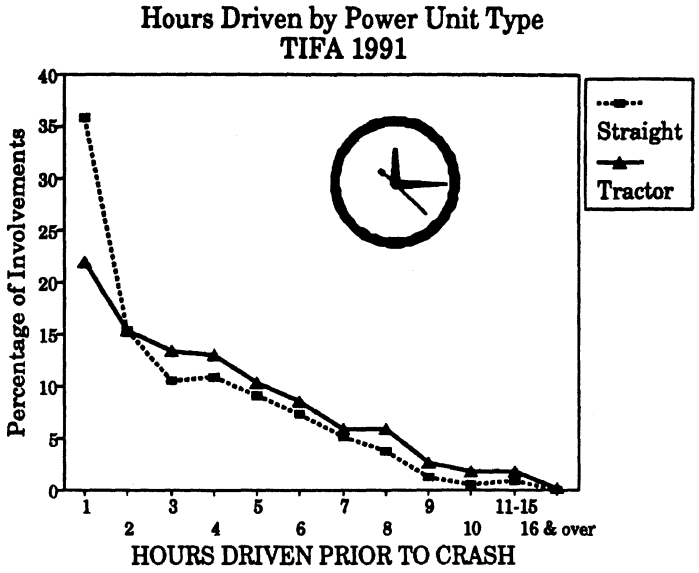


Figure 3-26

Even though a large proportion of cases (14.5%) 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, 35.8% of the straight-truck drivers had been driving for only an hour, compared with 21.8% of the tractor drivers. In contrast, just 6.1% of the straight-truck drivers had been on duty for eight or more hours prior to the crash, compared with 11.9% 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 1991

Hours Driven	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
1	419	29.76%	566	18.94%	985	22.40%
2	179	12.71	396	13.25	575	13.08
3	122	8.66	344	11.51	466	10.60
4	128	9.09	338	11.31	466	10.60
5	105	7.46	267	8.93	372	8.46
6	85	6.04	219	7.33	304	6.91
7	60	4.26	149	4.98	209	4.75
8	44	3.13	153	5.12	197	4.48
9	13	0.92	67	2.24	80	1.82
10	5	0.36	43	1.44	48	1.09
11–15	10	0.71	43	1.44	53	1.21
16 & over	0	0.00	3	0.10	3	0.07
N/A	9	0.64	18	0.60	27	0.61
Unknown	229	16.26	383	12.81	612	13.92
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 speeding/tailgating violations (7.0%), passing/lane change violations (6.6%), and right-of-way/traffic control violations (5.1%). 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.

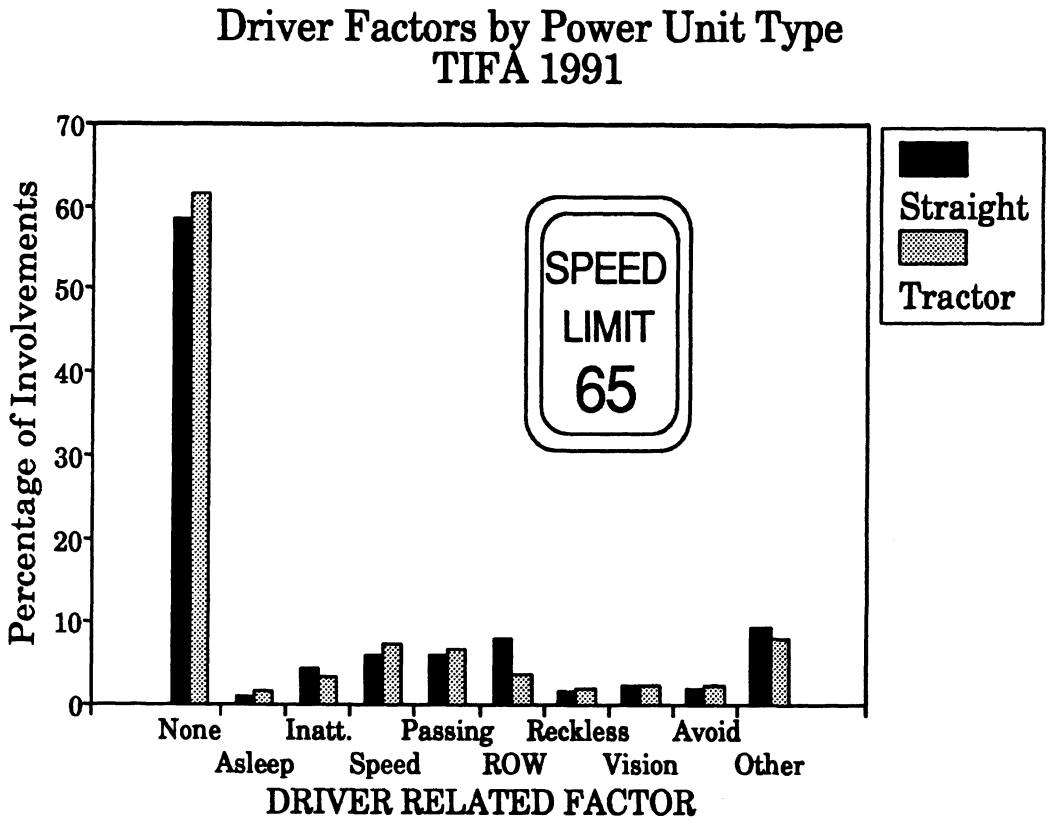


Figure 3-27

TABLE 3-27
Truck Driver Related Factors by Power Unit Type
TIFA 1991

Driver Factor	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
None	815	57.88%	1,830	61.22%	2,645	60.15%
Asleep/Ill	16	1.14	50	1.67	66	1.50
Drugs	2	0.14	5	0.17	7	0.16
Inattentive	60	4.26	100	3.35	160	3.64
Speed violations/ tailgating	87	6.18	221	7.39	308	7.00
Passing/lane change violations	86	6.11	203	6.79	289	6.57
Right-of-way/traffic control violations	112	7.95	114	3.81	226	5.14
Reckless driving	24	1.70	62	2.07	86	1.96
Vision obscured	33	2.34	68	2.28	101	2.30
Avoiding/swerving	29	2.06	65	2.17	94	2.14
Other	130	9.23	244	8.16	374	8.51
Unknown	14	0.99	27	0.90	41	0.93
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: Up to three factors reported for each case by FARS. This table based on first response for each case. The 7 cases of unknown power unit type are excluded from this table.

Vehicle Characteristics

This overview section of TIFA 1991 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 1991 showed great differences in carrier type according to the type of power unit. Of the known cases of carrier type, 46% of the straight trucks fell into the intrastate private category, while 64% of the tractors were in the interstate authorized class. Over 84% of the tractors were owned by interstate companies, compared with only 35% of the straight trucks. Almost 72% of the straight trucks were operated by private carriers, compared with only 26% of the tractors.

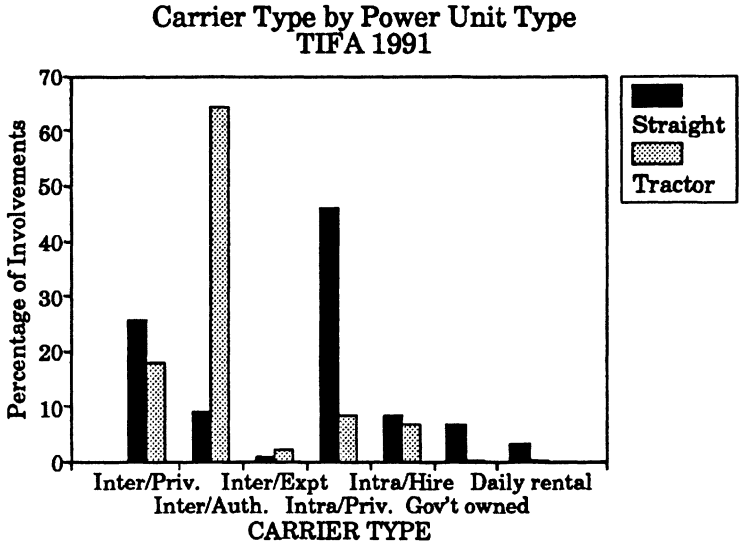


Figure 3-28

TABLE 3-28
Carrier Type by Power Unit Type
TIFA 1991

Carrier Type	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Interstate private	331	23.51%	502	16.79%	833	18.94%
Interstate authorized	115	8.17	1,813	60.66	1,928	43.85
Interstate exempt	11	0.78	66	2.21	77	1.75
Intrastate private	594	42.19	238	7.96	832	18.92
Intrastate for hire	109	7.74	192	6.42	301	6.85
Government owned	86	6.11	7	0.23	93	2.12
Daily rental	41	2.91	7	0.23	48	1.09
Unknown	121	8.59	164	5.49	285	6.48
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 cases of unknown power unit type are excluded from this table.

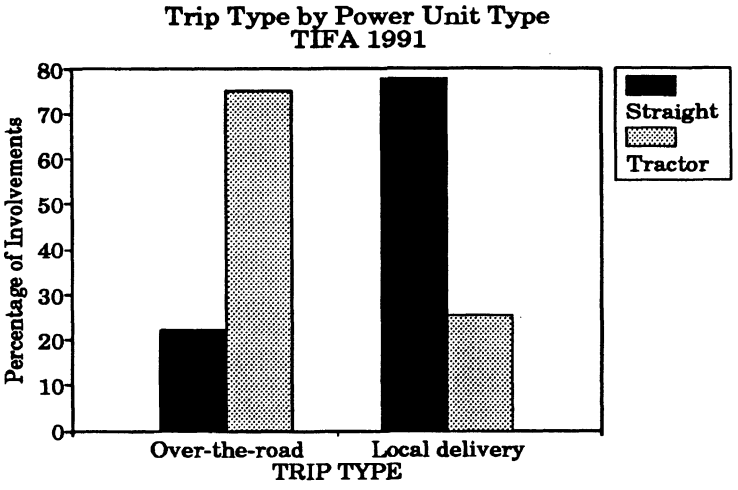


Figure 3-29

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 deliveries 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 1991

Trip Type	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Over-the-road	294	20.88%	2,139	71.56%	2,433	55.33%
Local delivery	1,031	73.22	723	24.19	1,754	39.89
Unknown	83	5.89	127	4.25	210	4.78
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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. More than 32% of the straight trucks and 27% 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 (18% of all cases), general freight (13%), liquids in bulk (6%), and refrigerated food (4%). For tractors, the cargo type distribution included general freight (26%), refrigerated food (10%), solids in bulk (8%), liquids in bulk (5%), and logs and lumber (5%). Cases with unknown cargo have been omitted from the pie graphs.

TABLE 3-30
Type of Cargo by Power Unit Type
TIFA 1991

Cargo Type	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Empty	462	32.81%	828	27.70%	1,260	28.66%
General freight	186	13.21	779	26.06	964	21.92
Household goods	22	1.56	29	0.97	50	1.14
Building materials	21	1.49	52	1.74	73	1.66
Metal	5	0.36	138	4.62	139	3.16
Heavy machinery	35	2.49	39	1.30	73	1.66
Large objects	25	1.78	61	2.04	85	1.93
Motor vehicles	25	1.78	8	0.27	33	0.75
Piggyback/towaway	17	1.21	18	0.60	35	0.80
Gases in bulk	13	0.92	8	0.27	21	0.48
Solids in bulk	251	17.83	235	7.86	470	10.69
Liquids in bulk	83	5.89	148	4.95	227	5.16
Explosives	0	0.00	2	0.07	2	0.05
Logs/lumber	31	2.20	146	4.88	170	3.87
Refrigerated food	54	3.84	286	9.57	338	7.69
Mobile home	0	0.00	8	0.27	8	0.18
Farm products	39	2.77	80	2.68	120	2.73
Live animals	4	0.28	38	1.27	42	0.96
Other	68	4.83	9	0.30	77	1.75
Unknown	67	4.76	77	2.58	73	1.66
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 cases of unknown power unit type are excluded from this table.

Cargo Type for Straight Trucks
TIFA 1991

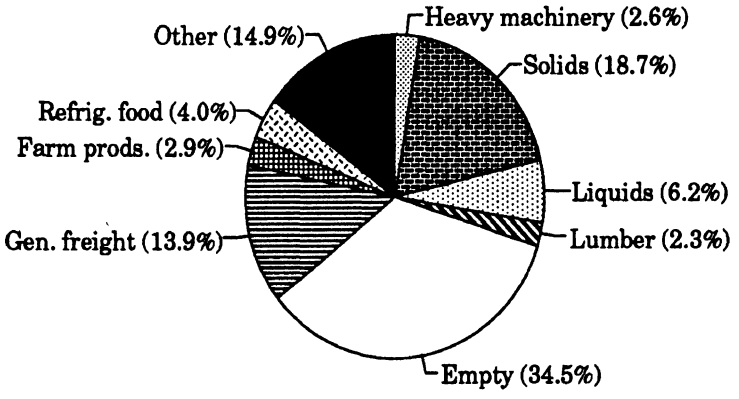


Figure 3-30a

Cargo Type for Tractors
TIFA 1991

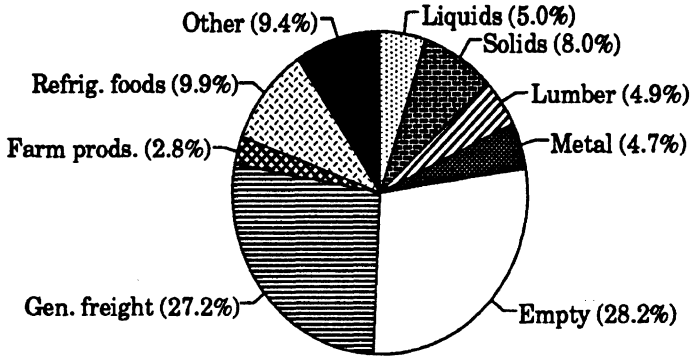


Figure 3-30b

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 1991 had conventional cabs. Straight trucks in particular were more likely to have conventional cabs; over 80% of them were in that category.

Cab Style by Power Unit Type
TIFA 1991

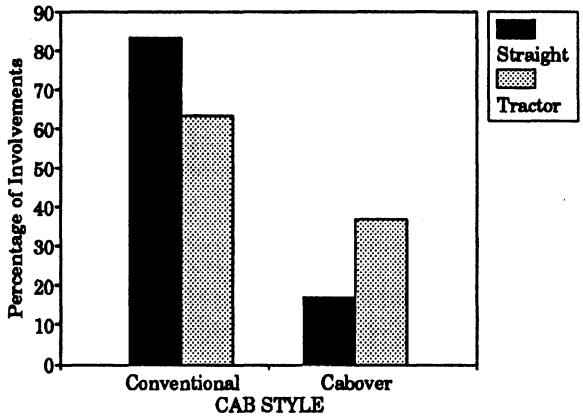


Figure 3-31

TABLE 3-31
Cab Style by Power Unit Type
TIFA 1991

Cab Style	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Conventional	1,130	80.26%	1,865	62.40%	2,995	68.11%
Cabover/Cab-forward	230	16.34	1088	36.40	1,318	29.97
Unknown	48	3.41	36	1.20	84	1.91
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 83% of the straight trucks were not hauling a trailer, while 89% of the tractors were hauling a single trailer. The tractor with three trailing units was not a triple (three cargo units), it was a heavy-equipment hauler with a jeep, lowboy, booster dolly combination.

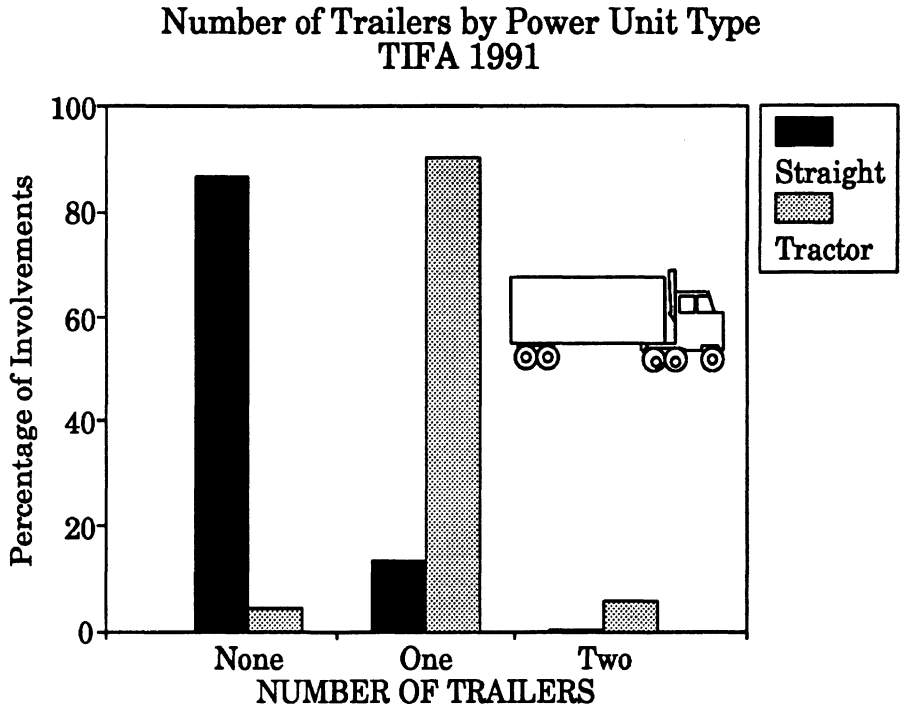


Figure 3-32

TABLE 3-32
Number of Trailers by Power Unit Type
TIFA 1991

Number of Trailers	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
No trailers	1,178	83.66%	127	4.25%	1,305	29.68%
One trailer	180	12.78	2,671	89.36	2,851	64.84
Two trailers	3	0.21	170	5.69	173	3.93
Three trailers	0	0.00	1	0.03	1	0.02
Unknown	47	3.34	20	0.67	67	1.52
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 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 98% of the involved tractors used diesel fuel, while the straight trucks were split between diesel and gasoline, 70% and 25%, respectively.

