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Large Trucks in FARS and in TIFA, 1999

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16. Abstract

The Federal Motor Carrier Safety Administration (FMCSA) has undertaken a wide variety of programs to improve the safety of truck operations and reduce the toll from traffic accidents. FMCSA is the primary sponsor of the Trucks Involved in Fatal Accidents (TIFA) survey, conducted annually by the Center for National Truck Statistics (CNTS) at the University of Michigan Transportation Research Institute. The TIFA survey is based on the Fatality Analysis Reporting System (FARS) file, which is compiled by NHTSA. The TIFA file is not intended to replace the FARS file but to supplement and enhance the FARS file by improving the identification of trucks in the file and supplying a more detailed description of the physical configuration of trucks involved in a fatal crash.

There are important differences between the set of cases identified in FARS as large trucks and the population of trucks in the TIFA file. The TIFA file identifies about 300 more trucks as involved in a fatal accident than does the FARS file. Among other consequences, TIFA identifies about 5,700 fatalities annually, about 6% more than FARS.

The purpose of this report is to document and discuss some of the differences between truck cases as identified in the FARS file and the cases in UMTRI's TIFA file. There are significant differences in the counts of trucks in each file, as well as some differences in details describing the vehicles. In addition, this report will illustrate some of the detail about the configuration and usage of trucks involved in fatal accidents that the TIFA data collection protocol can provide.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: Volumes greater than 1000 L shall be shown in m^3.				
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celcius temperature	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kpa

APPROXIMATE CONVERSIONS FROM SI UNITS

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

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

(Revised September 1993)

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Introduction: TIFA and FARS

Approximately 5,300 trucks are involved in fatal crashes each year, resulting in about 5,700 fatalities annually. In 1999, then-Secretary of Transportation Rodney Slater set a goal to reduce the number of fatalities in traffic crashes involving trucks by half within 10 years. The Federal Motor Carrier Safety Administration (FMCSA) has undertaken a wide variety of programs to improve the safety of truck operations and reduce the toll from traffic accidents. Central to any effort to reduce the number of deaths from traffic accidents involving trucks, and to measure that reduction, is an accurate accounting of traffic accidents involving trucks. FMCSA is the primary sponsor of the Trucks Involved in Fatal Accidents (TIFA) survey, conducted annually by the Center for National Truck Statistics (CNTS) at the University of Michigan Transportation Research Institute. (Other sponsors of the TIFA program include the National Highway Traffic Safety Administration (NHTSA), the Bureau of Transportation Statistics, and a private-sector affiliates program.)

The TIFA survey covers all medium and heavy trucks involved in a fatal traffic accident in the United States and is intended to provide the most accurate account available of trucks involved in fatal traffic accidents. The TIFA survey is based on the Fatality Analysis Reporting System (FARS) file, which is compiled by NHTSA. The first step in the TIFA data collection protocol is to select in the FARS file vehicles that are classified in the FARS BODY_TYP[1] variable as trucks, as well as vehicles that other variables indicate may be trucks.

The TIFA file is not intended to replace the FARS file but to supplement and enhance it by improving the identification of trucks in the file and supplying a more detailed description of the physical configuration of trucks involved in a fatal crash. The FARS file provides the indispensable first step for the TIFA survey, because FARS provides complete coverage of all fatal traffic crashes and all vehicles and persons involved in those accidents.

However, there are important differences between the set of cases identified in FARS as large trucks and the population of trucks in the TIFA file. The TIFA file identifies about 300 more trucks involved in a fatal accident than does the FARS file. Among other consequences, TIFA identifies about 5,700 fatalities annually, about 6% more than FARS.

The purpose of this report is to document and discuss some of the differences between truck cases as identified in the FARS file and the cases in UMTRI's TIFA file. There are

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[1] Variable names used are those in the SAS™ data file distributed by NHTSA.

significant differences in the counts of trucks in each file, as well as some differences in details describing the vehicles. In addition, this report will illustrate some of the detail about the configuration and usage of trucks involved in fatal accidents that the TIFA data collection protocol provides.

It is important to emphasize that the purpose here is not to diminish in any way either the FARS file or the efforts of the outstanding team that produces it. The FARS file compiled by NHTSA is indispensable to traffic safety research in the United States. Any data collection protocol has limitations. The TIFA program has been designed to supplement and enhance the FARS file. The TIFA protocol permits more detailed data collection than is feasible in FARS. It is hoped that the strengths of the TIFA file can be used to improve the quality of truck data in FARS. Understanding the differences between the two files can contribute to the continued improvement of truck crash data.

Organization of this Report

The first section of the report defines how trucks are identified in the FARS and TIFA files and provides a discussion of how the data are collected in each file. This discussion is followed by an accounting of the overlap between large trucks in the TIFA file and in the FARS file. Some of the consequences of the differing truck totals are discussed.

In the next section, variables from the FARS file that describe trucks are compared with the truck description produced by the TIFA survey.

The final section of the report illustrates some of the detail about trucks and their operation that is produced by the TIFA survey. Truck empty weight, gross weight, and length are considered, as well as operating authority, trip type, accident type, and driver hours.

Large Trucks in FARS and TIFA

The FARS file covers all vehicle types and does not itself explicitly contain a definition of "trucks." However, the definition NHTSA uses to define trucks can be gleaned from *Traffic Safety Facts*, an annual NHTSA publication of crash statistics using the FARS and General Estimates System (GES) files. In *Traffic Safety Facts,* large trucks are defined as "trucks over 10,000 pounds gross vehicle weight rating (GVWR), including single unit trucks and truck tractors."[2] The FARS variables and codes used to identify trucks are given in the *FARS Analytic Reference Guide 1975 to 1999*.[3] Large trucks are identified in FARS primarily using the BODY_TYP variable, or, where the truck type is unknown, whether it is pulling a trailer as indicated in the TOW_VEH variable. NHTSA identifies trucks in the FARS file as trucks with a GVWR over 10,000 pounds (FARS BODY_TYP coded 60, 61, 62,

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[2] *Traffic Safety Facts, 1998*, National Center for Statistics and Analysis, National Highway Traffic Safety Administration, Washington DC, October 1999, p. 201.

[3] National Highway Traffic Safety Administration, Washington DC, n.d., p. V-3.

63, 64, 66, 71, 72, or 78) or an unknown light, medium, or heavy truck type pulling at least one trailer (BODY_TYP coded 79 and TOW_VEH coded 1, 2, 3, or 4). Applying this definition to the FARS file produces the exact count of trucks reported in *Traffic Safety Facts*.

The definition of trucks used for the TIFA project is very similar, with one exception. Trucks in the TIFA file are all trucks with a GVWR over 10,000 pounds, but exclude emergency vehicles such as ambulances or fire trucks. As will be seen below, the exclusion of fire trucks and ambulances accounts for only a small part of the difference between FARS and TIFA. Other than the exclusion of emergency vehicles, both FARS and TIFA count the same types of vehicles as trucks.

Procedures for Collecting Data in FARS and TIFA

FARS analysts in each of the states compile the information that goes into the FARS file. The data are obtained primarily from existing documents within the states, including police accident reports, state vehicle registration files, death certificates, and other state documentation sources. From these documents, the FARS analysts code the FARS data elements. Clarifying calls may be made to the reporting police officer, but, unlike the TIFA survey, the analysts generally do not have the opportunity to collect additional information through follow-up interviews with the involved parties.

The TIFA file is built on the FARS file and is intended to supplement and enhance the FARS file by providing more descriptive detail about trucks in FARS. In selecting cases from FARS, the TIFA methodology includes all the vehicles (with the exception of "emergency vehicle") identified in the FARS BODY_TYP variable as medium or heavy trucks. But the TIFA selection criteria also include other vehicles that, upon investigation, might prove to be trucks. In addition to the vehicles that the FARS BODY_TYP variable shows to be trucks, vehicles coded as light duty or passenger vehicles, but whose vehicle identification number (VIN) indicates a GVWR over 10,000 pounds, are also selected for possible inclusion in the file.

Police reports are acquired from the states for each fatal accident involving a truck. CNTS interviewers then contact persons knowledgeable about the configuration of the vehicle at the time of the accident, typically the owner or driver of the vehicle, or the company safety director. If none of those sources could be contacted, as much information as possible is collected from other parties, such as the police officer who investigated the accident, witnesses, emergency personnel, or the tow truck operator if the vehicle was towed from the scene.

Each case is subjected to a careful review. Over the course of the project, UMTRI has accumulated an extensive collection of information on all aspects of trucks, cargoes, cargo bodies, truck operators, and other subjects that allow TIFA editors to evaluate the quality of the survey information. Similarly, UMTRI maintains a library of Vehicle Identification Number (VIN) decoding manuals that span over 40 years, enabling editors to decode virtually any truck VIN. UMTRI has also accumulated an extensive catalog of information

about a wide range of cargo weights, cargo types, cargo body styles, and other items. This information is used to evaluate the accuracy and completeness of survey responses.

The difference in truck counts between the two files is a result largely of the methods used in the TIFA project to find trucks in the FARS file and of the extra information produced by the additional investigation. The final list of trucks in the TIFA file is the product of two phases. The first is to select cases from FARS that either appear to be trucks or that may be trucks. The second phase is to collect a detailed description of each vehicle to determine if it actually is a truck. The interview process allows cases that might have been miscoded as light vehicles to be identified as trucks and to exclude cases that are coded as trucks in FARS but which, upon investigation, prove to be some other vehicle type.

