



Career Fire Chief Dies After Being Struck by a Fire Truck at a Motor-Vehicle Incident - Kansas

SUMMARY

On April 11, 2002, a 61-year-old male career Fire Chief (the victim), providing mutual aid at a scene of a motor vehicle incident, died after being struck by a fire truck. A 26-year-old male volunteer Fire Chief (the driver) from another department lost control of the fire truck after his brakes failed as he was arriving on the scene. The driver received injuries and was transported by ambulance to a regional hospital where he was hospitalized and then discharged the following day. The victim was transported by ambulance to a regional hospital where he was pronounced dead.

NIOSH investigators concluded that, to minimize the risk of similar occurrences, fire departments should

- *develop comprehensive apparatus maintenance programs in accordance with manufacturer's specifications and instructions that include regularly scheduled inspections, documentation, and procedures for removing apparatus from service until major defects are repaired*

- *ensure all drivers of fire department vehicles receive driver training at least twice a year*
- *develop, implement, and enforce standard operating procedures (SOPs) regarding emergency operations for highway incidents*
- *ensure that while operating at an emergency scene, personnel wear personal protective clothing that is suitable to that incident, such as a highly visible reflectorized flagger vest (strong yellow-green or orange)*
- *develop, implement, and enforce standard operating procedures (SOPs) on the safe operation of emergency vehicles which include the use of seat belts*

Additionally, municipalities should consider

- *establishing and maintaining regional mutual-aid radio channels to coordinate and communicate activities involving units from multiple jurisdictions*



Incident Site

The **Fire Fighter Fatality Investigation and Prevention Program** is conducted by the National Institute for Occupational Safety and Health (NIOSH). The purpose of the program is to determine factors that cause or contribute to fire fighter deaths suffered in the line of duty. Identification of causal and contributing factors enable researchers and safety specialists to develop strategies for preventing future similar incidents. The program does not seek to determine fault or place blame on fire departments or individual fire fighters. To request additional copies of this report (specify the case number shown in the shield above), other fatality investigation reports, or further information, visit the Program Website at

www.cdc.gov/niosh/firehome.html
or call toll free 1-800-35-NIOSH



Fatality Assessment and Control Evaluation Investigative Report #F2002-18

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INTRODUCTION

On April 11, 2002, a 61-year-old male career Fire Chief (the victim), with a combination fire department, died after being struck by a fire truck. A 26-year-old male volunteer Fire Chief (the driver) with a volunteer fire department, was injured when he lost control of the fire truck he was driving. On April 12, 2002, the U.S. Fire Administration notified the National Institute for Occupational Safety and Health (NIOSH) of this incident. On June 18, 2002, two Safety and Occupational Health Specialists investigated this incident. Interviews were conducted with the interim Chief and members of the victim's department. The NIOSH team reviewed copies of photos, police and crash reconstruction reports, the death certificate, the victim's training records, the standard operating procedures (SOPs) from the victim's department and the driver's volunteer department SOPs.

The victim was employed by a combination fire department that has one fire station and serves a population of about 4,500 in a geographical area of approximately 900 square miles. The combination department is comprised of 22 paid-call fire fighters.

The truck involved in this incident was a 1980 cab over entry with an aluminum 500-gallon water tank. At the time of the incident the water tank was full. The gross vehicle weight of the truck was approximately 16,000 lbs. The truck was equipped with a lap seat belt safety restraint system for the driver and passenger positions. Department fire fighters conducted maintenance checks on the truck on a monthly basis; however, they did not maintain written records. The department is required by State law to have vehicle inspections on a yearly basis and to submit an inspection form to the State Fire Marshal's office for the preceding calendar year. The office of the State Fire Marshal has a copy of the inspection form for 2001.

The State does not require a commercial driver's license for persons operating emergency vehicles or apparatus; the driver of the fire truck had a current basic driver's license. The driver's volunteer fire department does not have a written policy requiring the use of seat belts.

Roadway The truck was traveling on a two-lane county road with an asphalt surface. The road had a posted speed limit of 60 mph.

Weather Conditions on the day of the incident were clear and the roadway was dry.

Training The State has no minimum requirements to be a fire fighter. The victim had completed NFPA Level I training through the State, and he had completed over 1,000 hours of various fire and rescue training courses. The victim had a total of 33 years of experience with the department, 19 of those years as the Fire Chief.

The volunteer department that the Fire Chief/Driver represents has qualifications for becoming a driver. Before being eligible to be a driver for the department, a fire fighter must attend hands-on training and demonstrate driving skills to a department officer. The driver also had completed a 4-hour emergency response driving class offered by the State in 1998. The Fire Chief/Driver had 4 years' experience with the volunteer department, 4 of those years as a qualified driver.