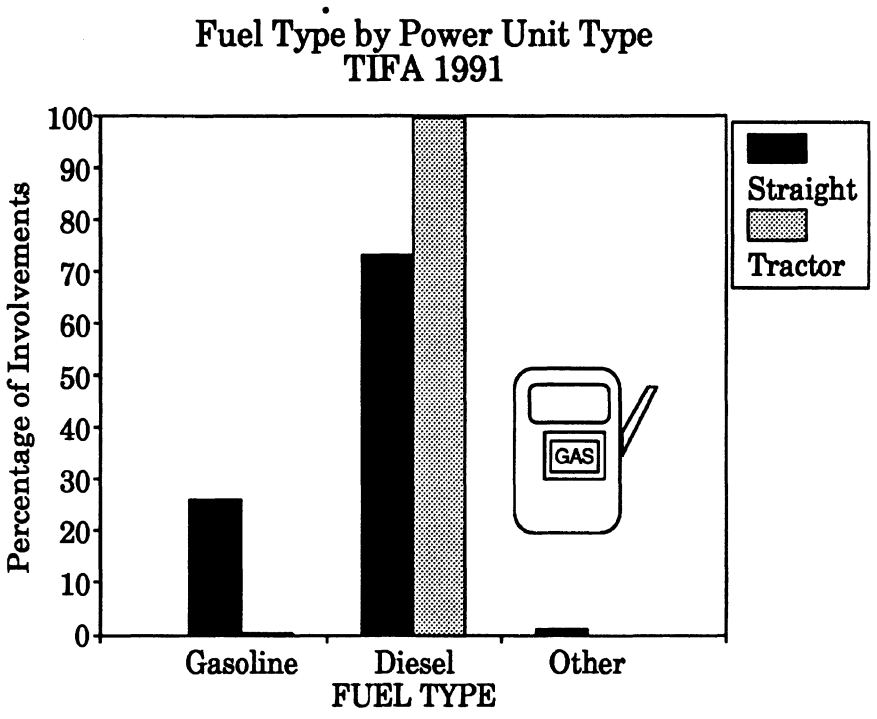


Figure 3-33

TABLE 3-33
Fuel Type by Power Unit Type
TIFA 1991

Fuel Type	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Gasoline	351	24.93%	9	0.30%	360	8.19%
Diesel	989	70.24	2,939	98.33	3,928	89.33
Other	14	0.99	0	0.00	14	0.32
Unknown	54	3.84	41	1.37	95	2.16
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 cases of unknown power unit type are excluded from this table.

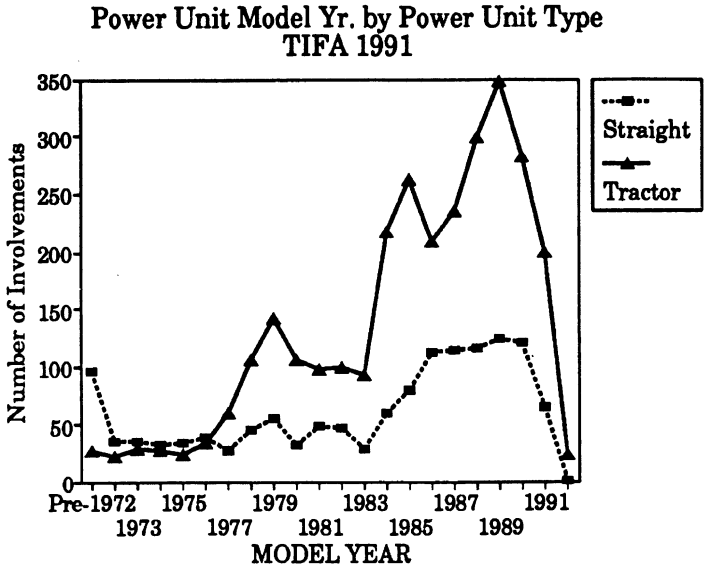


Figure 3-34

The line graph on the left depicts the number of fatal involvements in 1991 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, 70% of the tractors were from model years 1984-1992, compared to 58% of the straight trucks. On the other hand, 17% of the straight trucks dated from 1975 and earlier, compared to 4% 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 1991

Model Year	Straight Truck		Tractor		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
1952–1971	97	6.89%	27	0.90%	124	2.82%
1972	36	2.56	23	0.77	59	1.34
1973	36	2.56	30	1.00	66	1.50
1974	33	2.34	28	0.94	61	1.39
1975	34	2.41	24	0.80	58	1.32
1976	40	2.84	35	1.17	75	1.71
1977	27	1.92	61	2.04	88	2.00
1978	45	3.20	105	3.51	150	3.41
1979	56	3.98	142	4.75	198	4.50
1980	33	2.34	107	3.58	140	3.18
1981	48	3.41	98	3.28	146	3.32
1982	47	3.34	99	3.31	146	3.32
1983	30	2.13	93	3.11	123	2.80
1984	61	4.33	217	7.26	278	6.32
1985	79	5.61	262	8.77	341	7.76
1986	113	8.03	208	6.96	321	7.30
1987	114	8.10	234	7.83	348	7.91
1988	116	8.24	298	9.97	414	9.42
1989	124	8.81	347	11.61	471	10.71
1990	121	8.59	282	9.43	403	9.17
1991	65	4.62	198	6.62	263	5.98
1992	2	0.14	25	0.84	27	0.61
Unknown	51	3.62	46	1.54	97	2.21
TOTAL	1,408	100.00%	2,989	100.00%	4,397	100.00%

NOTE: The 7 cases of unknown power unit type are excluded from this table.

STRAIGHT-TRUCK FATAL ACCIDENT INVOLVEMENTS IN 1991

Distributions that characterize fatal accident involvements of straight trucks in 1991 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 over 96% of the 1,408 straight trucks in the TIFA 1991 file. Of the known cases, 26% were dumps, 24% vans, 15% flatbeds (including 6% flatbeds, 6% flatbeds with sides, 3% flatbeds with mounted equipment), 8% refuse, and 7% 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, 81% 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.

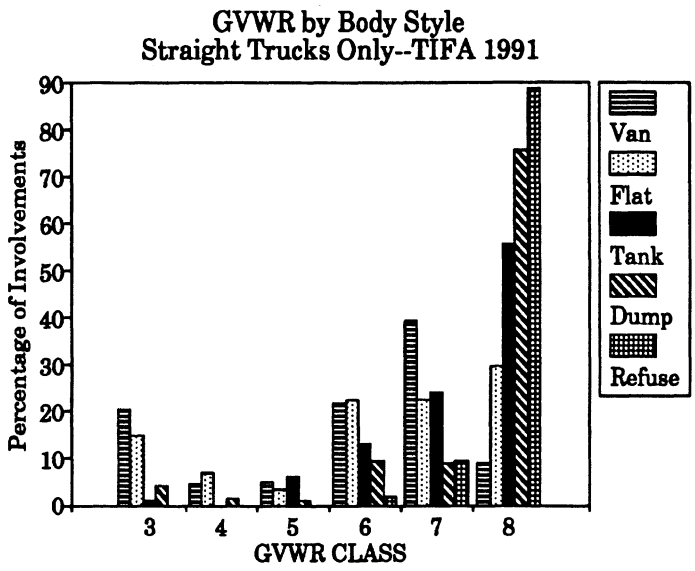


Figure 4-1

TABLE 4-1
GVWR by Body Style
Straight Trucks Only
TIFA 1991

GVWR Class/ Weight Range	BODY STYLE (Frequencies and Column Percents)							
	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
3 10,001–14,000	63 18.48	26 12.38	1 0.95	13 3.61	0 0.00	42 18.10	0 0.00	145 10.30
4 14,001–16,000	14 4.11	12 5.71	0 0.00	4 1.11	0 0.00	18 7.76	1 2.08	49 3.48
5 16,001–19,500	15 4.40	6 2.86	6 5.71	3 0.83	0 0.00	9 3.88	0 0.00	39 2.77
6 19,501–26,000	67 19.65	39 18.57	13 12.38	30 8.33	2 1.79	21 9.05	0 0.00	172 12.22
7 26,001–33,000	122 35.78	39 18.57	24 22.86	29 8.06	10 8.93	21 9.05	0 0.00	245 17.40
8 33,001+	28 8.21	52 24.76	55 52.38	246 68.33	94 83.93	97 41.81	0 0.00	572 40.63
Unknown	32 9.38	36 17.14	6 5.71	35 9.72	6 5.36	24 10.34	47 97.92	186 13.21
TOTAL	341 100.00	210 100.00	105 100.00	360 100.00	112 100.00	232 100.00	48 100.00	1,408 100.00

TABLE 4-2
Gross Vehicle Weight by Body Style
Straight Trucks Only
TIFA 1991

Gross Weight (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
< 20,000	221 64.81	132 62.86	19 18.10	93 25.83	2 1.79	106 45.69	0 0.00	573 40.70
20,000	35 10.26	36 17.14	30 28.57	110 30.56	23 20.54	34 14.66	0 0.00	268 19.03
30,000	17 4.99	8 3.81	15 14.29	46 12.78	38 33.93	27 11.64	0 0.00	151 10.72
40,000	6 1.76	6 2.86	4 3.81	34 9.44	11 9.82	19 8.19	0 0.00	80 5.68
50,000	0 0.00	5 2.38	7 6.67	12 3.33	12 10.71	3 1.29	0 0.00	39 2.77
60,000	0 0.00	2 0.95	4 3.81	16 4.44	4 3.57	11 4.74	0 0.00	37 2.63
70,000	0 0.00	6 2.86	6 5.71	22 6.11	0 0.00	7 3.02	0 0.00	41 2.91
80,000+	0 0.00	0 0.00	10 9.52	11 3.06	2 1.79	4 1.72	0 0.00	27 1.92
Unknown	62 18.18	15 7.14	10 9.52	16 4.44	20 17.86	21 9.05	48 100.00	192 13.64
TOTAL	341 100.00	210 100.00	105 100.00	360 100.00	112 100.00	232 100.00	48 100.00	1,408 100.00

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 1991 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 14% of the straight-truck cases. For the known cases, 69% were operating at a gross weight of under 30,000 pounds, and 82% 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 26% of the dumps.

On the following page, the gross vehicle weights of the known cases are depicted in a cumulative percentage diagram. 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 71% of the tanks, 82% of the dumps, and all of the vans were operating at a gross weight under 50,000 pounds.

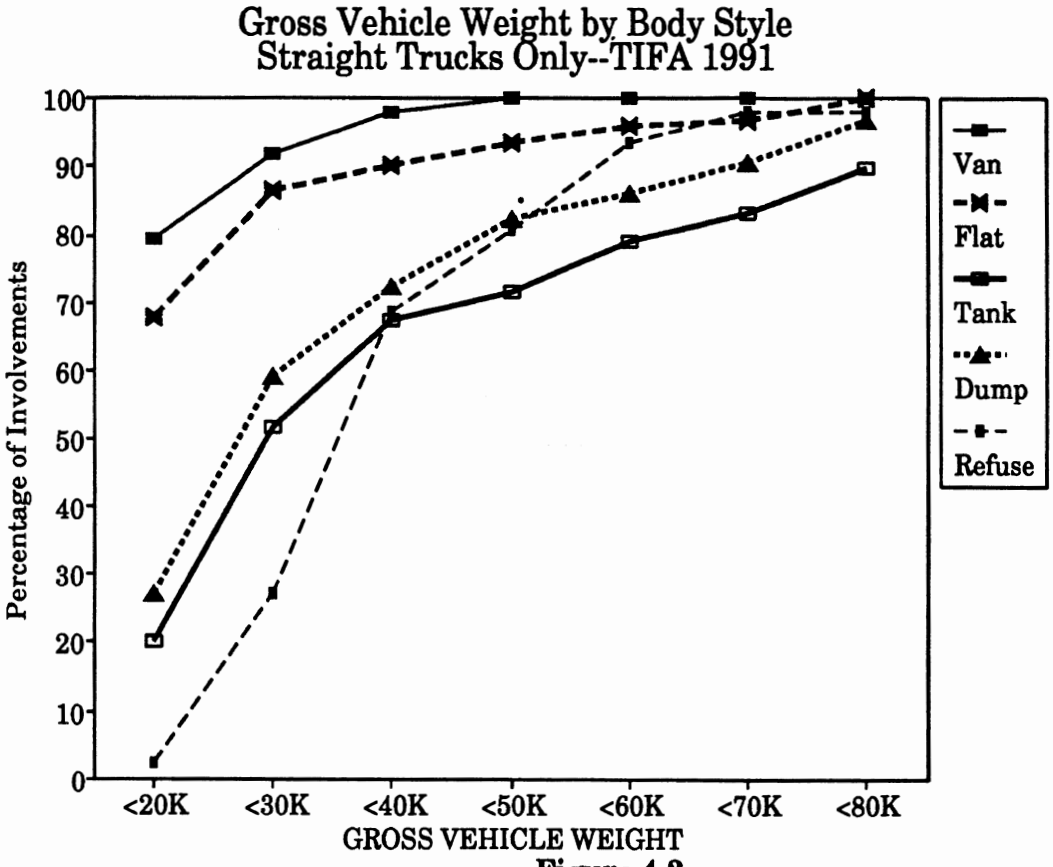


Figure 4-2

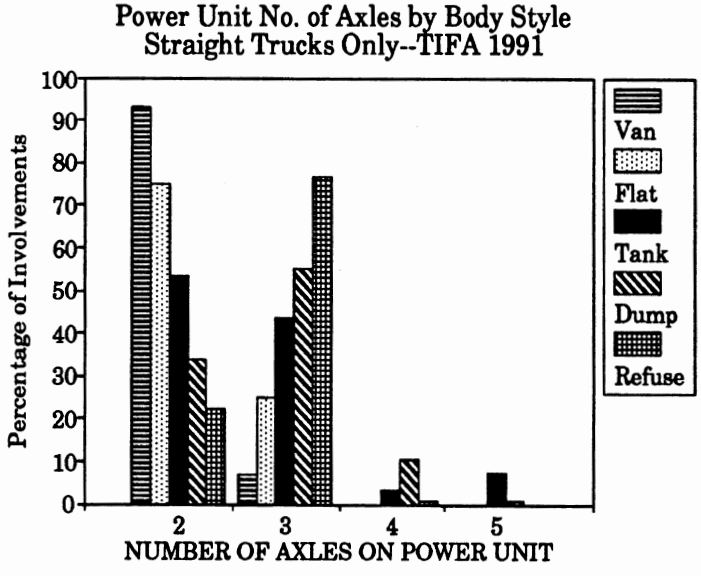


Figure 4-3

The number of axles on the power unit for the 1991 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 five axles were relatively uncommon but comprised almost 11% of the dumps and over 9% of the tanks.

TABLE 4-3
Number of Axles on Power Unit by Body Style
Straight Trucks Only
TIFA 1991

Power Unit No. of Axles (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
2	317 92.96	157 74.76	52 49.52	121 33.61	25 22.32	138 59.48	1 2.08	811 57.60
3	24 7.04	52 24.76	43 40.95	197 54.72	86 76.79	85 36.64	0 0.00	487 34.59
4	0 0.00	0 0.00	3 2.86	38 10.56	1 0.89	8 3.45	0 0.00	50 3.55
5	0 0.00	0 0.00	7 6.67	2 0.56	0 0.00	1 0.43	0 0.00	10 0.71
Unknown	0 0.00	1 0.48	0 0.00	2 0.56	0 0.00	0 0.00	47 97.92	50 3.55
TOTAL	341 100.00	210 100.00	105 100.00	360 100.00	112 100.00	232 100.00	48 100.00	1,408 100.00

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 show the number of axles on the power unit, with possibilities of two, three, four, five, and unknown. The columns list frequencies for trucks with no 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 1,408 straight trucks (736 cases) was a two-axle truck not hauling a trailer. Among the cases of trucks hauling a single trailer, the most common axle configuration (86 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 1991

Power Unit No. of Axles	Number of Trailers/Number of Axles on Trailer									
		One Trailer						Two Trailers	Unknown if Trailer	TOTAL
	No Trailer	1	2	3	4	5	Unk.	2,1		
2	736	24	46	4	0	1	0	0	0	811
3	381	3	86	7	5	1	1	3	0	487
4	48	0	1	0	1	0	0	0	0	50
5	10	0	0	0	0	0	0	0	0	10
Unknown	3	0	0	0	0	0	0	0	47	50
TOTAL	1,178	27	133	11	6	2	1	3	47	1,408

The following table presents the cargo type distributions of the straight trucks according to cargo body style.

TABLE 4-5
Cargo Type by Body Style
Straight Trucks Only
TIFA 1991

Cargo Type (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Empty	73 21.41	77 36.67	12 11.43	175 48.61	32 28.57	93 40.09	0 0.00	462 32.81
General freight	165 48.39	17 8.10	0 0.00	2 0.56	0 0.00	2 0.86	0 0.00	186 13.21
Household goods	22 6.45	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	22 1.56
Building materials	3 0.88	12 5.71	0 0.00	5 1.39	0 0.00	1 0.43	0 0.00	21 1.49
Metal	0 0.00	5 2.38	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	5 0.36
Heavy machinery	1 0.29	12 5.71	0 0.00	16 4.44	0 0.00	6 2.59	0 0.00	35 2.49
Large objects	3 0.88	12 5.71	0 0.00	7 1.94	0 0.00	3 1.29	0 0.00	25 1.78
Motor vehicles	2 0.59	0 0.00	0 0.00	0 0.00	0 0.00	23 9.91	0 0.00	25 1.78
Piggyback/towaway	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	17 7.33	0 0.00	17 1.21
Gases in bulk	0 0.00	0 0.00	13 12.38	0 0.00	0 0.00	0 0.00	0 0.00	13 0.92
Solids in bulk	1 0.29	24 11.43	0 0.00	120 33.33	76 67.86	30 12.93	0 0.00	251 17.83
Liquids in bulk	0 0.00	0 0.00	80 76.19	0 0.00	0 0.00	3 1.29	0 0.00	83 5.89
Logs/lumber	0 0.00	17 8.10	0 0.00	4 1.11	0 0.00	10 4.31	0 0.00	31 2.20
Refrigerated food	54 15.84	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	54 3.84
Farm products	3 0.88	12 5.71	0 0.00	22 6.11	0 0.00	2 0.86	0 0.00	39 2.77
Live animals	0 0.00	1 0.48	0 0.00	0 0.00	0 0.00	3 1.29	0 0.00	4 0.28
Other	7 2.05	19 9.05	0 0.00	5 1.39	0 0.00	37 15.95	0 0.00	68 4.83
Unknown	7 2.05	2 0.95	0 0.00	4 1.11	4 3.57	2 0.86	48 100.00	67 4.76
TOTAL	341 100.00	210 100.00	105 100.00	360 100.00	112 100.00	232 100.00	48 100.00	1,408 100.00

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 1991

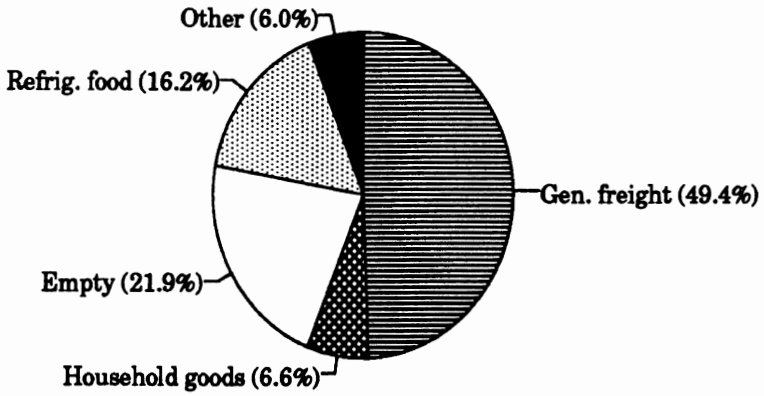


Figure 4-5a

Cargo Type for Flatbed Straight Trucks
TIFA 1991

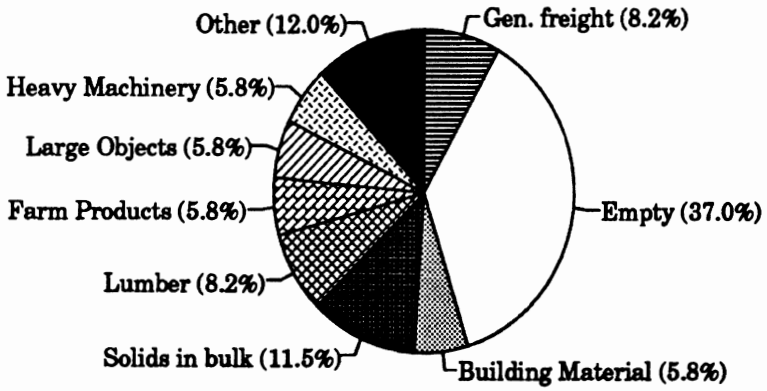


Figure 4-5b

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 (49% of the known cases). Tanks had the highest percentage of interstate authorized carriers (16%). On the other hand, dumps were characterized by the highest proportion of intrastate carriers (69%), and flatbed trucks by the highest percentage of intrastate private carriers (59% of the known cases).