The balance of this paper will explore some of the consequences of the different procedures in identifying trucks involved in fatal accidents. The consequences include differences in the count of the trucks involved in fatal accidents, the number of fatalities, and differences in details about the physical configuration of the trucks.

The purpose of the comparison is not to criticize the FARS process. The FARS file is an invaluable tool for traffic safety research. It provides the only national census file of fatal traffic accidents, involving all motor vehicle types. The TIFA file is limited to just trucks and is built on the FARS file, but includes more in-depth investigation of the vehicles. It is not surprising that this focused effort produces some differences with the more general FARS file. In the long term, it is hoped that the comparison presented here can contribute to a program that improves the quality of both the TIFA and the FARS files.

FARS File Versions

The FARS version issued during September 2000 was used as a baseline for the 1999 TIFA file and in this analysis. The FARS file is left open for late cases and updated information, with a final version issued in April 2001, after the TIFA file is completed. The second version of FARS (4,920 large truck cases) contains 25 cases not in the first version, and the first version of FARS (4,898 large truck cases) has 3 cases not in the final version, resulting in a total difference of 28 cases between those two versions of FARS. Of the 25 additional cases in the second version, six had the body type variable corrected since version 1, and would not have appeared as a difference between TIFA and FARS. Two of the remaining 19 cases would not have been included in TIFA since they were an ambulance and fire truck. The remaining 17 cases in the second version of FARS (but not first version) would probably have been included in TIFA if that version of the file had been available.

To assess the impact of using the two different versions of the FARS large truck file, we compared the body type variable between the two versions. For the 4,895 cases common to both files, only five cases had a difference in their body type assignment between the two files. Given this minimal variation, it was decided to base the FARS and TIFA variable comparisons (tables 6-11) on the September 2000 version of FARS, the one that was used to build the TIFA file.

Comparison between TIFA Trucks and FARS-Identified Trucks

The comparison of data files is based on the 1999 data years for both FARS and TIFA. Using NHTSA's definition of large trucks in FARS, the 1999 FARS file identifies 4,898 trucks involved in a fatal accident in 1999. The TIFA file for that year has 5,233 trucks, a difference of 335 trucks or about 6.8% more trucks in the TIFA file than FARS. The difference of 335 is the result of 40 cases that are counted in FARS as trucks but do not qualify as trucks in the TIFA file, and 375 cases identified as trucks in TIFA but which are classified as some other type of vehicle in the FARS file.

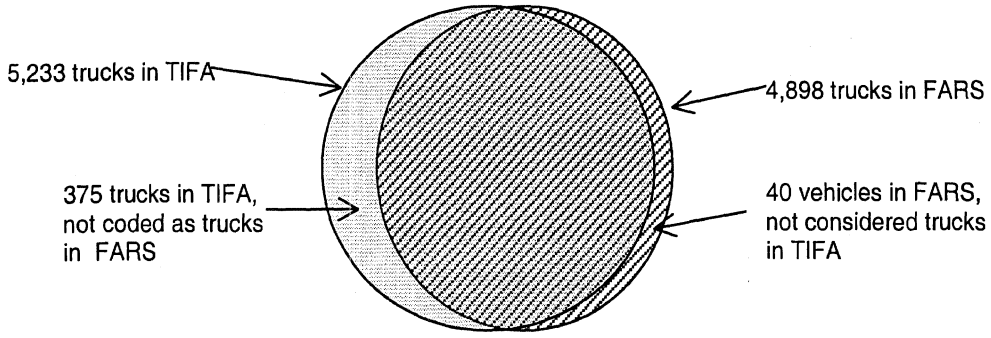

Figure 1: Large Truck Cases in TIFA vs. FARS, 1999

The 40 cases in the FARS large truck file that are not in TIFA include fire trucks, emergency vehicles, and other reasons for exclusion from TIFA (see Table 1). Most of the excluded vehicles are emergency vehicles, but ten of the vehicles were passenger cars or pickup trucks, and the remainder were excluded because they were non-contact vehicles, legally parked at the time of the accident, or because the case was not an accident.

Table 1: Cases in FARS Large Trucks, But Not TIFA by Reason for Exclusion, 1999

Reason Excluded from TIFA	N
Fire truck	15
Emergency vehicle (typically ambulances)	7
Vehicle legally parked	1
Passenger vehicle	2
Not a sampled truck (typically GVWR<3, or road equipment)	8
Not an accident (e.g. heart attack)	2
Other reason non-sampled (e.g. non-contact vehicle, not a vehicle in transport)	5
Total	40

The bulk of the difference in truck totals between FARS and TIFA is a result of the extra 375 trucks identified by TIFA among vehicles that FARS classified as light duty. These are all vehicles classified in FARS as utility vehicles or light trucks with a VIN weight code under 10,000 lbs. Table 2 shows the FARS body type categories and the TIFA combination code as determined by an interview. Over half of the cases (192 of 375) are identified as straight trucks in TIFA, but as pickup trucks in FARS.

Overall, the coding of the VIN truck weight code in FARS for these cases was verified when the TIFA editors decoded the VIN (table 3). Most of the vehicles were class 3 or 4, with a few in higher-rated weight categories.

Table 2: Cases in TIFA, But Not FARS Large Trucks by Configuration, 1999

TIFA Vehicle Combination Code	FARS Body Type Categories	N
Straight truck only	Utility vehicle	12
	Van-based light truck	50
	Pickup truck	192
	Other light truck	19
	Unknown truck type	1
	Unknown body type	4
Straight + full trailer	Pickup truck	3
Straight + other trailer	Utility vehicle	1
	Van-based light truck	6
	Pickup truck	31
	Other light truck	5
Straight + other trailer, gooseneck hitch	Pickup truck	31
	Other light truck	6
Wrecker + tow	Pickup truck	1
	Other light truck	1
	Unknown truck type	1
Tractor semitrailer	Utility vehicle	1
	Unknown body type	1
Unknown	Van-based light truck	2
	Pickup truck	4
	Other light truck	2
	Unknown body type	1
Total		375

Table 3: Cases in TIFA, But Not in FARS Large Trucks by Vehicle Weight, 1999

	FARS VIN truck Weight Code							
TIFA GVWR	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8	Not Coded	Total
Class 3	291	5	0	0	0	0	0	296
Class 4	0	42	0	0	0	0	1	43
Class 6	0	0	0	6	0	0	0	6
Class 7	0	0	0	1	3	0	0	4
Class 8	0	0	0	0	1	4	0	5
Unknown	8	2	1	2	0	0	8	21
Total	299	49	1	9	4	4	9	375

Note: The weight classes have the following ranges: Class 3 10001-14000, Class 4 14001-16000, Class 5 16001-19500, Class 6 19501-26000, Class 7 26001-33000, Class 8 33001 and over.

Counts of Accidents, Trucks, and Fatalities: TIFA and FARS

Significant consequences of the additional trucks identified in the TIFA file include substantially higher counts of accidents, truck involvements, and fatalities from truck crashes. Using the variables to identify trucks in the latest version (April 2001) of the 1999

FARS file, one would estimate that 4,920 trucks were involved in 4,560 fatal traffic accidents. However, the TIFA file for that year produces estimates of 5,233 trucks involved in 4,837 fatal traffic accidents (table 4). The TIFA file contains records on 313 or about 6.4% more trucks, and 277 or about 6.1% more fatal crashes than FARS.

Table 4: Counts of Crashes and Trucks, TIFA and FARS, 1999

	Crash counts	Truck counts	Fatality counts
TIFA	4837	5233	5696
FARS	4560	4920	5380

Counts of fatally injured persons are also substantially higher in the TIFA file than FARS. Table 5 shows the number of fatalities in crashes involving trucks, estimated from FARS and TIFA. The fatalities are classified by whether the fatally injured persons were in the truck, were in the other vehicles, or were non-motorists. For vehicle occupants, the persons were classified as drivers or passengers. Overall, the total number of fatalities from the TIFA database for 1999 is 5,696—316 more fatalities than in FARS-identified truck crashes.

Table 5: Fatalities in Truck Involvements by Occupant Type, 1999

Vehicle and	FARS		TIFA	
Person Type	N	%	N	%
Truck				
Driver	644	12.0	698	12.3
Passenger	113	2.1	136	2.4
Unknown type	2	0.0	2	0.0
Truck total	759	14.1	836	14.7
Other vehicle				
Drivers	3021	56.2	3169	55.6
Passengers	1154	21.4	1216	21.3
Unknown type	5	0.1	6	0.1
Other vehicle total	4180	77.7	4391	77.1
Non-motorists				
In parked vehicle	12	0.2	12	0.2
Pedestrian	349	6.5	371	6.5
Bicyclist	66	1.2	71	1.2
Other/unknown	14	0.3	15	0.3
Non-motorist total	441	8.2	469	8.2
Total	5380	100.0	5696	100.0

An analyst using the TIFA file would report that 698 truck drivers were killed in traffic accidents in 1999, 54 more than in FARS. Overall, the TIFA file shows that 836 truck occupants were killed in traffic accidents, compared with an estimate of 759 from the FARS-identified truck population. Similarly, using the TIFA file would generate an estimate of 4,391 fatalities in non-truck vehicles involved in crashes with a truck, and 469

fatalities among pedestrians, bicyclists, and other non-motorists. These estimates compare with 4,180 non-truck occupants and 441 non-motorists in traffic crashes involving a truck identified in FARS.

