

## *Fire truck crashes with apparatus driver fatalities: Fatality Analysis Report System (FARS): 1991-2000*

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### **ABSTRACT**

*This analysis reports crashes in which firefighters were killed on fire apparatus. The National Highway Traffic Safety Administration's (NHTSA) Fatality Analysis Reporting System (FARS) from 1991 through 2000 included 33 incidents with 38 firefighter fatalities, including 23 apparatus drivers. Crashes increased steadily from two in 1991 to six in 2000. The average age of the victims was 37.7 years and the average of the drivers was 38.3. Alcohol was a possible factor in two incidents. The most commonly cited driver-related factors are "failure to keep in proper lane or running off road" and "driving too fast for conditions or in excess of posted speed limit." Of 33 total incidents, 25 involved rollover. In 19 crashes involving rollover in which the apparatus drivers were killed, 12 drivers were either totally or partially ejected from the vehicle. Eleven were not wearing restraints. Twelve of the drivers were killed while using lights and sirens. Most fatalities took place on dry roads, in fair weather, during daylight hours. Twenty-one of 23 incidents occurred on rural roads. In 11 of the incidents, the driver was the sole vehicle occupant. Drivers should wear seat belts and adjust for vehicle limitations and hazardous conditions. Semiannual refresher driver training is recommended.*

### **INTRODUCTION**

On average, from 1991 through 2000, fire trucks (apparatus) were involved in 13,885 collisions per year.<sup>1</sup> In 2001, fire department apparatus responded to nearly 21 million calls; most apparatus responded and returned without being involved in collisions.<sup>1</sup> While the number of crashes in which the apparatus are involved is a small fraction of the overall calls to

which firefighters respond, collisions can have deadly consequences. Since 1984, motor vehicle collisions have accounted for between 20 and 25 percent of firefighter fatalities annually.<sup>2</sup> This report examines characteristics of crashes in which firefighters were killed on fire apparatus, specifically focusing on the drivers killed.

The firefighter driving the apparatus is responsible for transporting the truck and crew to the emergency scene safely, whether it involves a structure fire, motor vehicle crash, or other type of incident. The driver is also responsible for safe operation of the apparatus during nonemergency use, such as during training or when traveling to and from a repair shop.

### **METHODS**

Data were obtained from the National Highway Traffic Safety Administration's (NHTSA) Fatality Analysis Reporting System (FARS). FARS is a collection of files documenting all qualifying fatal crashes since 1975 that occurred within the 50 states, the District of Columbia, and Puerto Rico. To be included in this census of crashes, a crash must involve a motor vehicle traveling on a trafficway customarily open to the public and must result in the death of a person (occupant of a vehicle or a nonmotorist) within 30 days of the crash.<sup>3</sup> Data for FARS are collected primarily from police accident reports.

Cases for this study were selected by searching the "special use" variable for those vehicles coded as "fire truck." FARS does not distinguish among different types of fire trucks (engines, tankers, aerials, etc.) Firefighter victims were identified by searching the "fatal injury at work" variable for occupants of fire trucks; only those coded positively for "at-work"

**Table 1. Number of fire apparatus crashes with firefighter victims reported in FARS by year**

Year	Crashes	Firefighter victims	Apparatus drivers
1991	2	2	1
1992	3	3	3
1993	2	3	1
1994	0	0	0
1995	3	4	1
1996	3	4	3
1997	4	5	3
1998	5	6	3
1999	5	5	4
2000	6	6	4
<b>Totals</b>	<b>33</b>	<b>38</b>	<b>23</b>

were identified as on-duty firefighters and included in this analysis. Since it is not possible to distinguish career firefighters from volunteers in FARS, volunteers especially may be undercounted.

### RESULTS

From 1991 through 2000, FARS recorded 33 crash incidents with firefighter fatalities. These incidents claimed 38 total firefighter victims, 23 of whom were apparatus drivers. Both the numbers of crashes and victims increased over time.

The firefighter victims included 34 males and four females: 21 male and two female drivers, and 13 male and two female passengers. The average age of the victims was 37.7 years, with a median age of 37; the average age of the drivers killed was 38.3 years, and their median age was 31. Race and ethnicity data are not included in FARS files prior to 1999 and are not included in this study.