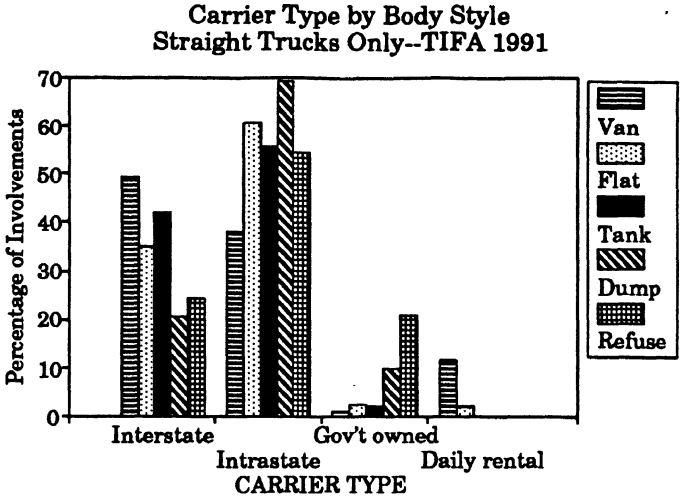


Figure 4-6

TABLE 4-6
Carrier Type by Body Style
Straight Trucks Only
TIFA 1991

Carrier Type (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Interstate private	120 35.19	60 28.57	27 25.71	46 12.78	26 23.21	52 22.41	0 0.00	331 23.51
Interstate authorized	35 10.26	9 4.29	16 15.24	22 6.11	0 0.00	33 14.22	0 0.00	115 8.17
Interstate exempt	2 0.59	1 0.48	0 0.00	1 0.28	0 0.00	7 3.02	0 0.00	11 0.78
Intrastate private	110 32.26	118 56.19	45 42.86	164 45.56	58 51.79	99 42.67	0 0.00	594 42.19
Intrastate for hire	11 3.23	4 1.90	12 11.43	68 18.89	0 0.00	14 6.03	0 0.00	109 7.74
Government owned	3 0.88	5 2.38	2 1.90	33 9.17	22 19.64	21 9.05	0 0.00	86 6.11
Daily rental	37 10.85	4 1.90	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	41 2.91
Unknown	23 6.74	9 4.29	3 2.86	26 7.22	6 5.36	6 2.59	48 100.00	121 8.59
TOTAL	341 100.00	210 100.00	105 100.00	360 100.00	112 100.00	232 100.00	48 100.00	1,408 100.00

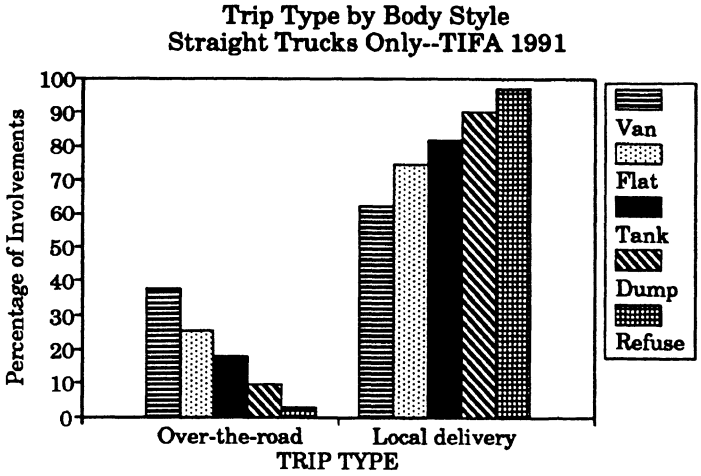


Figure 4-7

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 (38%), followed by flatbeds (26%), tanks (18%), dumps (10%), and refuse trucks (3%).

TABLE 4-7
Trip Type by Body Style
Straight Trucks Only
TIFA 1991

Trip Type (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Over-the-road	125 36.66	53 25.24	19 18.10	34 9.44	3 2.68	60 25.86	0 0.00	294 20.88
Local delivery	204 59.82	153 72.86	86 81.90	316 87.78	104 92.86	168 72.41	0 0.00	1,031 73.22
Unknown	12 3.52	4 1.90	0 0.00	10 2.78	5 4.46	4 1.72	48 100.00	83 5.89
TOTAL	341 100.00	210 100.00	105 100.00	360 100.00	112 100.00	232 100.00	48 100.00	1,408 100.00

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 flatbeds were slightly higher, and for refuse trucks and tanks were much lower. Almost 33% of all the accidents took place on the "other" class of roads, but refuse trucks were overrepresented with 54% of involvements on "other" class roads.

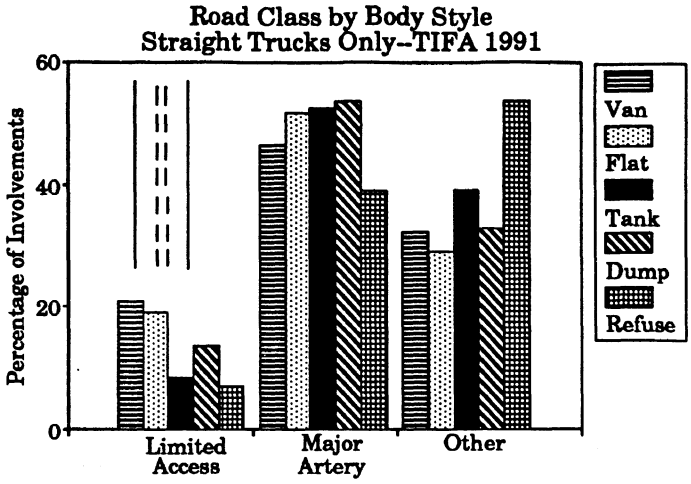


Figure 4-8

TABLE 4-8
Road Class by Body Style
Straight Trucks Only
TIFA 1991

Road Class (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Limited Access	71 20.82	40 19.05	9 8.57	49 13.61	8 7.14	50 21.55	4 8.33	231 16.41
Major Artery	158 46.33	108 51.43	55 52.38	193 53.61	44 39.29	116 50.00	38 79.17	712 50.57
Other	110 32.26	61 29.05	41 39.05	118 32.78	60 53.57	66 28.45	6 12.50	462 32.81
Unknown	2 0.59	1 0.48	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	3 0.21
TOTAL	341 100.00	210 100.00	105 100.00	360 100.00	112 100.00	232 100.00	48 100.00	1,408 100.00

Accidents

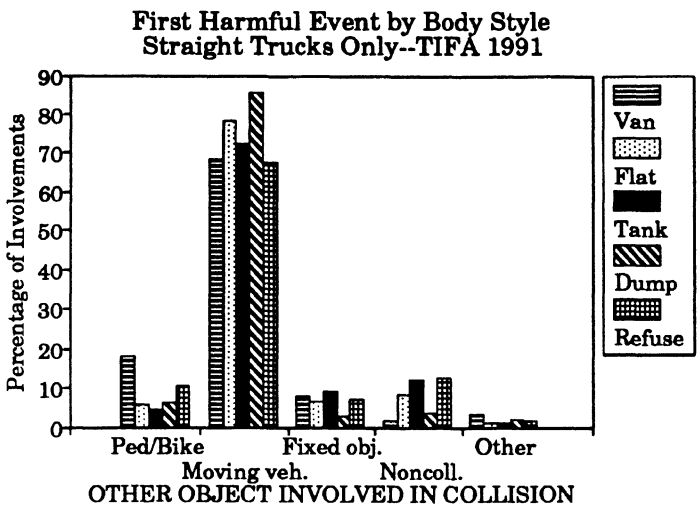


Figure 4-9

The graph on the left illustrates the distribution of the first harmful event in the accident for the 1991 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 vans, and a higher incidence of noncollisions for refuse trucks and tanks.

TABLE 4-9
First Harmful Event by Body Style
Straight Trucks Only
TIFA 1991

First Harmful Event (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Pedestrian	44 12.90	9 4.29	4 3.81	16 4.44	10 8.93	10 4.31	2 4.17	95 6.75
Pedalcyclist	19 5.57	3 1.43	1 0.95	6 1.67	2 1.79	7 3.02	0 0.00	38 2.70
Train	2 0.59	1 0.48	1 0.95	5 1.39	0 0.00	3 1.29	0 0.00	12 0.85
Moving vehicle	233 68.33	164 78.10	76 72.38	308 85.56	76 67.86	174 75.00	44 91.67	1,075 76.35
Parked vehicle	6 1.76	1 0.48	0 0.00	2 0.56	0 0.00	0 0.00	0 0.00	9 0.64
Other nonfixed object	3 0.88	0 0.00	0 0.00	0 0.00	2 1.79	0 0.00	0 0.00	5 0.36
Fixed object	28 8.21	14 6.67	10 9.52	10 2.78	8 7.14	22 9.48	0 0.00	92 6.53
Noncollision	6 1.76	18 8.57	13 12.38	13 3.61	14 12.50	16 6.90	2 4.17	82 5.82
TOTAL	341 100.00	210 100.00	105 100.00	360 100.00	112 100.00	232 100.00	48 100.00	1,408 100.00

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 1991 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 noncollisions, such as rollovers, explosions, and fires for tanks, and the drop in fixed object collisions for all cargo body styles.

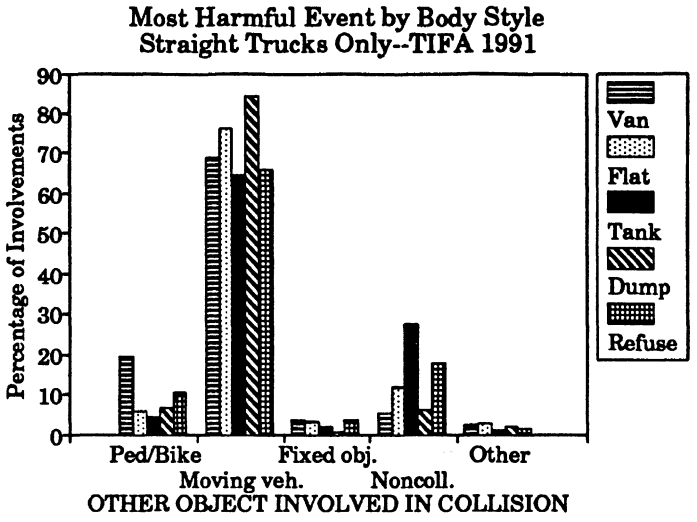


Figure 4-10

TABLE 4-10
Most Harmful Event by Body Style
Straight Trucks Only
TIFA 1991

Most Harmful Event (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Pedestrian	47 13.78	9 4.29	4 3.81	18 5.00	10 8.93	9 3.88	2 4.17	99 7.03
Pedalcyclist	19 5.57	3 1.43	1 0.95	6 1.67	2 1.79	7 3.02	0 0.00	38 2.70
Train	2 0.59	3 1.43	1 0.95	5 1.39	0 0.00	2 0.86	0 0.00	13 0.92
Moving vehicle	235 68.91	160 76.19	68 64.76	304 84.44	74 66.07	177 76.29	44 91.67	1,062 75.43
Parked vehicle	5 1.47	3 1.43	0 0.00	2 0.56	0 0.00	0 0.00	0 0.00	10 0.71
Other nonfixed object	1 0.29	0 0.00	0 0.00	0 0.00	2 1.79	0 0.00	0 0.00	3 0.21
Fixed object	13 3.81	7 3.33	2 1.90	3 0.83	4 3.57	15 6.47	0 0.00	44 3.13
Noncollision	19 5.57	25 11.90	29 27.62	22 6.11	20 17.86	22 9.48	2 4.17	139 9.87
TOTAL	341 100.00	210 100.00	105 100.00	360 100.00	112 100.00	232 100.00	48 100.00	1,408 100.00

The manner of collision distributions are shown in the graph to the right for the 1,075 straight-truck involvements where the first harmful event was a collision with another motor vehicle. Overall, angle collisions were the most common type (45%), followed by head-ons (30%), rear-ends (20%), and sideswipes (4%). Most of the different cargo body styles had collision type distributions similar to the overall pattern. The major exception was flatbeds, which were overinvolved in rear-end (27%) and sideswipes (8%), and underrepresented in angle collisions (38%).

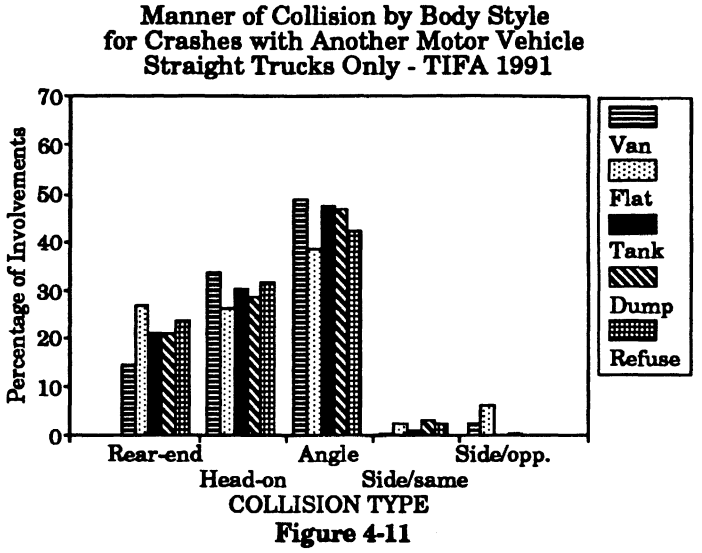


Figure 4-11

TABLE 4-11
Manner of Collision by Body Style
for Crashes with Another Motor Vehicle
Straight Trucks Only
TIFA 1991

Manner of Collision (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Rear-end	34 14.59	44 26.83	16 21.05	65 21.10	18 23.68	31 17.82	7 15.91	215 20.00
Head-on	78 33.48	43 26.22	23 30.26	88 28.57	24 31.58	46 26.44	26 59.09	328 30.51
Angle	114 48.93	63 38.41	36 47.37	144 46.75	32 42.10	86 49.43	11 25.00	486 45.21
Sideswipe, same dir.	1 0.43	4 2.44	1 1.32	10 3.25	2 2.63	5 2.87	0 0.00	23 2.14
Sideswipe, opp. dir.	6 2.58	10 6.10	0 0.00	1 0.32	0 0.00	5 2.87	0 0.00	22 2.05
Unknown	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 0.57	0 0.00	1 0.09
TOTAL	233 100.00	164 100.00	76 100.00	308 100.00	76 100.00	174 100.00	44 100.00	1,075 100.00

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, 56.2% of the known cases, compared with the overall average of 45.7%. The incidence of driver fatality was especially high among tank trucks with 29.5% of the known cases. The overall incidence of fatalities among the straight-truck drivers was less than 12%.

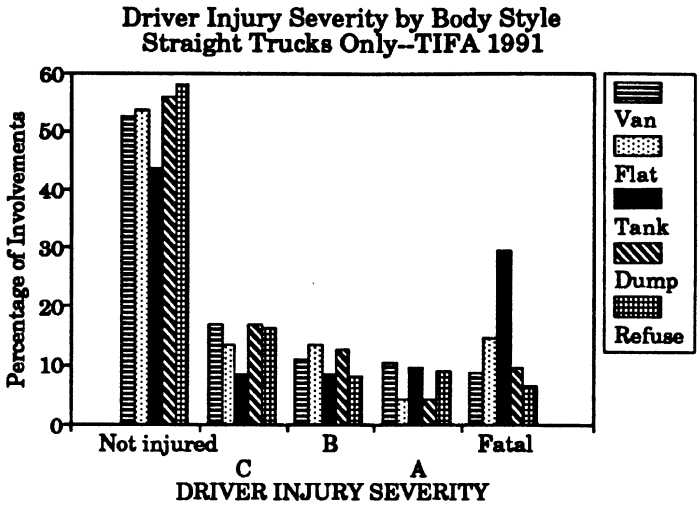


Figure 4-12

TABLE 4–12
Truck Driver Injury Severity by Body Style
Straight Trucks Only
TIFA 1991

Injury Severity (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Refuse	Other	Unknown	TOTAL
Not injured	178 52.20	110 52.38	46 43.81	196 54.44	63 56.25	138 59.48	19 39.58	750 53.27
C injury, possible	58 17.01	28 13.33	9 8.57	60 16.67	18 16.07	26 11.21	13 27.08	212 15.06
B injury, not incapacitating	37 10.85	28 13.33	9 8.57	45 12.50	9 8.04	28 12.07	6 12.50	162 11.51
A injury, incapacitating	36 10.56	9 4.29	10 9.52	15 4.17	10 8.93	11 4.74	4 8.33	95 6.75
Fatal injury	30 8.80	30 14.29	31 29.52	34 9.44	7 6.25	22 9.48	6 12.50	160 11.36
Injured, severity unknown	0 0.00	0 0.00	0 0.00	0 0.00	2 1.79	1 0.43	0 0.00	3 0.21
Unknown if injured	2 0.59	5 2.38	0 0.00	10 2.78	3 2.68	6 2.59	0 0.00	26 1.85
TOTAL	341 100.00	210 100.00	105 100.00	360 100.00	112 100.00	232 100.00	48 100.00	1,408 100.00

Next, driver injury severity is considered for all TIFA 1991 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 (56.4%), followed by the rear (13.9%) and the right side (11.6%). Although noncollisions represented only 4.2% of all fatal involvements, they accounted for 22.6% of the cases in which the truck driver died.