Comparisons between TIFA and FARS Truck Variables

The FARS file includes several variables that describe the physical configuration of trucks. These variables include vehicle configuration (V_CONFIG[4]), cargo body style (CARGO_BT), number of trailers (TOW_VEH), gross vehicle weight rating (WGTCD_TR), hazardous materials in the cargo (HAZ_CARG), and number of axles (AXLES). This section presents comparisons between FARS variables (September 2000 FARS version) that describe trucks and the description of those trucks as ascertained through the TIFA interview. Note that most of the 375 cases in TIFA that are not identified in FARS as trucks fall into the FARS NA (not applicable) category on the configuration, cargo body type, and axle count tables.

Truck configuration

Truck configuration in FARS can be determined by combining the information in two variables, vehicle configuration (V_CONFIG) and number of trailers (TOW_VEH). The vehicle configuration variable distinguishes straight trucks from tractors (along with some other information). In combination with the number of trailers, the most common truck configurations can be identified. In the TIFA file, the truck configuration is captured in a single variable that is flexible enough to identify virtually any truck combination on the road. The full range of combination types recorded in the 1999 TIFA file are shown in Table 12 on page 16. In Table 6, truck combinations in TIFA are aggregated to the same common truck configurations identified in the FARS file, to compare truck configuration derived from the FARS file with the truck configuration as determined from the TIFA survey.

Table 6: Comparison of truck configuration in FARS and TIFA, 1999

	FARS vehicle configuration and number of trailers									
	NA		Straight truck		Straight + trailers		Bobtail		Tractor-semitrailer	
TIFA description	N	%	N	%	N	%	N	%	N	%
Straight truck	273	75.6	1080	94.7	57	28.4	7	7.8	27	0.8
Strt truck, 1 trailer	77	21.3	19	1.7	75	37.3	0	0.0	48	1.5
Other strt comb	1	0.3	6	0.5	3	1.5	1	1.1	0	0.0
Tractor, no trailers	0	0.0	19	1.7	3	1.5	74	82.2	29	0.9
Tractor, 1 trailer	1	0.3	14	1.2	53	26.4	8	8.9	3029	95.3
Tractor, 2 trailers	0	0.0	1	0.1	8	4.0	0	0.0	24	0.8
Tractor, 3 trailers	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Other trac comb	0	0.0	0	0.0	2	1.0	0	0.0	0	0.0
Unknown	9	2.5	2	0.2	0	0.0	0	0.0	23	0.7
Total	361	100.0	1141	100.0	201	100.0	90	100.0	3180	100.0

[4] The names in parentheses are the variable names in the SAS® System file available from NHTSA at ftp://ftp.nhtsa.dot.gov/FARS/

Table 6 (continued)

	FARS vehicle configuration and number of trailers							
	Tractor + 2 trailers		Tractor + 3 trailers		Unknown		Total	
TIFA description	N	%	N	%	N	%	N	%
Straight truck	0	0.0	0	0.0	39	30.2	1483	28.3
Strt truck, 1 trailer	0	0.0	0	0.0	5	3.9	224	4.3
Other strt comb	0	0.0	0	0.0	1	0.8	12	0.2
Tractor, no trailers	0	0.0	0	0.0	5	3.9	130	2.5
Tractor, 1 trailer	9	7.4	1	10.0	63	48.8	3178	60.7
Tractor, 2 trailers	112	92.6	5	50.0	1	0.8	151	2.9
Tractor, 3 trailers	0	0.0	2	20.0	0	0.0	2	0.0
Other trac comb	0	0.0	1	10.0	0	0.0	3	0.1
Unknown	0	0.0	1	10.0	15	11.6	50	1.0
Total	121	100.0	10	100.0	129	100.0	5233	100.0

On the most important truck configuration—tractor-semitrailers—the FARS coding is quite good. In 1999, FARS identified 3,180 tractor-semitrailers, while the TIFA file coded 3,178. The TIFA coding agreed with FARS on 95.3% of FARS' tractor-semitrailers. Twenty-seven straight trucks with no trailers and 48 straights with one trailer were coded tractor-semitrailers in FARS. On the other hand, 14 TIFA-identified tractor-semitrailers were coded straight trucks with no trailers in FARS and 53 tractor-semitrailers were coded straight trucks with one or more trailers.

On other truck configurations, the FARS coding agreed with the TIFA codes at a lower rate. FARS identified 1,141 straight trucks with no trailers, while the TIFA file shows 1,483 in 1999. Most of the difference is accounted for by straight trucks miscoded as light vehicles, as shown in the NA column of Table 6. Among FARS-coded straight trucks with trailers, the TIFA file codes 28.4% of those as straights with no trailers and another 26.4% as tractor-semitrailers. TIFA counted 151 doubles combinations in 1999, compared with 121 in FARS. Twenty-four combinations identified as tractor-semitrailers in FARS account for almost all of the difference.

FARS also counts ten tractors with three trailers, while the TIFA survey identified only two. Five of the FARS-identified triples were actually doubles and one was a tractor-semitrailer. Identification of triples and other less common truck-trailer combinations is difficult, given the materials typically available to the FARS analysts, so these results should not be surprising. The TIFA survey methodology, which allows interviewers to probe for details, is better suited to the accurate identification of the broad range of truck combinations that are used.

Truck cargo body type

TIFA and FARS differ on code levels available to classify cargo body type. FARS has a separate category for concrete mixers, while TIFA includes that body style within the 'other'

group. On the other hand, the TIFA cargo body variables[5] provide more detail about cargo bodies than FARS. TIFA includes codes for three different enclosed van types—dry box, refrigerated van, and livestock van—as well as a code for open top vans. Flatbeds can be coded as a flatbed, lowboy, flatbed with mounted equipment, or a flatbed with sides. Tanks are divided into liquid/gas tankers or dry bulk tankers. And dump bodies can be classified as either the typical rear dump or as a bottom dump. TIFA's 'other' category is linked to a separate variable providing a text description of the cargo body type. This is used to describe trucks with concrete mixers, utility booms, drill rigs, or other bodies that do not fit into the specific body classifications.

Table 7 compares cargo body coding in TIFA and FARS. The cargo body classification in FARS is shown in the column headings and the body type as determined from the TIFA interview is shown in the row headings. Overall, there is reasonable agreement in the coding of cargo bodies, but there are some interesting differences in detail. TIFA and FARS had at least a 75% agreement on the coding of vans, cargo tanks, flatbeds, dump trucks, auto transporters, and garbage trucks. Of the 439 unknown body types in FARS, only 5% were unknown in TIFA. Of the 76 unknown types in TIFA, 70% were defined as truck types in FARS.

Table 7: Distribution of TIFA Cargo Body Style vs. FARS Cargo Body Type, 1999

	FARS Cargo Body Type											
	NA		Van/Enclosed box		Cargo Tank		Flatbed		Dump		Concrete Mixer	
TIFA Cargo Body Style	N	%	N	%	N	%	N	%	N	%	N	%
Tractor/no trailer	0	0.0	15	0.7	1	0.3	2	0.3	0	0.0	0	0.0
Van	81	22.3	1340	62.7	32	8.5	27	3.9	9	1.7	1	2.1
Open top van	0	0.0	29	1.4	0	0.0	1	0.1	2	0.4	0	0.0
Refrigerated van	7	1.9	417	19.5	10	2.6	4	0.6	2	0.4	0	0.0
Livestock van	0	0.0	23	1.1	0	0.0	2	0.3	1	0.2	0	0.0
Flatbed	35	9.6	51	2.4	7	1.9	444	64.5	5	0.9	0	0.0
Lowboy	0	0.0	9	0.4	1	0.3	35	5.1	0	0.0	0	0.0
Flatbed w/equipment	3	0.8	2	0.1	1	0.3	20	2.9	0	0.0	0	0.0
Flatbed w/sides	20	5.5	13	0.6	0	0.0	52	7.6	3	0.6	1	2.1
Pole/logging	0	0.0	17	0.8	3	0.8	27	3.9	0	0.0	0	0.0
Tank: liquid/gas	4	1.1	31	1.5	264	69.8	5	0.7	0	0.0	0	0.0
Tank: dry bulk	0	0.0	15	0.7	34	9.0	3	0.4	4	0.7	0	0.0
Auto carrier	0	0.0	5	0.2	1	0.3	0	0.0	1	0.2	0	0.0
Dump	19	5.2	77	3.6	4	1.1	16	2.3	444	83.1	1	2.1
Bottom dump/hopper	0	0.0	31	1.5	5	1.3	2	0.3	43	8.1	0	0.0
Garbage/refuse	0	0.0	7	0.3	0	0.0	2	0.3	14	2.6	0	0.0
Other body type	185	50.8	43	2.0	12	3.2	46	6.7	3	0.6	45	93.8
Unknown	10	2.7	12	0.6	3	0.8	0	0.0	3	0.6	0	0.0
Total	364	100.0	2137	100.0	378	100.0	688	100.0	534	100.0	48	100.0

[5] Cargo body type is coded separately for each unit in a truck combination.