Nine of the drivers were convicted of moving violations during the three-year period preceding the fatal crashes. (The FARS “previously recorded” variables count only those infractions occurring in the three years preceding the fatal incident.) It is not known whether the violations occurred in fire apparatus or other vehicles. Four drivers had only one previously recorded accident; one driver had a previously recorded accident and a previous speeding conviction; one driver had one accident and one “other” moving violation conviction. Two drivers had only “other” moving violation convictions. One driver had three license suspensions and/or revocations.

Since alcohol intoxication may contribute to motor vehicle incidents, the data were examined for this. None of the 23 fatally injured drivers had previously recorded “driving while intoxicated” convictions. The FARS “driver drinking” variable is derived from various information to conclude that a driver had a positive blood alcohol content or that the police reported that alcohol was involved in the incident.<sup>3</sup> Two incidents are coded positive for “driver drinking”; one of the incidents claimed a single fatality (the apparatus driver); the other incident claimed the apparatus driver and a passenger.

An examination of the driver-level related factors in all 33 incidents reveals that “failure to keep in proper lane or running off road” and “driving too fast for conditions or in excess of posted speed limit” are the factors most frequently identified. From 1982 through 1999, “failure to keep in proper lane or running off road” was considered as one factor. In 2000, the driver-level factors were redefined within FARS to separate “failure to keep in proper lane” and “running off road.” Table 2 details driver-level related factors associated with the fatal crashes.

Only three of the 23 drivers killed were known to have been using restraints at the time of the crash. One driver wore a lap belt, and two wore lap and shoulder belts. Seventeen fatally injured drivers were not wearing restraints, and three were coded as “unknown.”

In this analysis, 25 of the 33 total incidents involved rollover as either the first event (n = 15) or a subsequent event (n = 10). Only four of the 23 driver

fatalities did not indicate rollover as a factor. In the 19 crashes involving rollover in which an apparatus driver was killed, 12 of the drivers were either totally or partially ejected from the vehicle. Eleven of these 12 were not wearing restraints.

Fifteen fatally injured drivers (from both rollover and nonrollover incidents) were totally or partially ejected from their apparatus; only one of the fifteen was known to have been wearing a restraint.

The split is nearly even between fire truck driver fatalities during emergency use and nonemergency use. Emergency use is characterized by the use of emergency lights and/or sirens. Twelve of the drivers were killed during emergency use, while 11 died in nonemergency use situations. Overall, there were 19 incidents during emergency use and 14 during non-emergency use.

Mechanical failure was determined to be a significant factor in only two of the 33 total crashes. "Tires" were noted as a vehicle-related factor in a crash that claimed a driver; "brake system" was a factor in an incident that killed a passenger.

Most of the driver fatalities took place on dry roads, in normal ("fair") weather, during daylight hours. Table 3 describes the roadway, atmospheric, and lighting conditions in the 23 driver-fatality incidents.

Twenty-one of the 23 incidents involving driver fatalities occurred on rural roads. In nearly half (11) of the incidents, the driver was the sole vehicle occupant.

### DISCUSSION

There are various limitations on the findings contained in this report. To be captured in FARS, a crash must involve a motor vehicle traveling on a trafficway customarily open to the public and result in the death of a person (either a vehicle occupant or non-motorist) within 30 days of the crash.<sup>3</sup> These data may exclude firefighter apparatus crash fatalities that occur on private property and other noncustomary roadways. Wildland firefighting apparatus fatalities are one example of firefighter fatalities that might not be captured by FARS. The FARS special use code "fire truck" identifies firefighting apparatus but does not define the specifics of the apparatus. Vehicle make and model information is available but can be used

<b>Driver-level related factor</b>	<b>Number of times identified</b>
Failure to keep in proper lane or running off road	19
Driving too fast for conditions or in excess of posted speed limit	14
Inattentive (talking, eating, etc.)	7
Operating the vehicle in an erratic, reckless, careless, or negligent manner or operating at erratic or suddenly changes speeds	3
Over correcting	3
Failure to yield right of way	2
Operating without required equipment	1
Failure to obey	1
Unfamiliar with roadway	1
Skidding, swerving, sliding due to ice, water, snow, slush, sand, dirt, oil, wet leaves on road	1
Nontraffic violation charged—manslaughter or homicide, or other assault	1

only to identify the chassis, not the function of the apparatus. FARS has a variable indicating restraint usage by vehicle occupants; however, there is no separate variable to indicate the availability of restraints in the vehicle. The "fatal injury at work" variable was used to identify occupants of vehicles coded as "fire trucks" as on-duty firefighters. This variable is taken directly from the death certificate without editing. Therefore, undercounting may occur because of inaccurate or unavailable death certificates. Some apparatus drivers and passengers were not classified as fatalities at work and were excluded from this study. It is not possible to distinguish career firefighters from volunteers in FARS; volunteers especially may be undercounted due to the interpretation of volunteers as "working."