TABLE 4-13A
Driver Injury Severity by Principal Impact Point for Straight Trucks—Frequencies
TIFA 1991

Principal Impact Point	Driver Injury Severity							
	Not Injured	C	B	A	Fatal	Injured, severity unk	Unknown if injured	TOTAL
Noncollision	15	0	8	0	36	0	0	59
Right side	97	14	16	13	22	0	2	164
Rear	142	30	6	1	5	2	11	197
Left side	71	16	3	3	13	0	7	113
Front	376	144	124	74	71	1	5	795
Top	1	0	0	1	7	0	0	9
Undercarriage	35	7	2	0	6	0	0	50
Override	3	0	2	0	0	0	0	5
Unknown	10	1	1	3	0	0	1	16
TOTAL	750	212	162	95	160	3	26	1,408

TABLE 4-13B
Driver Injury Severity by Principal Impact Point for Straight Trucks—Column Percentages
TIFA 1991

Principal Impact Point	Driver Injury Severity							
	Not Injured	C	B	A	Fatal	Injured, sev unk	Unk if injured	TOTAL
Noncollision	2.01%	0.00%	4.97%	0.00%	22.64%	0.00%	0.00%	4.21%
Right side	12.87	6.64	9.94	13.68	13.84	0.00	7.69	11.63
Rear	18.90	14.22	3.73	1.05	3.14	66.67	42.31	13.99
Left side	9.52	7.58	1.86	3.16	8.18	0.00	26.92	8.07
Front	50.13	67.77	76.40	77.89	44.03	33.33	19.23	56.39
Top	0.13	0.00	0.00	1.05	4.40	0.00	0.00	0.64
Undercar.	4.69	3.32	1.24	0.00	3.77	0.00	0.00	3.57
Override	0.40	0.00	1.24	0.00	0.00	0.00	0.00	0.36
Unknown	1.34	0.47	0.62	3.16	0.00	0.00	3.85	1.14
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. Noncollisions were characterized by the highest proportion of driver fatalities (61%), and resulted in driver casualties in 75% of the cases. The category with the next highest percentage of truck driver casualties was front area impacts (53%). 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 77% of these cases.

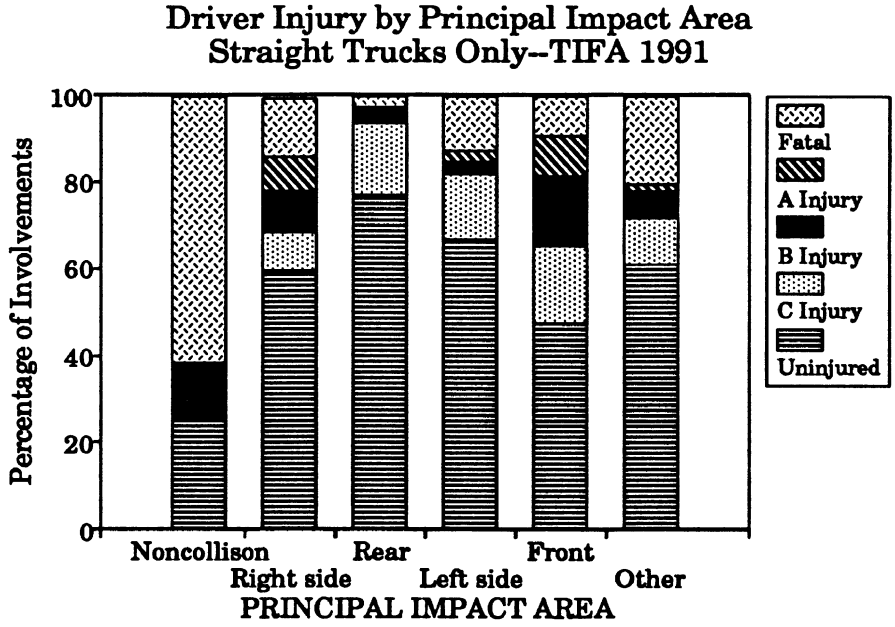


Figure 4-13

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 10% 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 30% did not include a rollover, fire, or ejection. In 24% of the truck driver fatals, there was a rollover and the driver was ejected; in 22% there was a rollover only; and in 11% 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% of the cases.

TABLE 4-14A
Driver Injury Severity by Rollover/Fire/Ejection
for Straight Trucks—Frequencies
TIFA 1991

Occurrence of Rollover/Fire/Ejection	Driver Injury Severity							
	Not Injured	C	B	A	Fatal	Injured, severity unk	Unknown if injured	TOTAL
None	710	181	119	64	49	2	2	1,127
Rollover only	24	23	34	20	35	1	0	137
Fire only	14	4	3	1	3	0	0	25
Ejection only	0	2	3	2	18	0	0	25
Rollover/Fire	2	0	1	1	13	0	0	17
Fire/Ejection	0	0	2	2	2	0	0	6
Rollover/Ejection	0	2	0	5	38	0	0	45
Rollover/Fire/Ejection	0	0	0	0	2	0	0	2
Unknown	0	0	0	0	0	0	24	24
TOTAL	750	212	162	95	160	3	26	1,408

TABLE 4-14B
Driver Injury Severity by Rollover/Fire/Ejection
for Straight Trucks—Column Percentages
TIFA 1991

Occurrence of Rollover/Fire/ Ejection	Driver Injury Severity							
	Not Injured	C	B	A	Fatal	Injured, sev unk	Unk if injured	TOTAL
None	94.64%	85.31%	73.91%	67.37%	30.19%	66.67%	7.69%	80.01%
Rollover only	3.22	10.90	20.50	21.05	22.01	33.33	0.00	9.71
Fire only	1.88	1.90	1.86	1.05	1.89	0.00	0.00	1.78
Ejection only	0.00	0.95	1.86	2.11	11.32	0.00	0.00	1.78
Rollover/Fire	0.27	0.00	0.62	1.05	8.18	0.00	0.00	1.21
Fire/Ejection	0.00	0.00	1.24	2.11	1.26	0.00	0.00	0.43
Roll/Eject	0.00	0.95	0.00	5.26	23.90	0.00	0.00	3.21
Roll/Fire/Eject	0.00	0.00	0.00	0.00	1.26	0.00	0.00	0.14
Unknown	0.00	0.00	0.00	0.00	0.00	0.00	92.31	1.71
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 63% of the time. The driver was uninjured in 56% of the cases when only a fire took place, 18% 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.

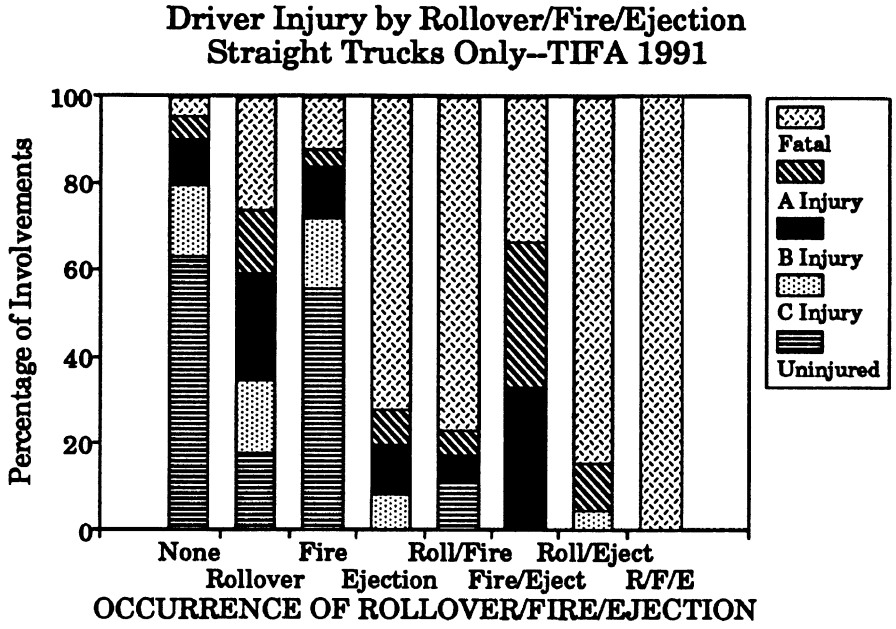


Figure 4-14

TRACTOR-COMBINATION FATAL ACCIDENT INVOLVEMENTS IN 1991

This section focuses exclusively on the fatal accident experience of tractor combinations in 1991. 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 68% of the fatal large-truck accidents in 1991, a greater number of variables is discussed for the tractors than 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, was 63% in 1991. 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.

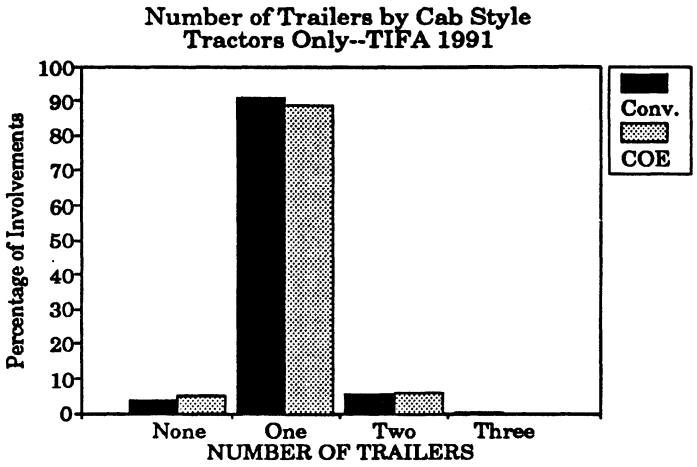


Figure 5-1

TABLE 5-1
Number of Trailers by Cab Style
Tractors Only
TIFA 1991

Number of Trailers	Conventional		Cabover/ Cab-forward		Unknown		TOTAL	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
No trailers	70	3.75%	56	5.15%	1	2.78%	127	4.25%
One trailer	1,692	90.72	964	88.60	15	41.67	2,671	89.36
Two trailers	102	5.47	68	6.25	0	0.00	170	5.69
Three trailers	1	0.05	0	0.00	0	0.00	1	0.03
Unknown	0	0.00	0	0.00	20	55.56	20	0.67
TOTAL	1,865	100.00%	1,088	100.00%	36	100.00%	2,989	100.00%

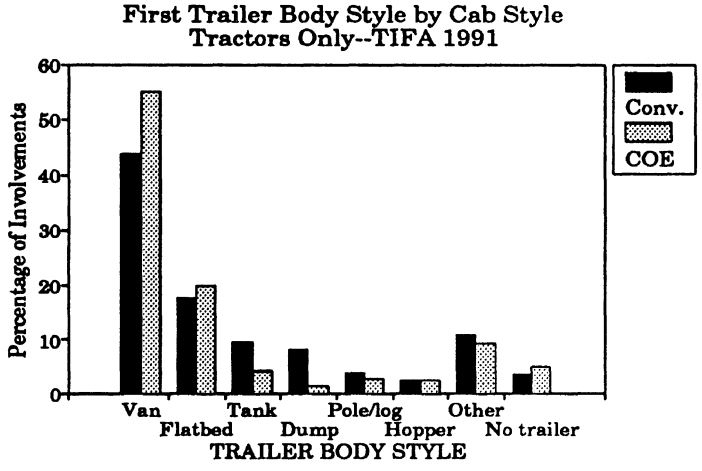


Figure 5-2

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 (58%) or a flatbed (21%) 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 1991

First Trailer Body Style	Conventional		Cabover/ Cab-forward		Unknown		TOTAL	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Van	848	45.47%	631	58.00%	2	5.56%	1,481	49.55%
Flatbed	339	18.18	229	21.05	3	8.33	571	19.10
Tank	186	9.97	49	4.50	0	0.00	235	7.86
Dump	157	8.42	14	1.29	0	0.00	171	5.72
Pole/Log	74	3.97	32	2.94	0	0.00	106	3.55
Hopper	48	2.57	27	2.48	0	0.00	75	2.51
Other	138	7.40	50	4.59	20	55.55	208	6.96
No first trailer	70	3.75	56	5.15	1	2.78	127	4.25
Unknown	5	0.27	0	0.00	10	27.78	15	0.50
TOTAL	1,865	100.00%	1,088	100.00%	36	100.00%	2,989	100.00%

Table 5-2 above indicates the relative proportions of the different first trailer body styles for the TIFA 1991 tractors. If the cases are restricted to those where there was a first trailer and its body style was known, then 52.0% of the involved tractors were hauling a van as the first trailer, 20.1% a flatbed, 8.2% a tank, 6.0% a dump, 3.7% a pole or logging trailer, 2.6% a hopper/bottom dump, and the remaining 7.3% 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, dump, pole/logging, and hopper/bottom dump so the proportion that each trailer type comprises of the total should be kept in mind.

The graph at right illustrates GVWR distributions for the 1991 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 1991 were class 8 (over 33,000 pounds). An even higher proportion of tractors hauling pole/logging trailers or tanks as the first trailer were class 8 vehicles. Class 8 tractors pulled slightly fewer vans (92%).

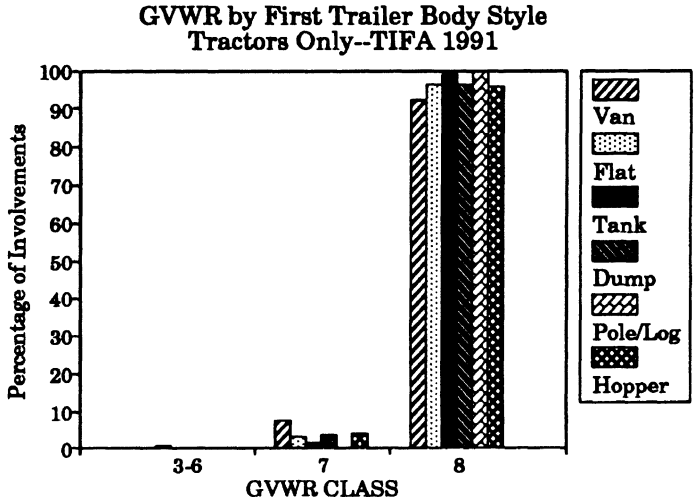


Figure 5-3

TABLE 5-3
GVWR by First Trailer Body Style
Tractors Only
TIFA 1991

GVWR Class/ Weight Range	BODY STYLE (Frequencies and Column Percents)								
	Van	Flatbed	Tank	Dump	Pole/ Log	Hopper	Other	Unknown/ No Trailer	TOTAL
3 10,001–14,000	0 0.00	1 0.18	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 0.03
4 14,001–16,000	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 0.53	0 0.00	1 0.03
5 16,001–19,500	0 0.00	1 0.18	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 0.03
6 19,501–26,000	4 0.27	1 0.18	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 0.62	6 0.20
7 26,001–33,000	111 7.49	18 3.15	3 1.28	6 3.51	0 0.00	3 4.00	7 3.72	1 0.62	149 4.98
8 33,001+	1,343 90.68	540 94.57	231 98.30	163 95.32	106 100.00	70 93.33	171 90.96	129 79.63	2,753 92.10
Unknown	23 1.55	10 1.75	1 0.43	2 1.17	0 0.00	2 2.67	9 4.79	31 19.14	78 2.61
TOTAL	1,481 100.00	571 100.00	235 100.00	171 100.00	106 100.00	75 100.00	188 100.00	162 100.00	2,989 100.00

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 53% of tanks (of all known cases), 53% of hopper/bottom dumps 51% of pole/logging trailers, 50% of dumps, 43% of flatbeds, and just 30% of vans.