Table 7 (continued)

	FARS Cargo Body Type											
	Auto Transporter		Garbage/ Refuse		Other Truck Body		Unknown Truck body		Unknown Type		Total	
TIFA Cargo Body Style	N	%	N	%	N	%	N	%	N	%	N	%
Tractor/no trailer	0	0.0	0	0.0	98	19.3	15	3.5	0	0.0	131	2.5
Van	2	7.1	3	2.7	51	10.1	116	27.3	3	21.4	1665	31.8
Open top van	0	0.0	1	0.9	11	2.2	5	1.2	0	0.0	49	0.9
Refrigerated van	0	0.0	1	0.9	20	3.9	33	7.8	0	0.0	494	9.4
Livestock van	0	0.0	0	0.0	18	3.6	3	0.7	0	0.0	47	0.9
Flatbed	2	7.1	0	0.0	25	4.9	31	7.3	4	28.6	604	11.5
Lowboy	0	0.0	0	0.0	7	1.4	3	0.7	1	7.1	56	1.1
Flatbed w/equipment	0	0.0	0	0.0	4	0.8	8	1.9	0	0.0	38	0.7
Flatbed w/sides	0	0.0	1	0.9	7	1.4	15	3.5	0	0.0	112	2.1
Pole/logging	0	0.0	1	0.9	70	13.8	20	4.7	0	0.0	138	2.6
Tank: liquid/gas	0	0.0	0	0.0	17	3.4	17	4.0	0	0.0	338	6.5
Tank: dry bulk	0	0.0	0	0.0	6	1.2	10	2.4	0	0.0	72	1.4
Auto carrier	21	75.0	0	0.0	1	0.2	4	0.9	0	0.0	33	0.6
Dump	0	0.0	7	6.4	46	9.1	59	13.9	1	7.1	674	12.9
Bottom dump/hopper	0	0.0	0	0.0	24	4.7	11	2.6	0	0.0	116	2.2
Garbage/refuse	0	0.0	92	83.6	9	1.8	11	2.6	0	0.0	135	2.6
Other body type	3	10.7	3	2.7	69	13.6	42	9.9	4	28.6	455	8.7
Unknown	0	0.0	1	0.9	24	4.7	22	5.2	1	7.1	76	1.5
Total	28	100.0	110	100.0	507	100.0	425	100.0	14	100.0	5233	100.0

Three types of vans are defined in the TIFA file: van, refrigerated van, and livestock carrier. A total of 2,206 vans are identified in the TIFA file, and 2,137 among FARS trucks. This is good agreement considering totals for the body type, but only 1,780 (80.7%) of TIFA vans were also identified as vans in FARS, a difference of 426. One-hundred and fifty-two were classified in the FARS file as unknown body type, 89 as other body type, 88 as not-applicable, 33 as flatbeds, 42 as tankers, and 29 as open top vans.

Both files also identified a similar number of cargo tanks—410 in the TIFA file and 378 in FARS—but there were differences in the specific vehicles that were coded as tanks. TIFA differentiates those carrying liquid or gaseous cargoes from those hauling dry bulk. Only 298 (72.7%) of the 410 tanks identified in TIFA were also coded as cargo tanks in FARS. The most common cargo body code in FARS for these tanks was enclosed van (46), followed by unknown body type (27), and other truck body (23).

TIFA defines four categories of flatbed trucks: flatbed, lowboy, flatbed with equipment, and flatbed with sides. Of 810 flatbed trucks identified in TIFA, 551 or 68.0% were coded as flatbeds in FARS. The remaining 259 cases were mainly designated in FARS as enclosed vans (75), unknown body (57), other truck body (43), and not applicable (58). TIFA also identified 674 trucks with dump bodies in 1999; FARS reported 534 dump cargo bodies. Of the 674 dump trucks, only 444 (65.9%) were coded with dump bodies in FARS. Of the remainder, 77 were coded with a van body, 59 with an unknown body type, and 46 with an "other" body type.

Overall, the TIFA file offers more detail on cargo bodies and the interview survey technique produces low missing data rates. Of the 5,233 trucks in the TIFA file, the FARS cargo body variable included 9.7% with an "other" body type, 8.1% with an unknown body type, and a further 7.0% were essentially missing data because they were coded "not-applicable." In contrast, 8.7% of the trucks were coded with an "other" body style, fully described in a text field, and only 1.5% of the cases had an unknown cargo body type.

For the power unit and each trailer, type of cargo carried is also available, such as general freight, building materials, and solids in bulk. There is also a text data element providing a more precise description of the cargo being carried (such as "auto parts in bins," "carpet and padding," "cattle – 25 dairy cows," "propane in cylinders," and so on).

Number of trailers

TIFA and FARS had approximately 94% agreement on the coding of trucks with no trailers and with one trailer (table 8). Of the 152 doubles combinations, 120 were coded with two trailers in FARS, 26 were coded with one trailer, and five were coded with three trailers. Thirteen of the cases coded in FARS with two trailers were found to have only one by the TIFA survey. In the FARS two unknown categories (trailer present but unknown number of trailers and number of trailers unknown), 59% of the 39 cases were assigned one trailer in TIFA. Of TIFA's 50 unknown cases, 70% were in the FARS one-trailer category.

Table 8: Distribution of TIFA Trailers vs. FARS Towed Trailing Unit, 1999

TIFA trailers	FARS Towed Trailing Unit													
			FARS Trailers Present											
	None		1		2		3 or More		Unknown		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
None	1486	93.8	124	3.6	1	0.7	1	9.1	3	25.0	11	40.7	1626	31.1
1	85	5.4	3280	94.7	13	9.7	1	9.1	7	58.3	16	59.3	3402	65.0
2	1	0.1	26	0.8	120	89.6	5	45.5	0	0.0	0	0.0	152	2.9
3	0	0.0	0	0.0	0	0.0	3	27.3	0	0.0	0	0.0	3	0.1
Unknown	12	0.8	35	1.0	0	0.0	1	9.1	2	16.7	0	0.0	50	1.0
Total	1584	100.0	3465	100.0	134	100.0	11	100.0	12	100.0	27	100.0	5233	100.0

Although FARS does not specifically identify triples by configuration, this table shows eleven cases of trucks coded with three or more trailers. In contrast, the TIFA survey found three truck combinations with three trailers. Two of these were a "triples" combination, consisting of a tractor pulling three trailers, and one was a tractor-jeep-full trailer-jeep combination.[6] The other eight trucks coded in FARS with three trailers were found to consist of five doubles, one tractor-semitrailer, one tractor with three saddlemount tractors, and one combination that could not be determined.

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[6] "Jeeps" are a set of axles with a fifth-wheel and kingpin that supplement trailer axles and increase a unit's load capacity.

Gross vehicle weight rating

In comparing FARS VIN truck weight code with TIFA's GVWR (Table 9), there was at least 81% agreement across all weight categories, and 99% agreement on the Class 8 vehicles. The largest discrepancy was in the 57 cases FARS identified as Class 7, that were found to be Class 8 in the TIFA survey. Further investigation determined that 27 of these cases had three axles on the power unit, and two cases had four power unit axles. These could be cases where axles were added to the truck, thus increasing the GVWR. Of 499 trucks with unknown GVWR in FARS, 71% were coded as Class 8 in TIFA.

Table 9: Distribution of TIFA GVWR vs. FARS VIN Truck Weight Code, 1999

TIFA GVWR	FARS VIN Truck Weight Code															
	Class 3		Class 4		Class 5		Class 6		Class 7		Class 8		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Class 3	337	97.1	9	6.3	0	0.0	1	0.5	0	0.0	0	0.0	2	0.4	349	6.7
Class 4	1	0.3	123	86.6	0	0.0	1	0.5	0	0.0	0	0.0	1	0.2	126	2.4
Class 5	0	0.0	0	0.0	31	86.1	2	0.9	0	0.0	0	0.0	0	0.0	33	0.6
Class 6	0	0.0	0	0.0	0	0.0	191	88.8	3	0.7	0	0.0	9	1.8	203	3.9
Class 7	0	0.0	2	1.4	0	0.0	8	3.7	352	81.1	3	0.1	9	1.8	374	7.1
Class 8	0	0.0	0	0.0	0	0.0	3	1.4	57	13.1	3523	99.0	355	71.1	3938	75.3
Unknown	9	2.6	8	5.6	5	13.9	9	4.2	22	5.1	34	1.0	123	24.6	210	4.0
Total	347	100.0	142	100.0	36	100.0	215	100.0	434	100.0	3560	100.0	499	100.0	5233	100.0

Note: The weight classes have the following ranges: Class 3 10001-14000, Class 4 14001-16000, Class 5 16001-19500, Class 6 19501-26000, Class 7 26001-33000, Class 8 33001 and over.

Hazardous cargo

As shown in Figure 2, TIFA identified 199 trucks carrying hazardous cargo, compared with 214 cases in FARS. The comparison shows a surprising amount of mismatch between FARS coding and the results of the TIFA survey. Only 126 cases were indicated as 'yes' in both files. Of the 199 cases in TIFA with hazardous cargo, FARS coded 69 as not carrying hazardous cargo ("hazmat"), and four as unknown. Likewise, of the 214 FARS cases with hazmat, TIFA determined that 87 did not have hazmat in the cargo, with one unknown.