INVESTIGATION

On April 11, 2002, at 1017 hours, a volunteer fire department and a combination fire department were notified by Central Dispatch of a motor-vehicle incident. At 1020 hours, Truck 301 from the volunteer fire department responded to the call with a Fire Chief driving. At 1021 hours, a Fire Chief (the victim), an Assistant Chief, two Captains, and a Lieutenant from the combination fire department



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were en route to the scene to provide mutual aid in Rescue 1.

At approximately 1029 hours, Rescue 1 arrived on the scene as the initial department on a two-lane county road and parked in the northbound lane, staging between an ambulance already on the scene and a stopped truck tractor and trailer. The ambulance parked approximately 25 feet from the motor vehicle involved, a sports utility vehicle (SUV) pulling a camping trailer. The SUV and trailer were resting upside down and were blocking the northbound lane (Diagram).

Both Captains and the Lieutenant from Rescue 1 approached the ambulance, which was parked directly in front of them, to receive a size-up of the incident. A paramedic at the ambulance advised them that no patient assistance was needed, so they decided to direct their attention to fluids leaking from the SUV and camping trailer.

At approximately 1032 hours, Truck 301 was traveling southbound on the road where the original motor-vehicle incident had occurred (Photo). The driver reported that his speed was approximately 62 mph as the truck crested a hill. After cresting the hill, he saw a police vehicle parked in the southbound lane and a county sheriff directing traffic approximately 2,000 feet north of the overturned SUV and trailer. The driver attempted to apply his brakes; however, the brake pedal went to the floor and had no effect in slowing the truck. While the driver was attempting to stop the truck, he steered it into the northbound (left) lane and drove past the police vehicle and sheriff patrolman. After cresting the hill he placed the truck into neutral gear, began pumping the brakes, and activated the electric parking brake. *Note: A post-crash examination by the State Highway Patrol determined that the lack of brakes was due to oil leaking from the left front metal brake line that connects to the left front*

wheel cylinder. The brake drum area on the front and rear brake lining on the left front had oil contamination (wet oil and greasy, dirty substance). Additionally, in the rear side of the wheel cylinder, a piece of plastic stuck between the brake shoe and the wheel cylinder prevented the brake from making a full return. The piece of plastic came from the dust cover that prevents debris from entering the brake area. The dust cover was broken in several places and caulk or other adhesive had been used to hold the broken pieces in place. While the truck was traveling down the hill toward the incident scene, the driver called on the radio that his brakes were not working. Note: The crew from Rescue 1 each had a portable radio; however, they did not hear the warning because their radios had a different radio frequency band.

The Captains, the Lieutenant, and the victim approached the SUV and trailer. One of the Captains and the Lieutenant stood behind (south side) the SUV, while the victim and the other Captain walked around to the southbound lane to check on the other (north) side of the SUV and the camping trailer. As the truck was traveling down the hill, the wailing sound of the tires on the roadway caused the Captains and the Lieutenant to look up and see the truck approaching. A civilian in a second SUV that had been traveling southbound in front of Truck 301 was attempting to go around the overturned SUV and trailer in the roadway where the victim, the Captains, and the Lieutenant were standing. As Truck 301 drew nearer, both of the Captains reported seeing the driver waving his hands back and forth. As Truck 301 approached them, the victim and the Captain tried to get out of the way. The Captain ran east into the northbound lane. The victim headed west into the southbound lane. Truck 301 struck the victim then struck the back of the second SUV that was going around the overturned SUV and trailer. The second SUV then struck the side of Rescue 1 and



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overturned onto its side. Truck 301 traveled off the west side of the road into a ditch and slid sideways before rolling over and ejecting the driver and dislodging the 500-gallon water tank from the truck. *Note: The truck was equipped with a lap seat belt safety restraint system for the driver and passenger positions. The State Highway Patrol report indicated that the driver was not wearing his seat belt safety restraint system at the time of the incident.* Truck 301 came to rest upside down and facing east, and the driver was sitting on the ground approximately 8 feet from the truck.

The Lieutenant yelled to his crew that the victim had been struck. The crew from Rescue 1 descended down the west-side embankment to a ditch where the victim was lying facedown. A paramedic on the scene assisted and detected a faint pulse. A Captain with Rescue 1 assisted with resuscitation efforts in the ambulance while transporting the victim to a local hospital. The victim arrived at the hospital at approximately 1104 hours and was pronounced dead at 1309 hours. The driver was transported by ambulance to a local hospital where he was hospitalized and then discharged the following day.