Following the table is a cumulative percentage diagram (Figure 5-4) of GCW. 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 1991

Gross Weight (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Pole/ Log	Hopper	Other	Unknown/ No Trailer	TOTAL
< 20,000	13 0.88	1 0.18	0 0.00	0 0.00	0 0.00	0 0.00	4 2.13	107 66.05	125 4.18
20,000	146 9.86	97 16.99	45 19.15	48 28.07	30 28.30	19 25.33	42 22.34	14 8.64	441 14.75
30,000	296 19.99	95 16.64	32 13.62	18 10.53	4 3.77	9 12.00	35 18.62	5 3.09	494 16.53
40,000	172 11.61	32 5.60	8 3.40	2 1.17	0 0.00	0 0.00	3 1.60	1 0.62	218 7.29
50,000	158 10.67	29 5.08	4 1.70	2 1.17	5 4.72	1 1.33	5 2.66	0 0.00	204 6.83
60,000	189 12.76	58 10.16	15 6.38	10 5.85	11 10.38	5 6.67	10 5.32	0 0.00	298 9.97
70,000	401 27.08	208 36.43	85 36.17	50 29.24	31 29.25	29 38.67	49 26.06	0 0.00	853 28.54
80,000+	22 1.49	28 4.90	33 14.04	29 16.96	21 19.81	9 12.00	29 15.43	0 0.00	171 5.72
Unknown	84 5.67	23 4.03	13 5.53	12 7.02	4 3.77	3 4.00	11 5.85	35 21.60	185 6.19
TOTAL	1,481 100.00	571 100.00	235 100.00	171 100.00	106 100.00	75 100.00	188 100.00	162 100.00	2,989 100.00

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

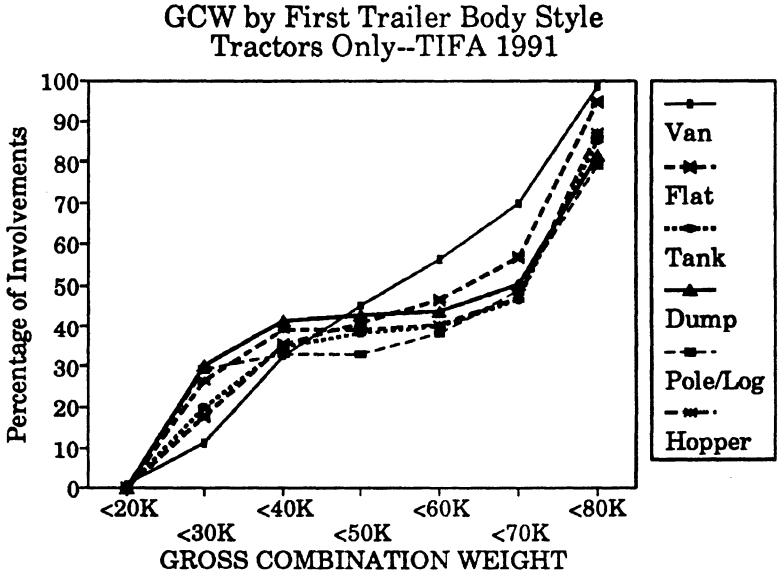


Figure 5-4

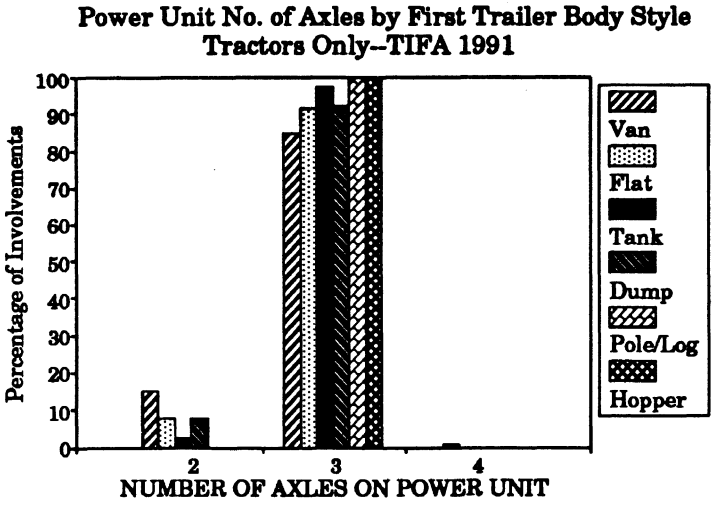


Figure 5-5

The graph at left depicts the number of axles on the tractor according to the first trailer body style. The vast majority of the six trailer body categories were hauled by three-axle tractors. The highest percentage of two-axle tractors (15%) was found among the van trailers.

TABLE 5-5
Number of Axles on Power Unit by First Trailer Body Style
Tractors Only
TIFA 1991

Power Unit No. of Axles (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Pole/ Log	Hopper	Other	Unknown/ No Trailer	TOTAL
2	224 15.12	46 8.06	6 2.55	13 7.60	0 0.00	7 9.33	25 13.30	19 11.73	340 11.38
3	1,254 84.67	520 91.07	229 97.45	158 92.40	106 100.00	68 90.67	163 86.70	110 67.90	2,608 87.25
4	0 0.00	3 0.53	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	2 1.23	5 0.17
Unknown	3 0.20	2 0.35	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	31 19.14	36 1.20
TOTAL	1,481 100.00	571 100.00	235 100.00	171 100.00	106 100.00	75 100.00	188 100.00	162 100.00	2,989 100.00

The next table indicates the unit and axle configurations of the 1991 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. In 1991 there was one three trailer combination, a heavy-equipment hauler with a jeep, lowboy, booster dolly configuration. 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 1991

Number of Trailers	Axle Config.	Cab Style							
		Conventional		Cabover/ Cab-forward		Unknown		TOTAL	
		No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
None	2	8	0.43%	8	0.74%	0	0.00%	16	0.54%
	3	62	3.32	46	4.23	0	0.00	108	3.61
	4	0	0.00	2	0.18	0	0.00	2	0.07
	Unknown	0	0.00	0	0.00	1	2.78	1	0.03
One	2/1	41	2.20%	16	1.47%	0	0.00%	57	1.91%
	2/2	98	5.25	33	3.03	0	0.00	131	4.38
	2/3	5	0.27	2	0.18	0	0.00	7	0.23
	3/1	4	0.21	4	0.37	0	0.00	8	0.27
	3/2	1,462	78.39	900	82.72	1	2.78	2,363	79.06
	3/3	65	3.49	8	0.74	0	0.00	73	2.44
	Other*	7	0.38	1	0.09	0	0.00	8	0.27
Two	2/1/2	72	3.86%	46	4.23%	0	0.00%	118	3.95%
	2/2/2	3	0.16	3	0.28	0	0.00	6	0.20
	3/1/2	10	0.54	9	0.83	0	0.00	19	0.64
	3/2/2	6	0.32	4	0.37	0	0.00	10	0.33
	3/2/3	4	0.21	2	0.18	0	0.00	6	0.20
	Other**	7	0.38	2	0.18	0	0.00	9	0.30
Three	***	1	0.05%	0	0.00%	0	0.00%	1	0.03%
Unknown No.	of Trailers	10	0.54%	2	0.18%	34	94.44%	46	1.54%
TOTAL		1,865	100.00%	1,088	100.00%	36	100.00%	2,989	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 2/4; 3/4,7; and 4/2,3.
** Includes 2/2/1; 3/2/4; 3/3/2,4,5; and 3/4/2,4.
*** Includes 3/2/3/2;

The table on the next page presents cargo type distributions by first trailer body style. Of all the cases of known cargo type, over 28% 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 1991

Cargo Type (Frequencies and Col. Pcts.)	No Trailer	Van	Flatbed	Tank	Dump	Pole/ Log	Hopper	Other	Unknown	TOTAL
Empty	108 85.04	277 18.70	164 28.72	79 33.62	68 39.77	34 32.08	28 37.33	71 37.77	1 2.86	829 27.74
General freight	0 0.00	750 50.64	28 4.90	0 0.00	0 0.00	0 0.00	0 0.00	1 0.53	0 0.00	779 26.06
Household goods	0 0.00	28 1.89	1 0.18	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	29 0.97
Building material	0 0.00	13 0.88	39 6.83	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	52 1.74
Metal	0 0.00	12 0.81	124 21.72	0 0.00	0 0.00	1 0.94	0 0.00	1 0.53	0 0.00	138 4.62
Heavy machinery	0 0.00	4 0.27	34 5.95	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	38 1.27
Large objects	0 0.00	5 0.34	50 8.76	0 0.00	0 0.00	2 1.89	0 0.00	3 1.60	1 2.86	61 2.04
Motor vehicles	0 0.00	0 0.00	8 1.40	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	8 0.27
Driveaway/ tow	17 13.39	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 0.53	0 0.00	18 0.60
Gases in bulk	0 0.00	0 0.00	0 0.00	8 3.40	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	8 0.27
Solids in bulk	0 0.00	50 3.38	13 2.28	0 0.00	94 54.97	2 1.89	21 28.00	55 29.26	0 0.00	235 7.86
Liquids in bulk	0 0.00	0 0.00	0 0.00	146 62.13	0 0.00	0 0.00	0 0.00	2 1.06	0 0.00	148 4.95
Explosives	0 0.00	2 0.14	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	2 0.07
Logs/ lumber	0 0.00	3 0.20	76 13.31	0 0.00	0 0.00	67 63.21	0 0.00	0 0.00	0 0.00	146 4.88
Refrig. food	0 0.00	285 19.24	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	1 0.53	0 0.00	286 9.57
Mobile home	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	8 4.26	0 0.00	8 0.27
Farm products	0 0.00	16 1.08	24 4.20	0 0.00	6 3.51	0 0.00	26 34.67	8 4.26	0 0.00	80 2.68
Live animals	0 0.00	0 0.00	6 1.05	0 0.00	0 0.00	0 0.00	0 0.00	32 17.02	0 0.00	38 1.27
Other	1 0.79	1 0.07	2 0.35	0 0.00	0 0.00	0 0.00	0 0.00	5 2.66	0 0.00	9 0.30
Unknown	0 0.00	36 2.43	2 0.35	2 0.85	3 1.75	0 0.00	0 0.00	1 0.53	33 94.29	77 2.58
TOTAL	127 100.00	1,481 100.00	571 100.00	235 100.00	171 100.00	106 100.00	75 100.00	188 100.00	35 100.00	2,989 100.00

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 hopper bottoms were hauling solids in bulk or farm products; 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.

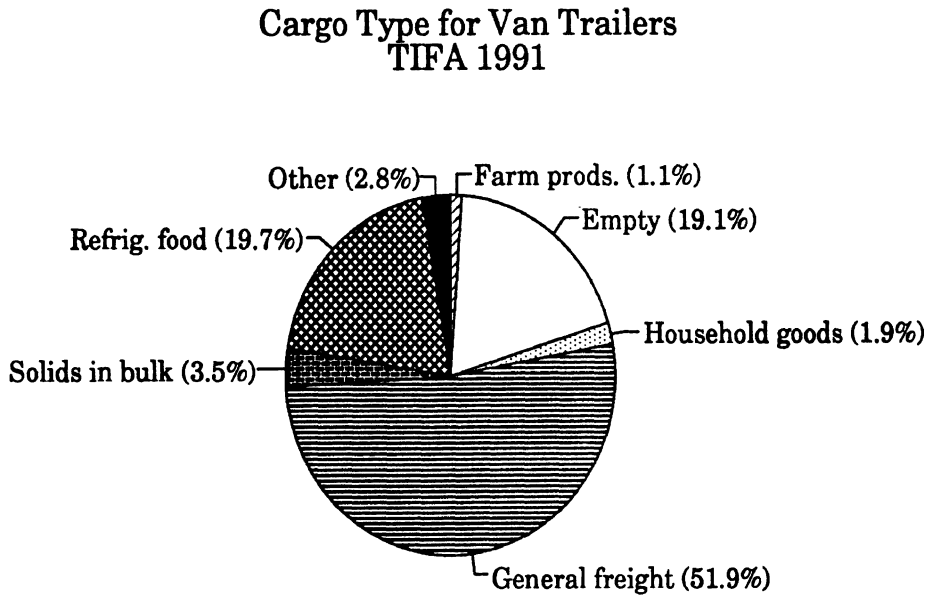


Figure 5-7a

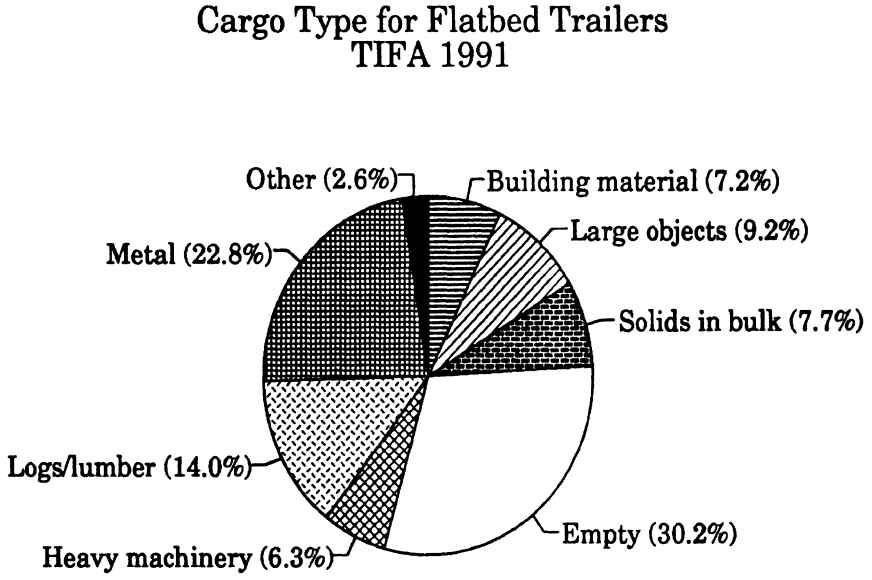


Figure 5-7b

The overwhelming majority of tractors involved in fatal accidents in 1991 used diesel fuel, as indicated in the table below.

TABLE 5-8
Fuel Type by Cab Style
Tractors Only
TIFA 1991

Fuel Type	Conventional		Cabover/ Cab-forward		Unknown		TOTAL	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Diesel	1852	99.30%	1086	99.82%	1	2.78%	2,939	98.33%
Gasoline	9	0.48	0	0.00	0	0.00	9	0.30
Unknown	4	0.21	2	0.18	35	97.22	41	1.37
TOTAL	1,865	100.00%	1,088	100.00%	36	100.00%	2,989	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 six trailer body styles is in the proportion of intrastate carriers. Of the known cases, 55% of the involved pole/logging trailers and 43% of dumps were intrastate carriers, but this percentage was only 6-24% for each of the other four trailer body styles. Tanks had the highest proportion of interstate private carriers (26% of the known cases), while vans had the highest proportion of interstate authorized carriers (75%).

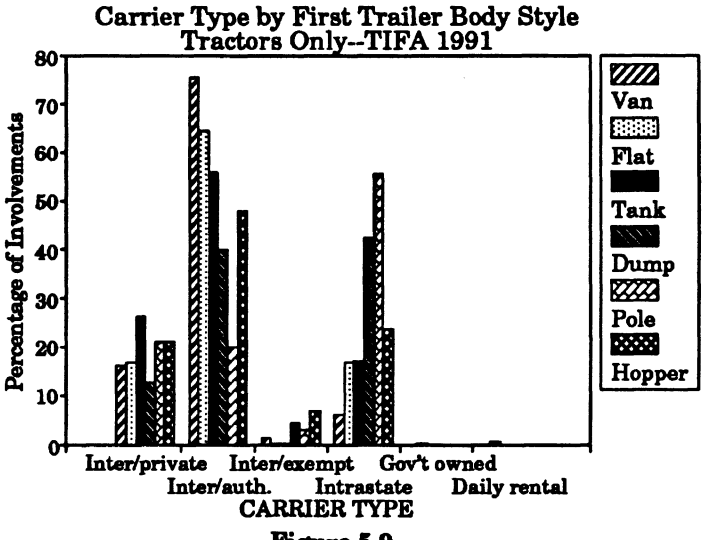


Figure 5-9

TABLE 5-9
Carrier Type by First Trailer Body Style
Tractors Only
TIFA 1991

Carrier Type (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Pole/ Log	Hopper	Other	Unknown/ No Trailer	TOTAL
Interstate private	236 15.94	94 16.46	60 25.53	19 11.11	21 19.81	15 20.00	41 21.81	16 9.88	502 16.79
Interstate authorized	1,079 72.86	360 63.05	128 54.47	59 34.50	20 18.87	34 45.33	58 30.85	75 46.30	1,813 60.66
Interstate exempt	21 1.42	2 0.35	1 0.43	7 4.09	3 2.83	5 6.67	26 13.83	1 0.62	66 2.21
Intrastate private	48 3.24	61 10.68	29 12.34	26 15.20	25 23.58	3 4.00	33 17.55	13 8.02	238 7.96
Intrastate for hire	42 2.84	33 5.78	11 4.68	37 21.64	30 28.30	14 18.67	16 8.51	9 5.56	192 6.42
Government owned	2 0.14	3 0.53	0 0.00	0 0.00	0 0.00	0 0.00	2 1.06	0 0.00	7 0.23
Daily rental	3 0.20	4 0.70	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	7 0.23
Unknown	50 3.38	14 2.45	6 2.55	23 13.45	7 6.60	4 5.33	12 6.38	48 29.63	164 5.49
TOTAL	1,481 100.00	571 100.00	235 100.00	171 100.00	106 100.00	75 100.00	188 100.00	162 100.00	2,989 100.00

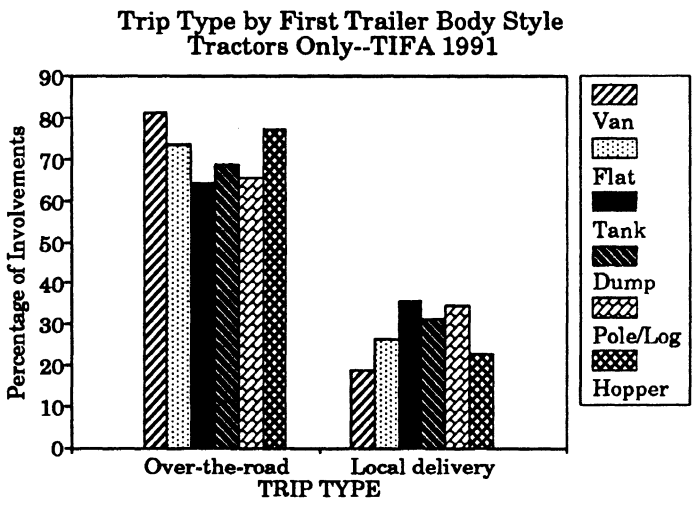


Figure 5-10

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, 81% of the vans were conducting over-the-road trips, followed by

hopper bottoms (77%), flatbeds (73%), dumps (69%), pole/logging trailers (65%), and tanks (64%). A similar order of trailer body styles was observed when calculating the proportions of interstate carriers. Note also that pole/logging trailers, which had by far the highest percentage of intrastate carriers, also had a higher percentage of trucks making local deliveries at the time of the accident (35% of the known cases, compared to 24% overall).

TABLE 5-10
Trip Type by First Trailer Body Style
Tractors Only
TIFA 1991

Trip Type (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Pole/ Log	Hopper	Other	Unknown/ No Trailer	TOTAL
Over-the-road	1,168 78.87	411 71.98	147 62.55	108 63.16	66 62.26	57 76.00	117 62.23	99 61.11	2,173 72.70
Local delivery	275 18.57	149 26.09	82 34.89	49 28.65	35 33.02	17 22.67	62 32.98	20 12.35	689 23.05
Unknown	38 2.57	11 1.93	6 2.55	14 8.19	5 4.72	1 1.33	9 4.79	43 26.54	127 4.25
TOTAL	1,481 100.00	571 100.00	235 100.00	171 100.00	106 100.00	75 100.00	188 100.00	162 100.00	2,989 100.00

For all trailer body styles except vans, 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 43% of the vans involvements occurred on limited-access routes, followed by 28% of flatbeds, 24% of tanks, 17% of hopper bottoms, 14% of dumps, and 5% of pole/logging trailers. A nearly reverse order held for other road class involvements, with hoppers having the highest proportion, followed by dumps, flatbeds, pole/logging trailers, tanks, and vans.