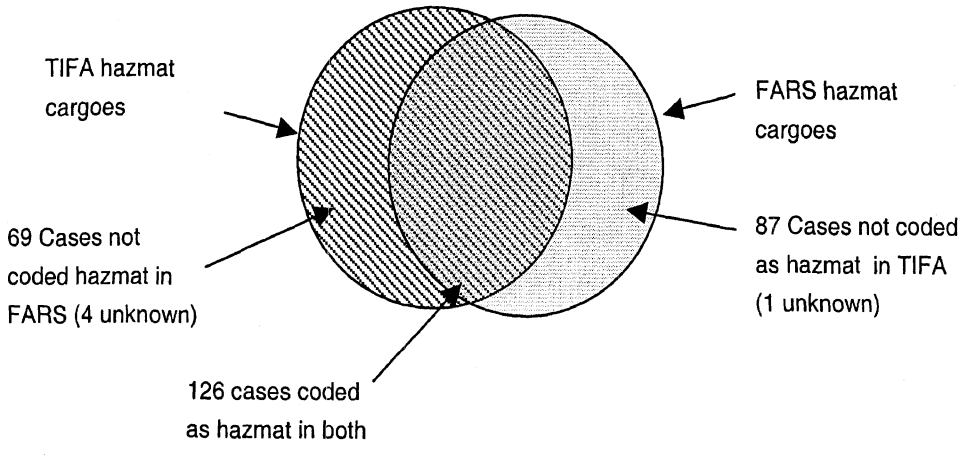

Figure 2: Hazardous Cargo Cases, 1999

Table 10 TIFA vs. FARS Coding of Hazardous Cargo, 1999												
	FARS Hazardous Cargo											
TIFA Hazardous Cargo	No		Yes, Placard		Yes, But No Placard		Yes, Unk. if Placard		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Yes	69	1.4	102	60.0	3	20.0	21	72.4	4	3.6	199	3.8
No	4627	94.3	67	39.4	12	80.0	8	27.6	89	80.9	4803	91.8
NA*	108	2.2	0	0.0	0	0.0	0	0.0	2	1.8	110	2.1
Unknown	105	2.1	1	0.6	0	0.0	0	0.0	15	13.6	121	2.3
Total	4909	100.0	170	100.0	15	100.0	29	100.0	110	100.0	5233	100.0

* Note: These are all bobtail tractors.

It is unknown why the discrepancy between FARS and TIFA coding of hazardous cargo is so great. In the TIFA data collection protocol, interviewers ask knowledgeable respondents whether the cargo was placarded, and they also determine the specific cargo. The cargo type information serves as a double-check on the hazardous materials placard, since the TIFA editors have information on the types of materials that require hazmat placards. The ability to interview involved parties and the cross-check provided by determining the actual cargo should help to improve the accuracy of the information.

Number of axles

Table 11 compares the number of axles on the trucks as recorded in the TIFA and FARS files. In the TIFA file, lift axles are distinguished from fixed axles, though they are combined in the table below.

Table 11: TIFA vs. FARS Coding of Number of Axles, 1999												
	FARS Number of Axles											
TIFA Axles	NA		2		3		4		5		6	
	N	%	N	%	N	%	N	%	N	%	N	%
2	283	75.7	487	85.7	23	4.2	2	0.7	11	0.4	2	1.2
3	13	3.5	46	8.1	394	72.0	12	4.4	28	1.1	3	1.9
4	61	16.3	23	4.0	44	8.0	199	73.7	30	1.2	1	0.6
5	8	2.1	7	1.2	79	14.4	50	18.5	2484	95.8	69	42.9
6	0	0.0	1	0.2	4	0.7	5	1.9	23	0.9	83	51.6
7	0	0.0	1	0.2	0	0.0	0	0.0	7	0.3	2	1.2
8	0	0.0	0	0.0	2	0.4	0	0.0	2	0.1	1	0.6
9+	0	0.0	0	0.0	1	0.2	1	0.4	1	0.0	0	0.0
Unknown	9	2.4	3	0.5	0	0.0	1	0.4	7	0.3	0	0.0
Total	374	100.0	568	100.0	547	100.0	270	100.0	2593	100.0	161	100.0

Table 11 (continued)

TIFA Axles	FARS Number of Axles									
	7		8		9 or More		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%
2	1	1.9	0	0.0	0	0.0	156	25.2	965	18.4
3	0	0.0	0	0.0	0	0.0	70	11.3	566	10.8
4	0	0.0	0	0.0	0	0.0	39	6.3	397	7.6
5	15	28.3	3	15.0	5	18.5	269	43.4	2989	57.1
6	4	7.5	2	10.0	0	0.0	19	3.1	141	2.7
7	28	52.8	3	15.0	0	0.0	7	1.1	48	0.9
8	4	7.5	9	45.0	1	3.7	4	0.6	23	0.4
9+	1	1.9	3	15.0	21	77.8	2	0.3	30	0.6
Unknown	0	0.0	0	0.0	0	0.0	54	8.7	74	1.4
Total	53	100.0	20	100.0	27	100.0	620	100.0	5233	100.0

There was better agreement between the two files for some truck combinations than others. The TIFA survey documented 965 two-axle trucks. Of these, 487 (50.5%) were reported in the FARS file with two axles. Most of the remainder (283) were classified as "not-applicable" because they were not identified as trucks in FARS. The AXLES variable was coded unknown in 156 cases identified as two-axle trucks in TIFA. The TIFA file also recorded 566 trucks with three axles. Coding in FARS agreed for 394 (69.6%), but 70 were coded "unknown" and 28 were coded with five axles. Agreement was best for five-axle truck combinations. Most of these are the typical two-axle tractor, three-axle trailer combination. Of the 2,989 five-axle combinations, 2,484 (83.1%) were coded with five axles in FARS. Two-hundred sixty-nine were coded "unknown" in FARS, 79 with three axles, 69 with six axles, and 50 with four.

Additional Detail Available in TIFA

The tables in this section highlight some of the additional detail that is available from the TIFA survey, but which is not captured in FARS. The purpose of including them here is to illustrate the type of detail the TIFA file provides to supplement and enhance the FARS file. Most of the information presented here would be difficult or impossible to collect within the FARS system. But it is very obtainable through the TIFA process of direct interviews with knowledgeable parties.

The tables in this section relate to the physical description of the truck and cargo, crash events, and details of how the truck was operated.

As shown in Table 12, the vehicle combination variable in TIFA specifies many more truck configurations than are available in FARS, allowing a more precise determination of the units comprising each particular vehicle. This variable is derived from a text variable in the survey that allows virtually any truck combination to be specified precisely. Different unit

types (tractor, straight truck, semitrailer, other trailer, A-dolly, B-train, etc.) are assigned letter codes. The truck combination variable is constructed by stringing together the letter codes. For example, a "TSAS" code indicates a combination consisting of a tractor, a semitrailer, an A-dolly, and a semitrailer.

TIFA's detail is particularly apparent in the classification of combination vehicles. Virtually any specific combination can be identified. Wreckers with a towed vehicle (one axle off the ground) are distinguished from wreckers towing a vehicle that is in turn towing a trailer. The different types of connections (A- or C-dolly or B-train) used in doubles and triples are recognized. Special combinations with sets of additional axles called "jeeps" can also be identified. Tractor and straight truck saddlemount combinations can be differentiated, including the number of saddlemounted vehicles. (A saddlemount is a device attached to the fifth-wheel of a tractor or frame of a straight truck with no cargo body, that holds the front axle of a trailing vehicle. They are used in "piggyback" operations, so that one vehicle can tow multiple other vehicles.) There is even a code for a bobtail tractor with cargo.

Table 12: Truck Involvements in Fatal Crashes by Truck Configuration, TIFA 1999

Configuration	N	%
Straight trucks		
Straight truck only	1483	28.3
Straight truck, 1 trailer		
Straight + full trailer	54	1.0
Straight + other	126	2.4
Straight + other, gooseneck hitch	44	0.8
Subtotal	224	4.3
Other straight combinations		
Wrecker + tow	10	0.2
Wrecker towing straight + full trailer	1	0.0
Straight truck, two saddlemount straights	1	0.0
Subtotal	12	0.2
Total straight trucks	1719	32.8
Tractor combinations		
Tractor, no trailers		
Bobtail tractor	110	2.1
Tractor carrying cargo	20	0.4
Subtotal	130	2.5
Tractor, 1 trailer		
Tractor and semitrailer	3159	60.4
Tractor + other	18	0.3
Tractor + full trailer	1	0.0
Subtotal	3178	60.7
Tractor, 2 trailers		
Double with A dolly	87	1.7
Double, B train	1	0.0
Tractor + semitrailer + full trailer	62	1.2
Tractor + semitrailer + other trailer	1	0.0
Subtotal	151	2.9
Tractor, 3 trailers		
Triple with A dollies	2	0.0
Subtotal	2	0.0
Other tractor combinations		
Tractor + semitrailer + jeep	1	0.0
Tractor + jeep + full trailer + jeep	1	0.0
Tractor + 3 saddlemount tractors	1	0.0
Subtotal	3	0.1
Total tractors	3464	66.2
Unknown	50	1.0
Grand total	5233	100.0

Table 13 shows some of the detail available from TIFA's accident type data element. This variable is modeled after the accident type variable in NHTSA's General Estimates System file. Using the same coding rules as GES allows TIFA data to be combined with GES data on truck crashes to cover all crash severities. The accident type variable can be used to capture the relative position and movement of each vehicle within an accident, allowing almost 100 different vehicle roles to be recorded. The table shows one way this information can be grouped.