**Table 3. Cross-tabulation of conditions for crashes in which the apparatus driver was killed**

Roadway	Atmospheric	Light	Crashes	Percent
Dry	Normal	Daylight	12	52
Dry	Normal	Dark	3	13
Dry	Normal	Dark but lighted	2	9
Dry	Fog	Dark	1	4
Wet	Rain	Daylight	2	9
Wet	Rain	Dark	2	9
Wet	Rain	Dawn	1	4

In this analysis of firefighting apparatus driver fatalities over a 10-year period, 33 incidents were identified. In 23 of these incidents, the apparatus driver was killed. With the exception of 1994, a year in which no on-board, on-duty firefighter apparatus fatalities were reported in FARS, the number of crashes has increased from a low of two in 1991 and 1993 to a high of six in 2000 (Table 1). Over the same time period, there has been a general downward trend in the number of fires reported to fire departments.<sup>4</sup> However, in FARS, it is not possible to determine the nature of the emergency to which the apparatus is responding; “emergency use” responses may include medical emergencies, among others.

Traumatic injury is the leading type of fatal injury to firefighters aged 35 and younger and accounts for approximately one-third of deaths in those aged 36 to 40.<sup>2</sup> In this study, the average age of the drivers killed was 38.3 years, while the median age was 31. It is not possible to determine the years of apparatus driving experience among the drivers, but it is likely that most were at least experienced drivers of privately owned vehicles.

In comparison with other emergency vehicles, approximately one in four fatal ambulance and fire truck crashes, and one in five fatal police car crashes results in an emergency vehicle occupant fatality.<sup>5</sup> However, among police cars, ambulances, and fire trucks involved in nonfatal crashes, the injury rate

for emergency vehicle occupants is lowest for fire trucks.<sup>5</sup> This is probably due to the relative size of the fire apparatus.

In this analysis, rollover was a factor in 83 percent of the incidents in which apparatus drivers were killed. Every apparatus driver should be aware of the danger of rollover. In one common scenario, the right wheels of the apparatus leave the road for some reason, the driver fights to regain control of the vehicle, and the vehicle collides with a fixed object, such as a tree or rolls over when the apparatus leaves the left side of the road.<sup>6</sup> The proportion of fire truck rollovers in all fatal accidents is nearly double the rollover rate for all medium/heavy trucks involved in fatal accidents.<sup>7</sup> Fire department apparatus, like many large trucks, have high centers of gravity, making them susceptible to handling difficulties. Fire department mobile water supply apparatus, commonly known as “tankers,” carry 1000 or more gallons of water.<sup>8</sup> The load in the tank can shift, depending on the degree to which the tank is filled and on the design of the tank itself, making it a potential hazard to an apparatus in transit.

The most common driver-related factors in all of the incidents involving firefighter fatalities were “failure to keep in lane/run off road” and “driving too fast.” However, nonemergency use situations accounted for 48 percent of the driver fatalities and 42 percent of all firefighter occupant fatalities.

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Seatbelts are the most basic piece of safety equipment provided with a motor vehicle.<sup>6</sup> In this analysis, a mere 13 percent of the fatally injured drivers were wearing restraints.

### SUMMARY

The overall findings in this analysis suggest the need for fire apparatus drivers to buckle up and slow down. Drivers must be aware of their responsibilities to their coworkers and their communities. More frequent driver training should be provided to drivers of firefighting apparatus.

The Centers for Disease Control and Prevention's National Institute for Occupational Safety and Health Fire Fighter Fatality Investigation and Prevention Program investigates occupational firefighter fatalities. The program has provided recommendations for drivers of fire department apparatus, including the following:<sup>9</sup>

- Recognize that the drivers are responsible for the safe and prudent operation of the vehicle under all conditions.
- Wear a seat belt when operating a vehicle.
- Take refresher driver training at least twice per year.
- Understand the vehicle characteristics, capabilities, and limitations.
- Adjust speed when driving on wet or icy roads, in darkness or fog, or under any

other conditions that make emergency vehicle operation especially hazardous.

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