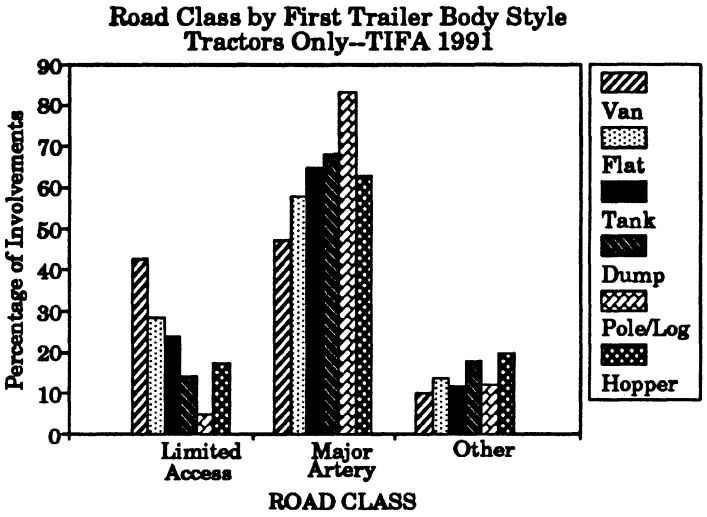


Figure 5-11

TABLE 5-11
Road Class by First Trailer Body Style
Tractors Only
TIFA 1991

Road Class (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Pole/ Log	Hopper	Other	Unknown/ No Trailer	TOTAL
Limited Access	632 42.67	162 28.37	56 23.83	24 14.04	5 4.72	13 17.33	38 20.21	38 23.46	968 32.39
Major Artery	699 47.20	330 57.79	152 64.68	115 67.25	88 83.02	47 62.67	138 73.40	87 53.70	1,656 55.40
Other	148 9.99	78 13.66	27 11.49	30 17.54	13 12.26	15 20.00	12 6.38	37 22.84	360 12.04
Unknown	2 0.14	1 0.18	0 0.00	2 1.17	0 0.00	0 0.00	0 0.00	0 0.00	5 0.17
TOTAL	1,481 100.00	571 100.00	235 100.00	171 100.00	106 100.00	75 100.00	188 100.00	162 100.00	2,989 100.00

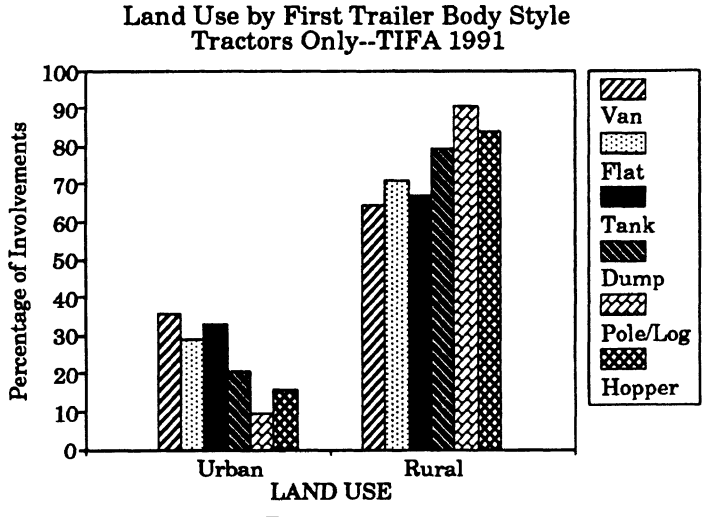


Figure 5-12

The land use distributions are very stable from one trailer body style to another. For vans, flatbeds, tanks, dumps, hoppers, and logging trailers the proportion of involvements in urban areas ranged from 9% to 36%, while the proportion in rural areas varied from 64% to 91%.

TABLE 5-12
Land Use by First Trailer Body Style
Tractors Only
TIFA 1991

Land Use (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Pole/ Log	Hopper	Other	Unknown/ No Trailer	TOTAL
Urban	529 35.72	165 28.90	78 33.19	35 20.47	10 9.43	12 16.00	39 20.74	62 38.27	930 31.11
Rural	950 64.15	405 70.93	157 66.81	134 78.36	96 90.57	63 84.00	149 79.26	99 61.11	2,053 68.69
Unknown	2 0.14	1 0.18	0 0.00	2 1.17	0 0.00	0 0.00	0 0.00	1 0.62	6 0.20
TOTAL	1,481 100.00	571 100.00	235 100.00	171 100.00	106 100.00	75 100.00	188 100.00	162 100.00	2,989 100.00

The light condition at the time of the accident is indicated for the six different trailer body styles in the graph below. Dumps, pole/logging, and hopper bottom combinations had higher proportions of daylight involvements and a smaller proportion of their involvements taking place in the dark. On the other hand, 48% of the van involvements occurred at night as did 40% of the tank, and 39% of the flatbed 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.

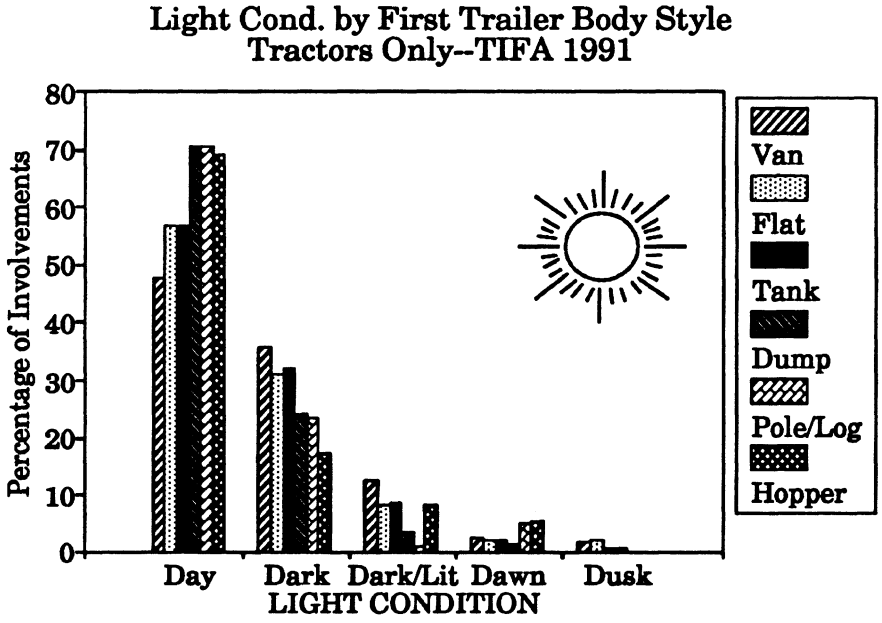


Figure 5-13

TABLE 5-13
Light Condition by First Trailer Body Style
Tractors Only
TIFA 1991

Light Condition (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Pole Log	Hopper	Other	Unknown/ No Trailer	TOTAL
Daylight	704 47.54	324 56.74	133 56.60	121 70.76	75 70.75	52 69.33	109 57.98	93 57.41	1,611 53.90
Dark, not lighted	529 35.72	177 31.00	75 31.91	41 23.98	25 23.58	13 17.33	55 29.26	47 29.01	962 32.18
Dark, but lighted	185 12.49	47 8.23	20 8.51	6 3.51	1 0.94	6 8.00	15 7.98	16 9.88	296 9.90
Dawn	37 2.50	12 2.10	5 2.13	2 1.17	5 4.72	4 5.33	3 1.60	2 1.23	70 2.34
Dusk	24 1.62	11 1.93	1 0.43	1 0.58	0 0.00	0 0.00	2 1.06	3 1.85	42 1.41
Unknown	2 0.14	0 0.00	1 0.43	0 0.00	0 0.00	0 0.00	4 2.13	1 0.62	8 0.27
TOTAL	1,481 100.00	571 100.00	235 100.00	171 100.00	106 100.00	75 100.00	188 100.00	162 100.00	2,989 100.00

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 75% of the flatbed involvements to 88% of the pole/

First Harmful Event by 1st Trailer Body Style
Tractors Only--TIFA 1991

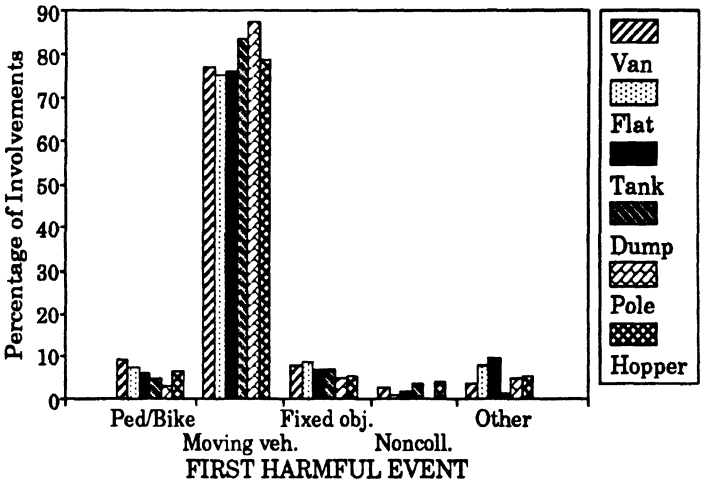


Figure 5-14

logging trailer involvements. Pole/logging trailers and dumps experienced relatively fewer pedestrian involvements, while tanks had higher percentages of noncollisions (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 1991

First Harmful Event (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Pole Log	Hopper	Other	Unknown/ No Trailer	TOTAL
Pedestrian	121 8.17	36 6.30	12 5.11	4 2.34	2 1.89	4 5.33	8 4.26	20 12.35	207 6.93
Pedalcyclist	15 1.01	5 0.88	2 0.85	4 2.34	1 0.94	1 1.33	0 0.00	6 3.70	34 1.14
Train	2 0.14	3 0.53	0 0.00	5 2.92	0 0.00	3 4.00	0 0.00	1 0.62	14 0.47
Animal	4 0.27	0 0.00	0 0.00	1 0.58	0 0.00	0 0.00	2 1.06	0 0.00	7 0.23
Moving vehicle	1,143 77.18	429 75.13	179 76.17	143 83.63	93 87.74	59 78.67	160 85.11	110 67.90	2,316 77.48
Parked vehicle	23 1.55	2 0.35	2 0.85	0 0.00	0 0.00	0 0.00	1 0.53	0 0.00	28 0.94
Other nonfixed object	7 0.47	0 0.00	2 0.85	0 0.00	0 0.00	0 0.00	0 0.00	2 1.23	11 0.37
Fixed object	114 7.70	51 8.93	16 6.81	12 7.02	5 4.72	4 5.33	10 5.32	13 8.02	225 7.53
Noncollision	52 3.51	45 7.88	22 9.36	2 1.17	5 4.72	4 5.33	7 3.72	10 6.17	147 4.92
TOTAL	1,481 100.00	571 100.00	235 100.00	171 100.00	106 100.00	75 100.00	188 100.00	162 100.00	2,989 100.00

The graph on the right illustrates the most harmful event for 1991 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 noncollisions as the most harmful event for vans, flatbeds, tanks, and dumps.

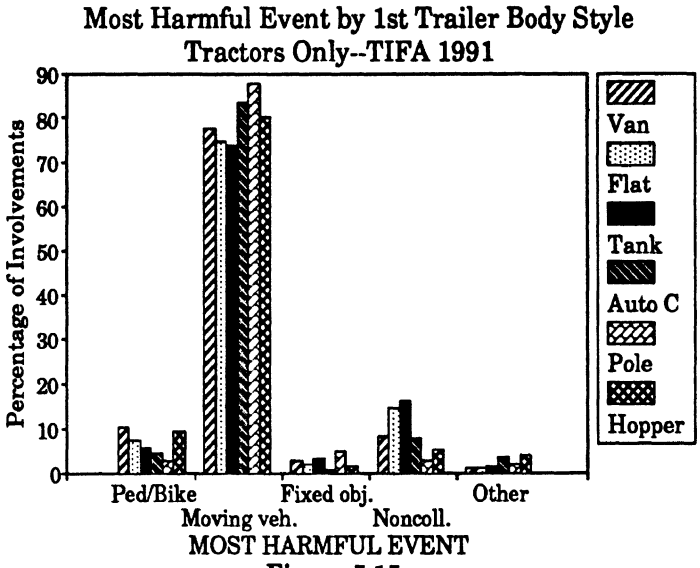


Figure 5-15

TABLE 5-15
Most Harmful Event by First Trailer Body Style
Tractors Only
TIFA 1991

Most Harmful Event (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Pole/ Log	Hopper	Other	Unknown/ No Trailer	TOTAL
Pedestrian	137 9.25	38 6.65	11 4.68	4 2.34	2 1.89	6 8.00	10 5.32	21 12.96	229 7.66
Pedalcyclist	16 1.08	5 0.88	2 0.85	4 2.34	1 0.94	1 1.33	0 0.00	6 3.70	35 1.17
Train	2 0.14	3 0.53	0 0.00	5 2.92	0 0.00	3 4.00	0 0.00	1 0.62	14 0.47
Animal	0 0.00	0 0.00	0 0.00	1 0.58	0 0.00	0 0.00	0 0.00	0 0.00	1 0.03
Moving vehicle	1,150 77.65	427 74.78	174 74.04	143 83.63	93 87.74	60 80.00	154 81.91	112 69.14	2,313 77.38
Parked vehicle	9 0.61	3 0.53	1 0.43	0 0.00	2 1.89	0 0.00	1 0.53	1 0.62	17 0.57
Other nonfixed object	6 0.41	0 0.00	2 0.85	0 0.00	0 0.00	0 0.00	0 0.00	1 0.62	9 0.30
Fixed object	40 2.70	12 2.10	7 2.98	1 0.58	5 4.72	1 1.33	9 4.79	4 2.47	79 2.64
Noncollision	121 8.17	83 14.54	38 16.17	13 7.60	3 2.83	4 5.33	14 7.45	16 9.88	292 9.77
TOTAL	1,481 100.00	571 100.00	235 100.00	171 100.00	106 100.00	75 100.00	188 100.00	162 100.00	2,989 100.00

The graph and table on this page illustrate the manner of collision for the 2,316 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, vans had the highest proportion of rear-end collisions, pole/logging trailers the highest percentage of both head-ons and angle collisions. Overall, angle collisions were the most common collision type, representing almost 40% of all tractor involvements, followed by head-ons (29.6%) and rear-ends (24.6%).

Manner of Collision by 1st Trailer Body Style for Crashes with Another Motor Vehicle Tractors Only--TIFA 1991

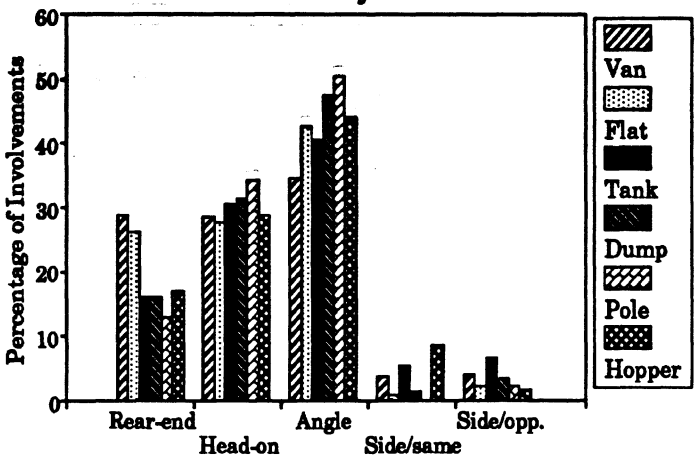


Figure 5-16

TABLE 5-16
Manner of Collision by First Trailer Body Style for Crashes with Another Motor Vehicle Tractors Only TIFA 1991

Manner of Collision (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Pole/ Log	Hopper	Other	Unknown/ No Trailer	TOTAL
Rear-end	330 28.87	111 25.87	29 16.20	23 16.08	12 12.90	10 16.95	29 18.13	25 22.73	569 24.57
Head-on	326 28.52	118 27.51	55 30.73	45 31.47	32 34.41	17 28.81	50 31.25	42 38.18	685 29.58
Angle	395 34.56	181 42.19	73 40.78	68 47.55	47 50.54	26 44.07	71 44.38	40 36.36	901 38.90
Sideswipe, same dir.	42 3.67	4 0.93	10 5.59	2 1.40	0 0.00	5 8.47	5 3.13	2 1.82	70 3.02
Sideswipe, opp. dir.	46 4.02	10 2.33	12 6.70	5 3.50	2 2.15	1 1.69	3 1.88	1 0.91	80 3.45
Unknown	4 0.35	5 1.17	0 0.00	0 0.00	0 0.00	0 0.00	2 1.25	0 0.00	11 0.47
TOTAL	1,143 100.00	429 100.00	179 100.00	143 100.00	93 100.00	59 100.00	160 100.00	110 100.00	2,316 100.00

TABLE 5-17
Gross Combination Weight by Rollover Occurrence
Tractors Only
TIFA 1991

Gross Weight	Rollover Occurrence							
	None		First Event		Subsequent Event		TOTAL	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
< 20,000	106	84.80%	5	4.00%	14	11.20%	125	100.00%
20,000	416	94.33	7	1.59	18	4.08	441	100.00
30,000	472	95.55	6	1.21	16	3.24	494	100.00
40,000	199	91.28	5	2.29	14	6.42	218	100.00
50,000	175	85.78	9	4.41	20	9.80	204	100.00
60,000	236	79.19	14	4.70	48	16.11	298	100.00
70,000	669	78.43	59	6.92	125	14.65	853	100.00
80,000+	133	77.78	16	9.36	22	12.87	171	100.00
Unknown	165	89.19	10	5.41	10	5.41	185	100.00
TOTAL	2,571	86.02%	131	4.38%	287	9.60%	2,989	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 two heaviest (70,000-79,999 and 80,000+ pounds) GCW categories had the highest proportions of first-event rollovers, with 6.9% and 9.4%, respectively. Subsequent-event rollovers were most common (16.1%) among the 60,000-69,999 pound GCW category. Overall, only 5% of the 20,000-59,999 pound combinations experienced subsequent-event rollovers, compared to over 11% for the lightest (many of which were bobtails) and over 14% for the three heaviest GCW categories.