Table 13: Truck Involvements in Fatal Crashes by Accident Type and Truck Configuration, TIFA 1999

	Straight Truck		Straight, 1 Trailer		Bobtail		Tractor-Semitrailer		Tractor-2 Trailers		Other Truck Type		Unknown		Total	
Accident Type	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Single vehicle																
Ran off road	124	8.4	14	6.3	18	13.8	273	8.6	12	7.9	6	16.7	0	0.0	447	8.5
Hit object in road	152	10.2	22	9.8	14	10.8	199	6.3	17	11.3	1	2.8	1	2.0	406	7.8
Same direction, same trafficway																
Rearend, truck striking	56	3.8	11	4.9	5	3.8	208	6.6	13	8.6	0	0.0	0	0.0	293	5.6
Rearend, truck struck	134	9.0	11	4.9	8	6.2	273	8.6	9	6.0	2	5.6	4	8.0	441	8.4
Sideswipe, in other's lane	8	0.5	2	0.9	3	2.3	32	1.0	2	1.3	0	0.0	0	0.0	47	0.9
Sideswipe, in truck's lane	18	1.2	4	1.8	0	0.0	70	2.2	4	2.6	1	2.8	0	0.0	97	1.9
Opposite direction, same trafficway																
Head-on, in other's lane	54	3.6	7	3.1	6	4.6	42	1.3	3	2.0	0	0.0	0	0.0	112	2.1
Head-on, in truck's lane	186	12.5	26	11.6	17	13.1	330	10.4	19	12.6	2	5.6	0	0.0	580	11.1
Sideswipe, in other's lane	18	1.2	3	1.3	6	4.6	20	0.6	4	2.6	0	0.0	0	0.0	51	1.0
Sideswipe, in truck's lane	87	5.9	18	8.0	6	4.6	216	6.8	6	4.0	7	19.4	0	0.0	340	6.5
Change trafficway, one vehicle turning																
Truck turn across path	57	3.8	12	5.4	3	2.3	116	3.7	11	7.3	2	5.6	0	0.0	201	3.8
Other turn across path	124	8.4	15	6.7	10	7.7	177	5.6	5	3.3	2	5.6	0	0.0	333	6.4
Intersecting paths, both going straight																
Truck into side of other	204	13.8	20	8.9	16	12.3	294	9.3	8	5.3	1	2.8	0	0.0	543	10.4
Other into side of truck	53	3.6	9	4.0	1	0.8	136	4.3	8	5.3	1	2.8	0	0.0	208	4.0
Other accident types																
Truck backed into other	5	0.3	1	0.4	0	0.0	25	0.8	0	0.0	0	0.0	0	0.0	31	0.6
Other backed into truck	1	0.1	0	0.0	0	0.0	2	0.1	1	0.7	0	0.0	0	0.0	4	0.1
Untripped roll	17	1.1	2	0.9	0	0.0	52	1.6	0	0.0	1	2.8	0	0.0	72	1.4
Other	158	10.7	43	19.2	15	11.5	597	18.9	24	15.9	10	27.8	1	2.0	848	16.2
Unknown	27	1.8	4	1.8	2	1.5	97	3.1	5	3.3	0	0.0	44	88.0	179	3.4
Total	1483	100.0	224	100.0	130	100.0	3159	100.0	151	100.0	36	100.0	50	100.0	5233	100.0

The accident type variable can be very useful in a variety of applications. In a head-on collision, knowing which vehicle crossed the centerline is a crucial first step in developing preventive measures. Understanding the relative motion of the vehicles prior to impact can help identify priorities for collision avoidance technologies or for reducing the aggressivity of heavy trucks.

Table 14 and Figure 3 display TIFA's empty combination weight and gross combination weight variables. Empty weight and cargo weight are determined in the TIFA survey for

each unit in a truck combination. Empty combination weight is the sum of the empty weights for the power unit and any trailers. Table 14 shows the empty weights of various tractor combinations. Virtually all bobtails (tractor, no trailers) weighed between 10,000 and 20,000 pounds. Over 80% of tractor-semitrailers involved in fatal crashes in 1999 had an empty weight between 25,000 and 35,000 pounds. Most doubles fell into that range, though almost 18% had empty weights between 35,000 and 50,000 pounds.

Table 14: Truck Involvements in Fatal Crashes by Empty Combination Weight and Configuration tractor combinations, TIFA 1999

Empty Combination Weight (lbs)	Tractor, no Trailers		Tractor, 1 Trailer		Tractor, 2 Trailers		Tractor, 3 Trailers		Other Tractor combs.		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
5,000 or less	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	1	0.0
5,001-10,000	1	0.8	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
10,001-15,000	22	16.9	9	0.3	0	0.0	0	0.0	0	0.0	31	0.9
15,001-20,000	102	78.5	29	0.9	0	0.0	0	0.0	1	33.3	132	3.8
20,001-25,000	3	2.3	167	5.3	4	2.6	0	0.0	0	0.0	174	5.0
25,001-30,000	0	0.0	1321	41.6	64	42.4	0	0.0	0	0.0	1385	40.0
30,001-35,000	0	0.0	1319	41.5	44	29.1	1	50.0	0	0.0	1364	39.4
35,001-40,000	0	0.0	172	5.4	10	6.6	1	50.0	0	0.0	183	5.3
40,001-45,000	0	0.0	17	0.5	10	6.6	0	0.0	0	0.0	27	0.8
45,001-50,000	0	0.0	2	0.1	7	4.6	0	0.0	0	0.0	9	0.3
50,001-55,000	0	0.0	1	0.0	6	4.0	0	0.0	0	0.0	7	0.2
55,001-60,000	0	0.0	0	0.0	1	0.7	0	0.0	0	0.0	1	0.0
60,001-65,000	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
65,001-70,000	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	1	0.0
70,001-75,000	0	0.0	3	0.1	0	0.0	0	0.0	0	0.0	3	0.1
75,001-80,000	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	1	0.0
80,001 and over	0	0.0	2	0.1	0	0.0	0	0.0	1	33.3	3	0.1
Unknown	2	1.5	133	4.2	5	3.3	0	0.0	1	33.3	141	4.1
Total	130	100.0	3178	100.0	151	100.0	2	100.0	3	100.0	3464	100.0

Gross combination weight reflects the actual weight of the combination at the time of the crash, including truck and cargo weights. The figure reflects differences in the operating gross weights of straight trucks, tractor-semitrailer, and doubles combinations. For example, the tractor-semitrailer curve shows two peaks, one in the 25,000 to 35,000 pound range, which corresponds to typical empty weights, and the other in the 70,000 to 80,000 pound range, corresponding to a fully loaded condition. The curve for doubles shows a more uniform distribution between 30,000 pounds and 80,000 pounds, while the most frequent gross weight for straight trucks is between 10,000 and 20,000 pounds. But note that about 13% of doubles had gross weights greater than 100,000 pounds.

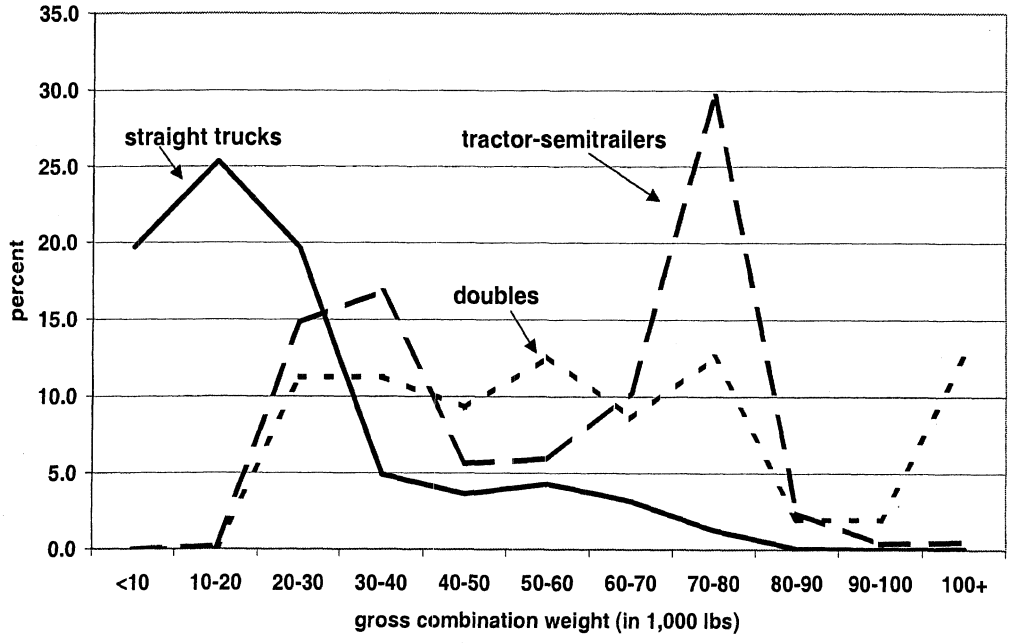

Figure 3: Truck Involvements in Fatal Crashes by Gross Combination Weight for Straight Trucks, Tractor-Semitrailers, and Doubles, TIFA 1999

Figure 4 shows the distribution of overall length for the same three truck configurations. Most tractor-semitrailers involved in a fatal crash were reported with lengths between 61 and 65 feet. But note the wide range of lengths represented, from combinations shorter than 40 feet, to tractor-semitrailers longer than 80. Doubles also have a wide range of overall lengths, with the most frequent value between 71 and 75 feet. A substantial majority of straight trucks were less than 30 feet long.

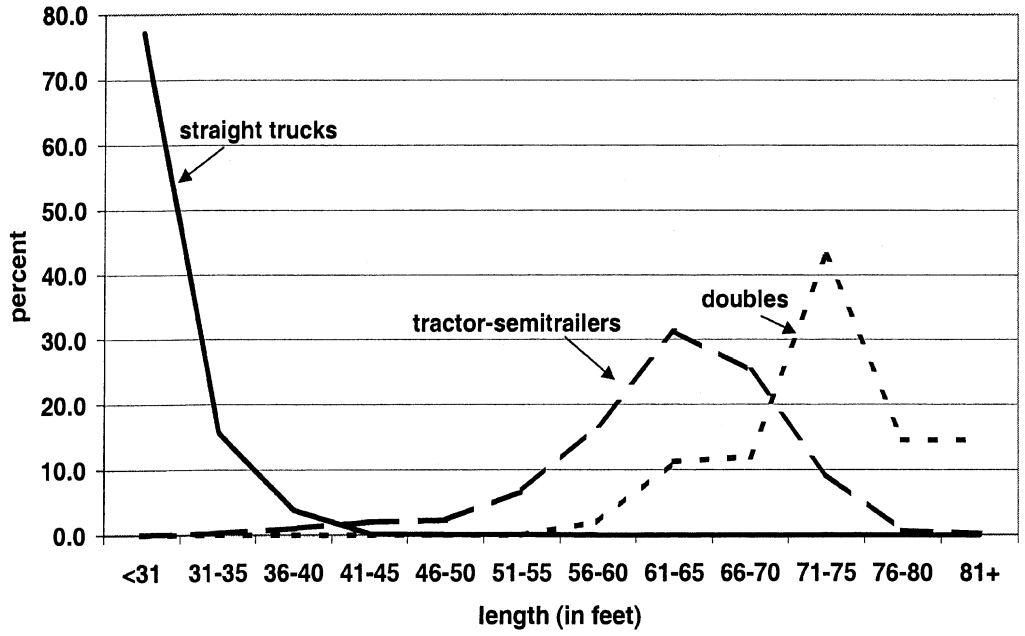

Figure 4: Truck Involvements in Fatal Crashes by Truck Length for Three Configurations, TIFA 1999

The type of cargo carried in each unit is captured in the TIFA survey. Table 15 shows the primary type of cargo carried for different truck configurations. About 32% of the trucks were empty at the time of the fatal crash, and 20.9% were carrying general freight. Solids in bulk (e.g., coal, gravel, dirt) were the next most common cargo with 12.4% of the involvements. Cargo type could not be determined for 3.4% of the trucks.

Table 15: Truck Involvements in Fatal Crashes by Type of Cargo and Truck Configuration, 1999

	Straight Truck		Straight, 1 Trailer		Bobtail		Tractor-Semitrailer		Tractor, 2 Trailers		Other Combs.		Unknown		Total	
Type of Cargo	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Empty/bobtail	568	38.3	120	53.6	110	84.6	826	26.1	40	26.5	1	2.8	0	0.0	1665	31.8
General freight	199	13.4	2	0.9	0	0.0	834	26.4	59	39.1	2	5.6	0	0.0	1096	20.9
Household goods	31	2.1	13	5.8	0	0.0	16	0.5	0	0.0	0	0.0	0	0.0	60	1.1
Building materials	15	1.0	4	1.8	0	0.0	51	1.6	2	1.3	1	2.8	0	0.0	73	1.4
Metal (coils, sheets)	13	0.9	0	0.0	0	0.0	117	3.7	3	2.0	0	0.0	0	0.0	133	2.5
Heavy machinery	8	0.5	0	0.0	0	0.0	45	1.4	0	0.0	0	0.0	0	0.0	53	1.0
Large objects	18	1.2	6	2.7	0	0.0	65	2.1	5	3.3	2	5.6	0	0.0	96	1.8
Motor vehicles	8	0.5	11	4.9	0	0.0	17	0.5	0	0.0	1	2.8	0	0.0	37	0.7
Piggyback/towaway	0	0.0	0	0.0	20	15.4	0	0.0	0	0.0	11	30.6	0	0.0	31	0.6
Gases in bulk	9	0.6	0	0.0	0	0.0	9	0.3	0	0.0	0	0.0	0	0.0	18	0.3
Solids in bulk	294	19.8	19	8.5	0	0.0	315	10.0	19	12.6	0	0.0	0	0.0	647	12.4
Liquids in bulk	38	2.6	2	0.9	0	0.0	182	5.8	4	2.6	0	0.0	0	0.0	226	4.3
Explosives	1	0.1	0	0.0	0	0.0	1	0.0	0	0.0	0	0.0	0	0.0	2	0.0
Logs/poles/lumber	28	1.9	7	3.1	0	0.0	156	4.9	4	2.6	0	0.0	0	0.0	195	3.7
Refrigerated foods	42	2.8	0	0.0	0	0.0	293	9.3	1	0.7	0	0.0	0	0.0	336	6.4
Mobile home	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	15	41.7	0	0.0	15	0.3
Farm products	32	2.2	3	1.3	0	0.0	76	2.4	9	6.0	0	0.0	0	0.0	120	2.3
Live animals	3	0.2	1	0.4	0	0.0	34	1.1	0	0.0	0	0.0	0	0.0	38	0.7
Other	150	10.1	34	15.2	0	0.0	8	0.3	0	0.0	1	2.8	0	0.0	193	3.7
Cargo, unk. type	1	0.1	0	0.0	0	0.0	19	0.6	1	0.7	0	0.0	0	0.0	21	0.4
Saddlemount tractor	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	2.8	0	0.0	1	0.0
Unknown	25	1.7	2	0.9	0	0.0	95	3.0	4	2.6	1	2.8	50	100.0	177	3.4
Total	1483	100.0	224	100.0	130	100.0	3159	100.0	151	100.0	36	100.0	50	100.0	5233	100.0

Note that straight trucks were more likely to be empty at the time of the crash than tractor-semitrailers or doubles, probably reflecting operating differences. The most common type of cargo for a straight truck was solids-in-bulk, like gravel, soil, or coal. The most prevalent type of cargo on tractor-semitrailers was general freight, followed by solids-in-bulk and refrigerated food. Almost 40% of tractor-doubles combinations were carrying general freight at the time of the crash.

The TIFA survey also records cargo spillage, noting whether the spilled cargo was hazardous material (Table 16). Only 60 hazardous cargoes were spilled in fatal crashes in 1999. Most of those (39) were from tractor-semitrailer combinations. Most cargo spills (723) were of nonhazardous cargo. Overall, there was some cargo spillage in 15.0% of trucks involved in fatal crashes.

Table 16: Truck Involvements in Fatal Crashes by Cargo Spillage and Truck Configuration, TIFA 1999

Truck Cargo Spillage	Straight Truck		Straight, 1 Trailer		Bobtail		Tractor-Semitrailer		Tractor 2 Trailers		Other Combs.		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
None	1211	81.7	174	77.7	18	13.8	2599	82.3	123	81.5	28	77.8	5	10.0	4158	79.5
Nonhazardous	221	14.9	45	20.1	2	1.5	430	13.6	19	12.6	6	16.7	0	0.0	723	13.8
Hazardous	16	1.1	3	1.3	0	0.0	39	1.2	2	1.3	0	0.0	0	0.0	60	1.1
Unknown	35	2.4	2	0.9	110	84.6	91	2.9	7	4.6	2	5.6	45	90.0	292	5.6
Total	1483	100.0	224	100.0	130	100.0	3159	100.0	151	100.0	36	100.0	50	100.0	5233	100.0

Carrier type characterizes the operating authority of the truck involved in the accident, allowing comparisons between interstate and intrastate carriers or private and for-hire (Table 17). (A for-hire carrier is a company or individual whose business is to transport goods. Businesses or individuals that operate trucks as part of their main business, such as construction firms, farmers, or retail stores, are considered private.) Interstate/for-hire carriers operated almost 70% of tractor-semitrailer combinations involved in a fatal crash in 1999. In contrast, only 9.4% of straight trucks involved in a fatal crash were operated by an interstate/for-hire firm, while 64.4% were operated by a private company, whether interstate or not. Overall, interstate/for-hire companies operated almost half of the trucks involved in a fatal crash in 1999. Company type could not be determined in 5.6% of the involvements. Differences in the proportion of involvements do not directly indicate the relative safety of these operations, since they do not take into account the different exposures—the amount of travel on the roads—of each type of operation.