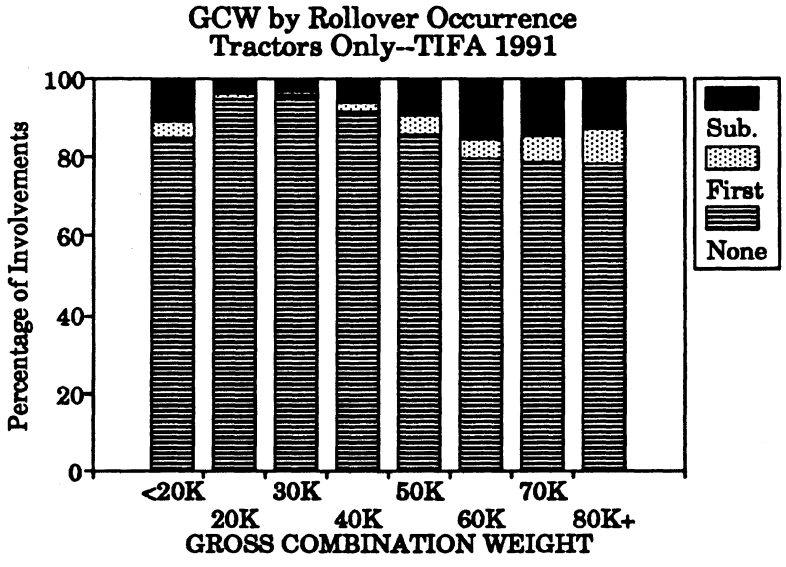


Figure 5-17

TABLE 5-18
Gross Combination Weight by Jackknife Occurrence
Tractors Only
TIFA 1991

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	37	29.60%	1	0.80%	1	0.80%	86	68.80%	125	100.00%
20,000	340	77.10	30	6.80	39	8.84	32	7.26	441	100.00
30,000	411	83.20	20	4.05	39	7.89	24	4.86	494	100.00
40,000	183	83.94	4	1.83	10	4.59	21	9.63	218	100.00
50,000	177	86.76	5	2.45	13	6.37	9	4.41	204	100.00
60,000	262	87.92	3	1.01	14	4.70	19	6.38	298	100.00
70,000	770	90.27	11	1.29	21	2.46	51	5.98	853	100.00
80,000+	151	88.30	7	4.09	4	2.34	9	5.26	171	100.00
Unknown	142	76.76	3	1.62	6	3.24	34	18.38	185	100.00
TOTAL	2,473	82.74%	84	2.81%	147	4.92%	285	9.53%	2,989	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 (4.9% of all tractor involvements) rather than the primary event (2.8%). 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 8.8% of the tractors in the 20,000-29,999 pound group and 7.9% in the 30,000-39,999 group jackknifed as the subsequent event in the accident. This compares with 2.5% in the 70,000-79,999 pound group and 2.3% 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.

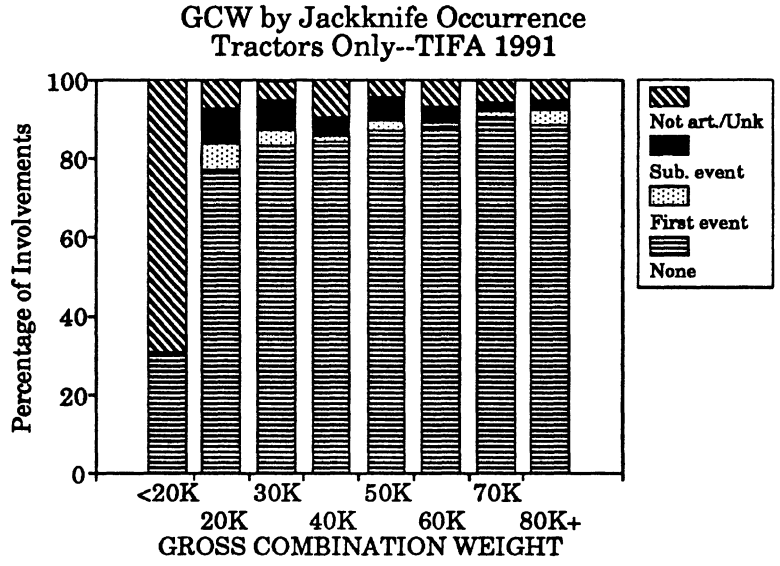


Figure 5-18

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. Vans had the highest proportion of uninjured drivers (61%) and hopper/bottom dumps had the lowest proportion of uninjured drivers (43%), compared with the overall average of 58%. Tanks had the highest proportion of fatalities among drivers at 19%, compared with 13% overall. In general, however, the injury severity distributions are similar among the different trailer body styles.

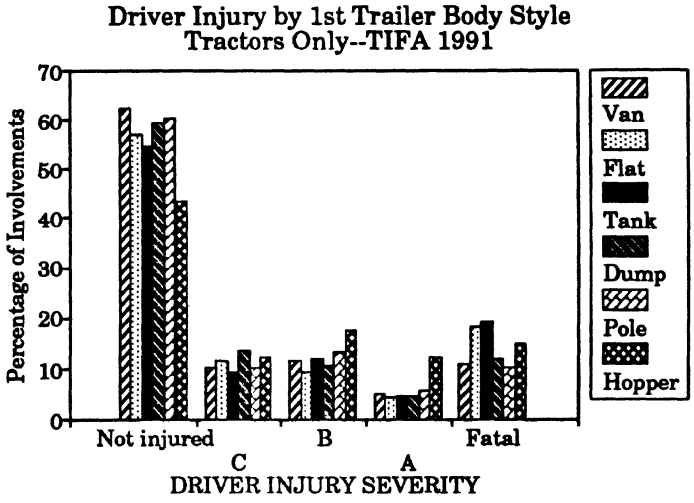


Figure 5-19

TABLE 5-19
Truck Driver Injury Severity by First Trailer Body Style
Tractors Only
TIFA 1991

Injury Severity (Frequencies and Col. Pcts.)	Van	Flatbed	Tank	Dump	Pole/ Log	Hopper	Other	Unk/ No Trail	TOTAL
Not injured	906 61.17	321 56.22	128 54.47	101 59.06	64 60.38	32 42.67	118 62.77	77 47.53	1,747 58.45
C injury, possible	150 10.13	65 11.38	22 9.36	23 13.45	11 10.38	9 12.00	24 12.77	29 17.90	333 11.14
B injury, not incapacitating	169 11.41	52 9.11	28 11.91	18 10.53	14 13.21	13 17.33	9 4.79	14 8.64	317 10.61
A injury, incapacitating	70 4.73	24 4.20	11 4.68	8 4.68	6 5.66	9 12.00	17 9.04	16 9.88	161 5.39
Fatal injury	158 10.67	103 18.04	45 19.15	20 11.70	11 10.38	11 14.67	20 10.64	21 12.96	389 13.01
Unknown if injured	28 1.89	6 1.05	1 0.43	1 0.58	0 0.00	1 1.33	0 0.00	5 3.09	42 1.41
TOTAL	1,481 100.00	571 100.00	235 100.00	171 100.00	106 100.00	75 100.00	188 100.00	162 100.00	2,989 100.00

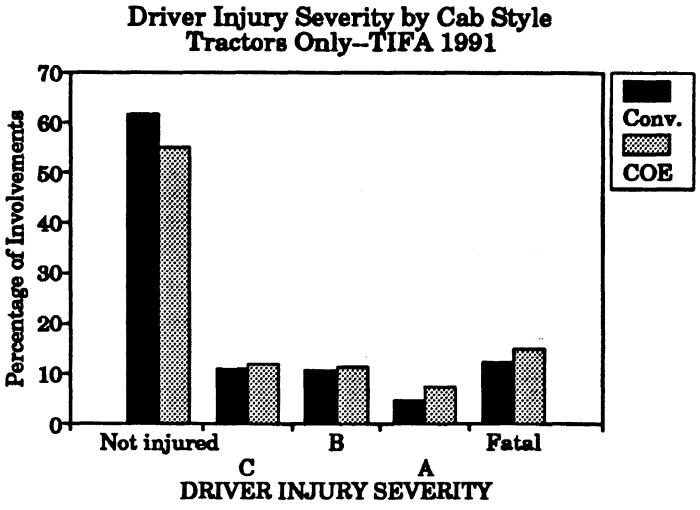


Figure 5-20

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 cabs had higher proportions of uninjured drivers, while the drivers in cabover tractors 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 1991

Injury Severity	Conventional		Cabover/ Cab-forward		Unknown		TOTAL	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Not injured	1,137	60.97%	586	53.86%	24	66.67%	1,747	58.45%
C injury	201	10.78	128	11.76	4	11.11	333	11.14
B injury	196	10.51	120	11.03	1	2.78	317	10.61
A injury	84	4.50	77	7.08	0	0.00	161	5.39
Fatal injury	226	12.12	160	14.71	3	8.33	389	13.01
Unknown if injured	21	1.13	17	1.56	4	11.11	42	1.41
TOTAL	1,865	100.00%	1,088	100.00%	36	100.00%	2,989	100.00%

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 70% of the cases. Noncollisions accounted for 3% of all involvements but 18% of the involvements that were fatal to the truck driver.

TABLE 5-21A
Driver Injury Severity by Principal Impact Point for Tractors—Frequencies TIFA 1991

Principal Impact Point	Driver Injury Severity						
	Not Injured	C	B	A	Fatal	Unknown if injured	TOTAL
Noncollision	5	1	4	4	69	0	83
Right side	187	31	41	16	50	9	334
Rear	302	31	22	6	5	14	380
Left side	292	31	11	12	13	6	365
Front	792	225	225	117	194	10	1,563
Top	2	0	1	1	25	0	29
Undercarriage	130	6	4	3	7	1	151
Override	21	5	7	2	3	0	38
Unknown	16	3	2	0	23	2	46
TOTAL	1,747	333	317	161	389	42	2,989

TABLE 5-21B
Driver Injury Severity by Principal Impact Point for Tractors—Column Percentages TIFA 1991

Principal Impact Point	Driver Injury Severity						
	Not Injured	C	B	A	Fatal	Unk if injured	TOTAL
Noncollision	0.29%	0.30%	1.26%	2.48%	17.74%	0.00%	2.78%
Right side	10.70	9.31	12.93	9.94	12.85	21.43	11.17
Rear	17.29	9.31	6.94	3.73	1.29	33.33	12.71
Left side	16.71	9.31	3.47	7.45	3.34	14.29	12.21
Front	45.33	67.57	70.98	72.67	49.87	23.81	52.29
Top	0.11	0.00	0.32	0.62	6.43	0.00	0.97
Undercar.	7.44	1.80	1.26	1.86	1.80	2.38	5.05
Override	1.20	1.50	2.21	1.24	0.77	0.00	1.27
Unknown	0.92	0.90	0.63	0.00	5.91	4.76	1.54
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

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 over 80% of the known cases in these categories. On the other hand, 83% of the noncollisions resulted in the death of the driver, and the driver was uninjured in only 6% of these cases.

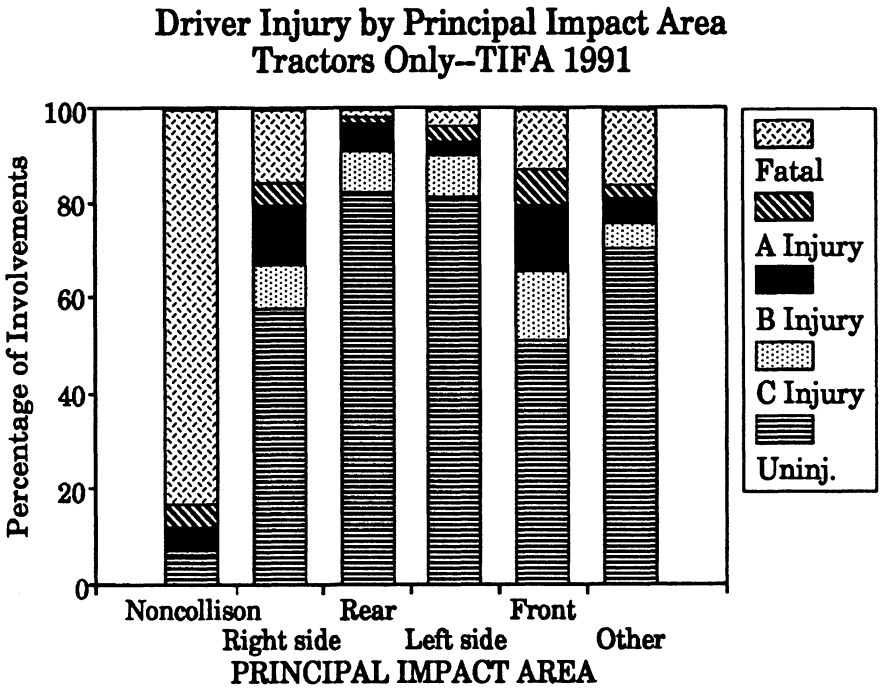


Figure 5-21

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 80% of the involvements did not include any of these events. Rollovers alone occurred in 9.7% of the involvements, but accounted for 12.3% of the cases of drivers with "B" injuries, 24.8% of those with "A" injuries, and 35.2% of those with fatal injuries. Ejections alone took place in 1.5% of the involvements, but represented 8% of the cases in which the driver was killed. Only 2.5% of the involvements included both a rollover and the ejection of the driver, but 18% 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 1991

Occurrence of Rollover/Fire/Ejection	Driver Injury Severity						
	Not Injured	C	B	A	Fatal	Unknown if injured	TOTAL
None	1,665	284	248	92	76	14	2,379
Rollover only	49	26	39	40	137	0	291
Fire only	28	17	19	11	35	4	114
Ejection only	2	2	0	11	31	0	46
Rollover/Fire	2	4	7	1	32	0	46
Fire/Ejection	0	0	0	2	5	0	7
Rollover/Ejection	0	0	3	4	69	0	76
Rollover/Fire/Ejection	0	0	1	0	4	0	5
Unknown	1	0	0	0	0	24	25
TOTAL	1,747	333	317	161	389	42	2,989

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	Unk if injured	TOTAL
None	95.31%	85.29%	78.23%	57.14%	19.54%	33.33%	79.59%
Rollover only	2.80	7.81	12.30	24.84	35.22	0.00	9.74
Fire only	1.60	5.11	5.99	6.83	9.00	9.52	3.81
Ejection only	0.11	0.60	0.00	6.83	7.97	0.00	1.54
Rollover/Fire	0.11	1.20	2.21	0.62	8.23	0.00	1.54
Fire/Ejection	0.00	0.00	0.00	1.24	1.29	0.00	0.23
Roll/Eject	0.00	0.00	0.95	2.48	17.74	0.00	2.54
Roll/Fire/Eject	0.00	0.00	0.32	0.00	1.03	0.00	0.17
Unknown	0.06	0.00	0.00	0.00	0.00	57.14	0.84
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

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 25% of the cases when a fire alone occurred, 17% of the cases when a rollover alone took place, and 4% of the cases when there was only an ejection. Not surprisingly, combinations of these events generally proved more perilous to the driver. In 71% of the cases in which there was a fire and an ejection, and 91% of the cases in which there was a rollover and an ejection, the crash resulted in the death of the driver.

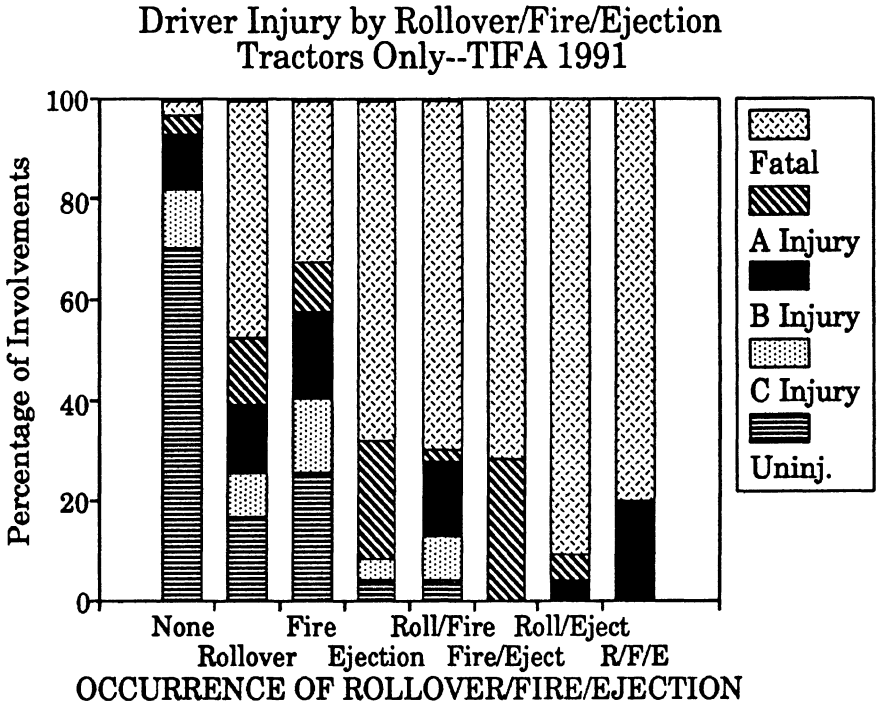
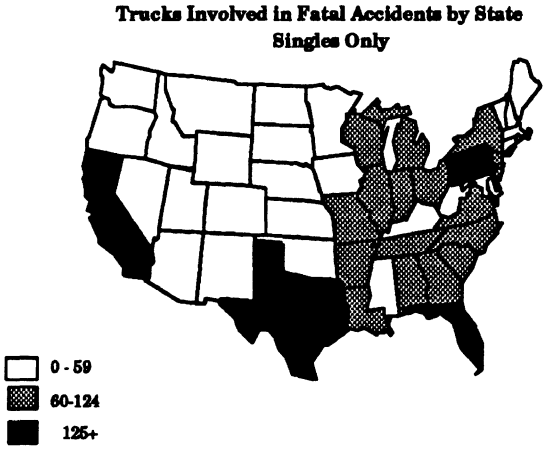


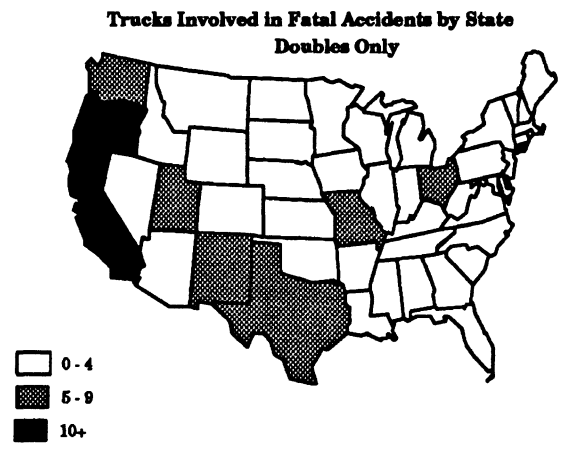
Figure 5-22

MULTIPLE-TRAILER FATAL ACCIDENT INVOLVEMENTS IN 1991

The final section of the 1991 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 were three straight truck - double trailer combinations involved in fatal accidents in 1991. 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 1991 there were 2,659 fatal accidents involving singles and 167 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 1991 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 slightly more likely to have a conventional cab than doubles; (for cases with known cabstyle) 64% of the singles and 60% of the doubles had conventional cabs.