Table 17: Truck Involvements in Fatal Crashes by Carrier Type and Truck Configuration, TIFA 1999

Carrier Type	Straight Truck		Straight, 1 Trailer		Bobtail		Tractor-Semitrailer		Tractor 2 Trailers		Other Combs.		Unknown		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Interstate private	390	26.3	55	24.6	17	13.1	499	15.8	9	6.0	4	11.1	1	2.0	975	18.6
Interstate for-hire	140	9.4	38	17.0	74	56.9	2200	69.6	108	71.5	19	52.8	1	2.0	2580	49.3
Intrastate private	565	38.1	82	36.6	11	8.5	183	5.8	13	8.6	3	8.3	0	0.0	857	16.4
Intrastate for-hire	165	11.1	12	5.4	15	11.5	165	5.2	17	11.3	5	13.9	0	0.0	379	7.2
Government owned	74	5.0	3	1.3	0	0.0	14	0.4	1	0.7	0	0.0	0	0.0	92	1.8
Daily rental	43	2.9	14	6.3	0	0.0	2	0.1	0	0.0	0	0.0	0	0.0	59	1.1
Unknown	106	7.1	20	8.9	13	10.0	96	3.0	3	2.0	5	13.9	48	96.0	291	5.6
Total	1483	100.0	224	100.0	130	100.0	3159	100.0	151	100.0	36	100.0	50	100.0	5233	100.0

The TIFA survey also determines the type of trip the truck was on at the time of the crash. Trip type records the intended one-way distance of the trip (Table 18). Most straight trucks were on local trips, while almost 54% of tractor-semitrailers and 50% of doubles were on a

trip of more than 100 miles. This information could not be determined for 13.1% of the trucks. These differences reflect the type of applications the different truck combinations are typically used for.

Table 18: Truck Involvements in Fatal Crashes by Trip Type and Truck Configuration, TIFA 1999

	Straight Truck		Straight, 1 Trailer		Bobtail		Tractor-Semitrailer		Tractor 2 Trailers		Other Combs.		Unknown		Total	
Trip Type	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Local	1068	72.0	114	50.9	62	47.7	654	20.7	32	21.2	12	33.3	0	0.0	1942	37.1
51-100 miles	146	9.8	22	9.8	20	15.4	387	12.3	20	13.2	8	22.2	0	0.0	603	11.5
101-200	58	3.9	25	11.2	6	4.6	366	11.6	27	17.9	2	5.6	0	0.0	484	9.2
201-500	41	2.8	14	6.3	4	3.1	519	16.4	37	24.5	7	19.4	0	0.0	622	11.9
Over 500	16	1.1	22	9.8	8	6.2	680	21.5	9	6.0	4	11.1	0	0.0	739	14.1
Unk. over-the-road dist.	13	0.9	3	1.3	4	3.1	130	4.1	3	2.0	2	5.6	0	0.0	155	3.0
Unknown	141	9.5	24	10.7	26	20.0	423	13.4	23	15.2	1	2.8	50	100.0	688	13.1
Total	1483	100.0	224	100.0	130	100.0	3159	100.0	151	100.0	36	100.0	50	100.0	5233	100.0

The TIFA survey also attempts to determine the number of hours the driver had been driving at the time of the crash (table 19). This information is quite sensitive, and interviewers were unable to obtain an answer in about one-third of the cases. Even so, estimates of hours driven were obtained in the remaining cases, including cases in which the driver was reported as exceeding the daily limit on hours.

Table 19: Truck Involvements in Fatal Crashes by Truck Driver Hours Driven and Truck Configuration, TIFA 1999

	Straight Truck		Straight, 1 Trailer		Bobtail		Tractor-Semitrailer		Tractor, 2 Trailers		Other Combs.		Unknown		Total	
Hours Driven	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1 hr	430	29.0	67	29.9	34	26.2	489	15.5	16	10.6	8	22.2	0	0.0	1044	20.0
2 hrs	130	8.8	18	8.0	10	7.7	361	11.4	19	12.6	5	13.9	0	0.0	543	10.4
3-4 hrs	195	13.1	28	12.5	8	6.2	469	14.8	30	19.9	4	11.1	0	0.0	734	14.0
5-6 hrs	125	8.4	23	10.3	11	8.5	330	10.4	25	16.6	1	2.8	0	0.0	515	9.8
7-8 hrs	70	4.7	7	3.1	8	6.2	191	6.0	9	6.0	1	2.8	0	0.0	286	5.5
9-10 hrs	15	1.0	1	0.4	1	0.8	63	2.0	5	3.3	0	0.0	0	0.0	85	1.6
11-12 hrs	2	0.1	0	0.0	2	1.5	25	0.8	0	0.0	0	0.0	0	0.0	29	0.6
13-18 hrs	1	0.1	0	0.0	0	0.0	6	0.2	0	0.0	0	0.0	0	0.0	7	0.1
> 18 hrs	0	0.0	1	0.4	0	0.0	2	0.1	0	0.0	0	0.0	0	0.0	3	0.1
Unknown, legal	48	3.2	6	2.7	5	3.8	161	5.1	7	4.6	1	2.8	0	0.0	228	4.4
Unk., not legal	0	0.0	0	0.0	1	0.8	5	0.2	0	0.0	0	0.0	0	0.0	6	0.1
Unknown/NA	467	31.5	73	32.6	50	38.5	1057	33.5	40	26.5	16	44.4	50	100.0	1753	33.5
Total	1483	100.0	224	100.0	130	100.0	3159	100.0	151	100.0	36	100.0	50	100.0	5233	100.0

Conclusion

Accurate and complete crash statistics are important in any effort to improve the safe operation of trucks as well as to measure progress toward that end. The Fatality Analysis Reporting System (FARS) file, compiled by NHTSA, provides the only national census file of fatal traffic accidents including all motor vehicle types. The Trucks Involved in Fatal Accidents (TIFA) file, the result of a survey conducted by the Center for National Truck Statistics, is built on the FARS file, but is limited to heavy trucks. The present analysis compares the two files to identify their differences, with the intent of improving the quality of both files, and thus the estimates of fatal truck crashes and fatalities.

The FARS file remains an indispensable tool in conducting traffic safety research. There can be no question of that. But this review has demonstrated that the FARS file undercounts truck involvements in fatal crashes, primarily because of a misidentification of about 7% of trucks involved in crashes as light vans, pickups, or some other type of light vehicle. Some of the difference in truck counts between the two files can be attributed to the exclusion of emergency vehicles from the TIFA file, but that exclusion only accounts for about 0.8% of trucks annually. Trucks misidentified as light vehicles in FARS account for most of the difference in the count of trucks in the two files.

As a result of the more complete identification of trucks in the TIFA file, the TIFA database provides higher counts of trucks involved in fatal traffic crashes, traffic crashes involving trucks, and counts of the number of persons killed in traffic crashes involving trucks. For the 1999 calendar year, the version of the FARS file released in April 2001 produced estimates of 4,560 traffic accidents involving 4,920 trucks. In these crashes, a total of 5,380 persons were fatally injured. Counts from the TIFA file for the same year are higher. Analysis of the 1999 TIFA data shows that 5,233 trucks were involved in 4,837 fatal traffic accidents in that year. In those crashes, 5,696 people were killed. TIFA produces counts of truck involvements that are 6.4% higher, and counts of fatalities that are 5.9% higher.

In addition, a review of FARS variables describing trucks shows that missing data rates are lower in the TIFA file and there are important differences in the description of the vehicles between the FARS and TIFA files. For example, a total of 2,206 vans are identified in the TIFA file, and 2,137 among FARS trucks. While there was good agreement in the totals for the body type, only 1,780 (80.7%) of TIFA vans were also identified as vans in FARS, a difference of 426. One-hundred and fifty-two were classified in the FARS file as unknown body type, 89 as other body type, 88 as not applicable, 33 as flatbeds, 42 as tankers, and 29 as open top vans. The TIFA file coded 566 trucks with three axles. Coding in FARS agreed for 394 (69.6%), but 70 was coded "unknown" and 28 were coded with five axles in FARS. TIFA identified 199 trucks carrying hazardous cargo, compared with 214 cases in FARS. But only 126 cases were coded with hazardous cargo in both files. FARS reported eleven trucks with three trailers in 1999, but the TIFA survey found only three—two triples combinations and one case of a tractor/jeep/full trailer/jeep combination. It is assumed here that the TIFA description is more accurate, because of the survey methodology and the intense focus on trucks.

FARS analysts in the states do an outstanding job of data collection. However, this report documents that the TIFA survey can play a valuable role in supplementing and enhancing the FARS file. The survey data collection methodology employed in producing the TIFA file is outside of the scope of the FARS effort. FARS analysts are responsible for collecting data on all fatal traffic crashes in the United States. The survey team at the Center for National Truck Statistics focuses on trucks, which account for only about 9% of the vehicles the FARS analysts deal with. Moreover, the TIFA survey concentrates primarily on ensuring an accurate identification and physical description of the trucks, not of all the other vehicles, drivers, occupants, and circumstances. The TIFA protocol permits a more intense and focused data collection than is feasible in the FARS effort.

The original purpose of the TIFA file was to supplement and enhance truck data available from the FARS file. While the FARS file continues to evolve and to improve, clearly the TIFA effort has an important role to play in providing detailed, accurate, and complete data on trucks and truck crashes.

References

Traffic Safety Facts 1999, a compilation of motor vehicle crash data from the Fatality Analysis reporting System and the General Estimates System. December 2000. National Highway Traffic Safety Administration, National Center for Statistics and Analysis, U.S. Department of Transportation, Washington DC 20590.

FARS Analytic Reference Guide, 1975 to 1999. National Highway Traffic Safety Administration, National Center for Statistics and Analysis, U.S. Department of Transportation, Washington DC 20590.

Putcha, Devi; Blower, Daniel; Masters, Raymond. *Trucks Involved in Fatal Accidents, Codebook 1999.* Center for National Truck Statistics, University of Michigan Transportation Research Institute, September 2001.