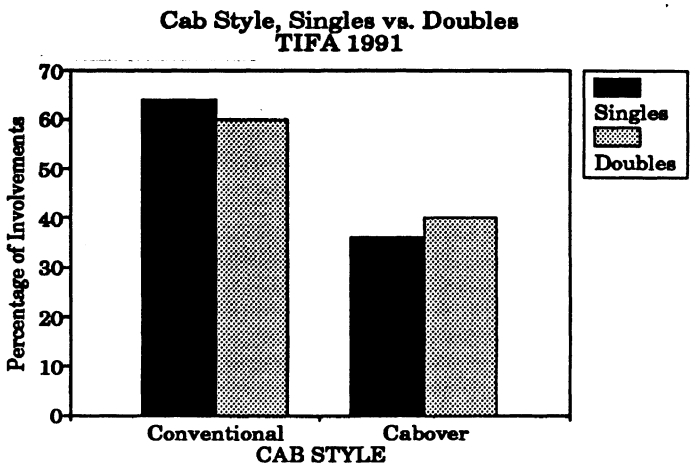


Figure 6-1

TABLE 6-1
Cab Style: Singles vs. Doubles
TIFA 1991

Cab Style	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Conventional	1,689	63.52%	100	59.88%	1,789	63.31%
Cabover/Cab-forward	956	35.95	67	40.12	1,023	36.20
Unknown	14	0.53	0	0.00	14	0.50
TOTAL	2,659	100.00%	167	100.00%	2,826	100.00%

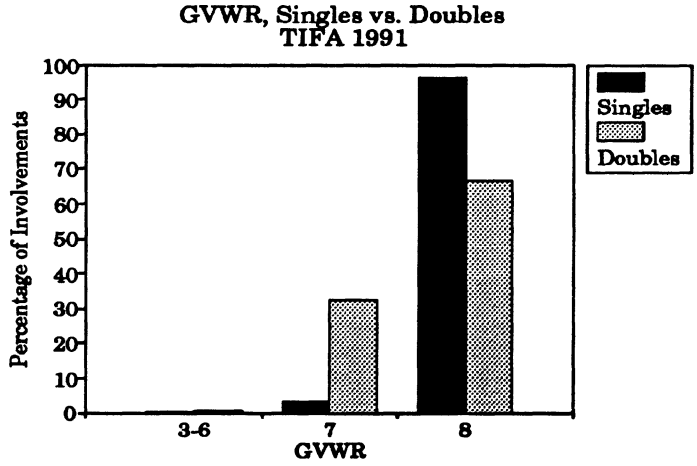


Figure 6-2

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 1991

GVWR Class	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
3	1	0.04%	0	0.00%	1	0.04%
4	1	0.04	0	0.00	1	0.04
5	1	0.04	0	0.00	1	0.04
6	4	0.15	1	0.60	5	0.18
7	94	3.54	51	30.54	145	5.13
8	2,517	94.66	104	62.28	2,621	92.75
Unknown	41	1.54	11	6.59	52	1.84
TOTAL	2,659	100.00%	167	100.00%	2,826	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 34% 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. Almost 56% of the known doubles cases fall into the three heaviest GCW categories, indicating weights of 60,000 pounds and above.

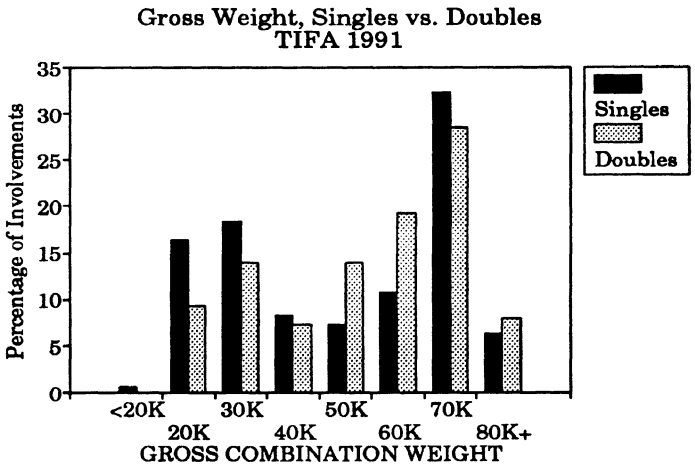


Figure 6-3

TABLE 6-3
Gross Combination Weight: Singles vs. Doubles
TIFA 1991

Gross Weight	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
< 20,000	16	0.60%	0	0.00%	16	0.57%
20,000	410	15.42	14	8.38	424	15.00
30,000	462	17.37	21	12.57	483	17.09
40,000	206	7.75	11	6.59	217	7.68
50,000	183	6.88	21	12.57	204	7.22
60,000	268	10.08	29	17.37	297	10.51
70,000	810	30.46	43	25.75	853	30.18
80,000+	159	5.98	12	7.19	171	6.05
Unknown	145	5.45	16	9.58	161	5.70
TOTAL	2,659	100.00%	167	100.00%	2,826	100.00%

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

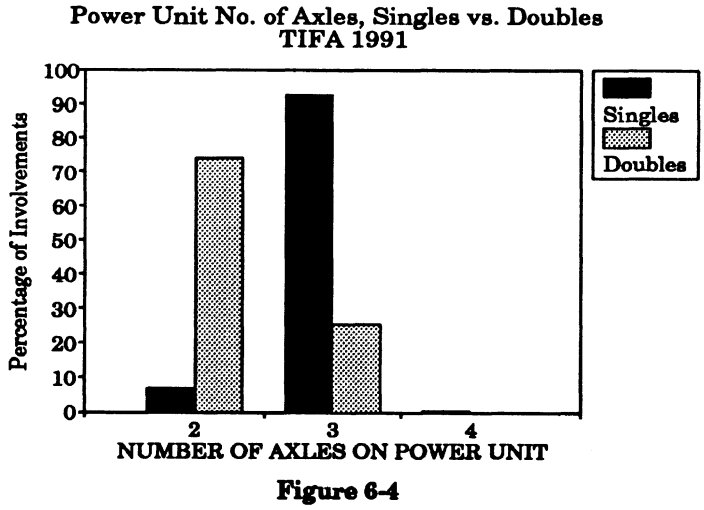


Figure 6-4

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 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 1991

Power Unit No. of Axles	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
2	190	7.15%	124	74.25%	314	11.11%
3	2,451	92.18	43	25.75	2,494	88.25
4	3	0.11	0	0.00	3	0.11
Unknown	15	0.56	0	0.00	15	0.53
TOTAL	2,659	100.00%	167	100.00%	2,826	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, 85% of the involved singles and 77% of the doubles were interstate carriers. Conversely, 14% of the involved singles and 23% of the doubles were intrastate carriers.

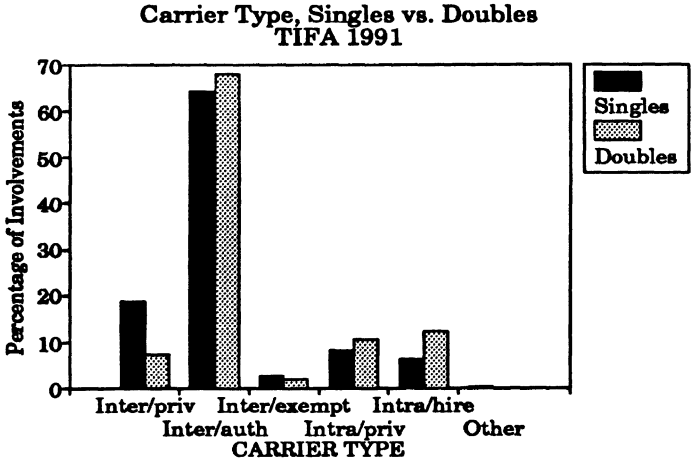


Figure 6-5

TABLE 6-5
Carrier Type: Singles vs. Doubles
TIFA 1991

Carrier Type	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Interstate private	466	17.53%	12	7.19%	478	16.91%
Interstate authorized	1,625	61.11	110	65.87	1,735	61.39
Interstate exempt	62	2.33	3	1.80	65	2.30
Intrastate private	207	7.78	17	10.18	224	7.93
Intrastate for hire	162	6.09	20	11.98	182	6.44
Government owned	6	0.23	0	0.00	6	0.21
Daily rental	7	0.26	0	0.00	7	0.25
Unknown	124	4.66	5	2.99	129	4.56
TOTAL	2,659	100.00%	167	100.00%	2,826	100.00%

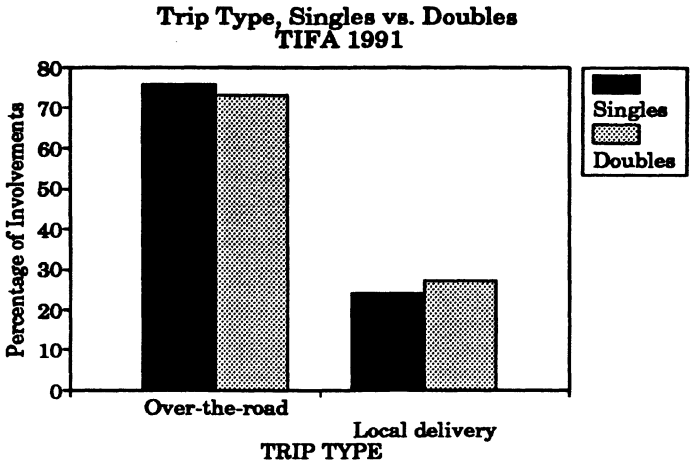


Figure 6-6

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 1991

Trip Type	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Over-the-road	1,944	73.11%	118	70.66%	2,062	72.97%
Local delivery	623	23.43	44	26.35	667	23.60
Unknown	92	3.46	5	2.99	97	3.43
TOTAL	2,659	100.00%	167	100.00%	2,826	100.00%

The road class distributions are shown in the graph at right. Relatively more doubles involvements took place on limited-access highways and fewer on major arteries compared with singles involvements. Of the known cases, 44% of the doubles accidents occurred on limited-access roads and 43% occurred on major arteries. The respective figures for singles were 33% and 56%.

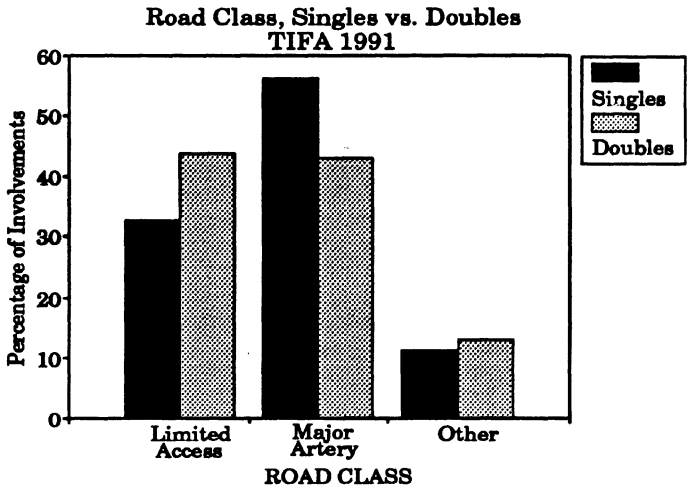


Figure 6-7

TABLE 6-7
Road Class: Singles vs. Doubles
TIFA 1991

Road Class	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Limited Access	866	32.57%	73	43.71%	939	33.23%
Major Artery	1,488	55.96	72	43.11	1,560	55.20
Other	300	11.28	22	13.17	322	11.39
Unknown	5	0.19	0	0.00	5	0.18
TOTAL	2,659	100.00%	167	100.00%	2,826	100.00%

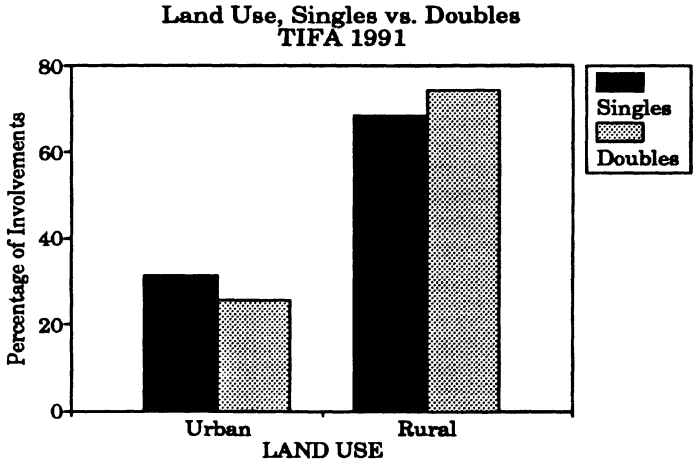


Figure 6-8

The land use distributions, whether the accident took place in a rural or urban area, indicate that while the majority of both singles and doubles involvements occurred in rural areas, the proportion of rural accidents was slightly higher for doubles (74%) than for singles (68%). This difference probably reflects the different travel patterns of these two configurations.

TABLE 6-8
Land Use: Singles vs. Doubles
TIFA 1991

Land Use	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Urban	833	31.33%	43	25.75%	876	31.00%
Rural	1,821	68.48	124	74.25	1,945	68.83
Unknown	5	0.19	0	0.00	5	0.18
TOTAL	2,659	100.00%	167	100.00%	2,826	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 54% of the singles involvements occurred during daylight, compared with 42% of the doubles involvements. On the other hand, 52% of the doubles involvements took place at night, compared with 42% of the singles involvements. This probably reflects a larger proportion of nighttime travel for doubles compared with singles.

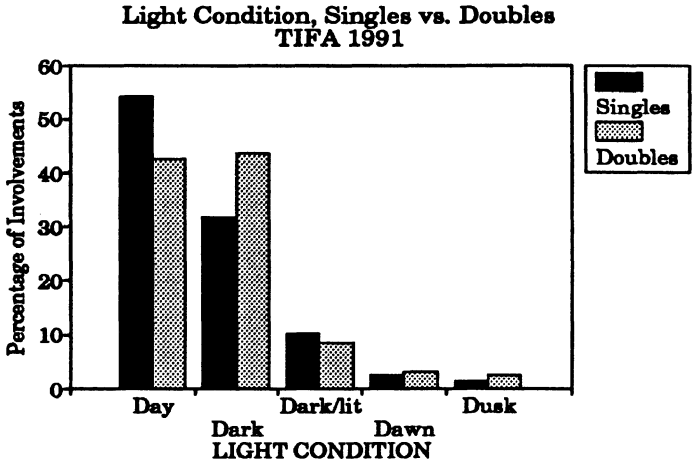


Figure 6-9

TABLE 6-9
Light Condition: Singles vs. Doubles
TIFA 1991

Light Condition	Singles		Doubles		TOTAL	
	Number	Percent	Number	Percent	Number	Percent
Daylight	1,441	54.19%	71	42.51%	1,512	53.50%
Dark, not lighted	843	31.70	73	43.71	916	32.41
Dark, but lighted	270	10.15	14	8.38	284	10.05
Dawn	62	2.33	5	2.99	67	2.37
Dusk	35	1.32	4	2.40	39	1.38
Unknown	8	0.30	0	0.00	8	0.28
TOTAL	2,659	100.00%	167	100.00%	2,826	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 34% from 1989 to 1991 the number of LCV fatal accidents has shown a general increase during the decade.

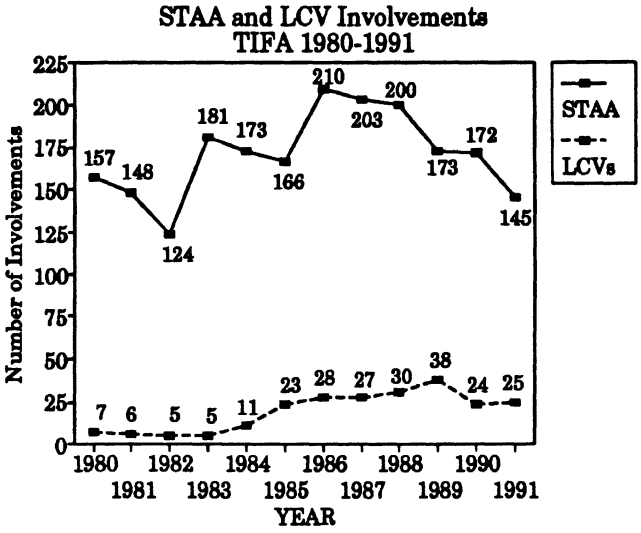


Figure 6-10

TABLE 6-11
Tractor Multiple-Trailer Combination Vehicles
by Configuration Type
TIFA 1991

Configuration Type						
STAA Doubles	Rocky Mtn. Doubles	Turnpike Doubles	Other LCV >75'	Other Double	Triples	Total
145	9	1	14	1	0	170

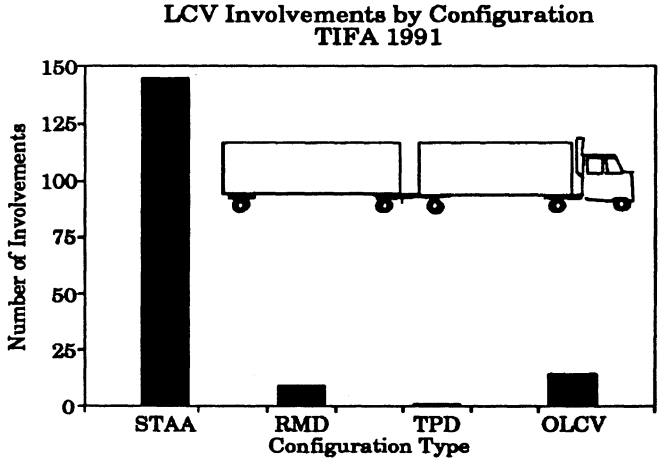


Figure 6-11

The table above and the graph on the left, illustrate the data on multiple-trailer combinations in the 1991 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 9 RMD

fatal involvements in 1991. 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 involved in one fatal accident in 1991. 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. Three 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 double has an unknown overall length and was excluded from the graph. The LCVs comprised just 15% of the tractor and multiple-trailer combinations in fatal accidents and less than 1% of all tractor involvements in 1991.

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