CAUSE OF DEATH

The death certificate lists the cause of death as chest, abdomen, and skull trauma.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Fire departments should develop comprehensive apparatus maintenance programs in accordance with manufacturer's specifications and instructions that include regularly scheduled inspections, documentation, and procedures for removing apparatus from service until major defects are repaired.^{1,2}

Discussion: Maintenance schedules should be established and recorded as an integral part of a well-

planned maintenance program. The maintenance program should include daily, weekly, and periodic maintenance service checks. The daily maintenance check should follow the manufacturer's handbook and should include items such as oil level, coolant level, batteries, visible and audible warning signals, fuel levels, brakes, and tires. Brakes should be checked for the brake-fluid level in the master cylinder, wheel cylinder or hose leaks, brake-fluid leaks underneath and at the wheels, and all brakes should be pressure-tested by operating the foot pedal.

At the time of the investigation, the State Highway Patrol determined that the loss of brakes was due to oil leaking from the left front metal brake line that connects to the left front wheel cylinder. The department in this incident performs monthly visual inspections on the department vehicles. It does not, however, document these inspections and has no procedures in place on how to identify and remove an apparatus from service until major defects (e.g., the braking, steering, electrical, and coolant systems, hydraulic fluids, tires, and belts) are repaired or replaced. The post-crash examination performed by the State Highway Patrol revealed that in the rear side of the wheel cylinder a piece of plastic was stuck between the brake shoe and the wheel cylinder which prevented the brake from making a full return.

Recommendation #2: Fire departments should ensure all drivers of fire department vehicles receive driver training at least twice a year.^{3,4}

Discussion: Driver training should be provided to all driver/operators as often as necessary to meet the requirements of NFPA 1451, but not less than twice a year. This training should be documented and cover defensive driving techniques during emergency and nonemergency conditions. Sound defensive driving skills are one of the most important aspects of safe driving. Every driver/operator should be familiar with

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these basic concepts of defensive driving. They include anticipating other drivers' actions, visual lead time, braking and reaction time, combating skids, evasive tactics, and knowledge of weight transfer.

Additionally, fire department driver training should be in accordance with NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program*, and NFPA 1002, *Fire Apparatus Driver/Operator Professional Qualifications*. These standards state that departments should establish and maintain a driver training education program, and each member should be provided driver training not less than twice a year. During this training, each driver should operate the vehicle and perform tasks that the driver/operator is expected to encounter during normal operations to ensure the vehicle is safely operated in compliance with all applicable State and local laws.

Recommendation #3: Fire departments should develop, implement, and enforce standard operating procedures (SOPs) regarding emergency operations for highway incidents. ⁵⁻⁹

Discussion: Fire fighters operating at the scene of a motor-vehicle incident on a highway are in danger of being struck by oncoming motor vehicles, and SOPs can help establish proper traffic control measures when operating at the scene of motor-vehicle incidents. SOPs should include but not be limited to the following: apparatus positioning, lane closures, methods to establish a secure work area, wearing appropriate protective clothing at all times, clearing traffic lanes, and releasing the incident scene back to normal operation. At the time of the incident, both the combination fire department and the volunteer fire department did not have any standard operating procedures regarding motor-vehicle incidents and traffic control.

Recommendation #4: Fire departments should ensure that while operating at an emergency scene, personnel wear personal protective clothing that is suitable to that incident, such as a highly visible reflectorized flagger vest (strong yellow-green or orange). ^{7,8,9}

Discussion: The need to wear personal protective clothing such as a reflectorized, brightly colored vest arises from the fact that personnel need to be highly visible while working on the scene of a motor-vehicle incident. Fire fighters could wear either strong yellow-green or orange personal protective clothing to provide a suitable contrast with the background. Vests that have three 3-inch retro-reflective stripes, either orange or strong yellow-green, have been in use since 1996 and found to be highly effective. The victim was wearing dark blue coveralls with reflective striping around the arms and legs.

Recommendation #5: Fire departments should develop, implement, and enforce standard operating procedures (SOPs) on the safe operation of emergency vehicles which include the use of seat belts. ^{2,3,10,11}

Discussion: Fire departments should develop written SOPs for the safe operation of emergency vehicles and the use of seat belts. These SOPs should include all department policies, procedures, and any ordinance laws that pertain to that State and/or the department. The SOPs should be made available to all vehicle operators and should be implemented into fire fighter training. Developing and following SOPs for safely driving fire department vehicles during nonemergency travel and emergency response include, but are not limited to, specific criteria for maintaining appropriate vehicle speed, crossing intersections, traversing railroad grade crossings, using seat belts, and using emergency warning devices. Such procedures for emergency response should emphasize that the safe arrival of fire



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department vehicles and personnel at emergency scenes is the first priority. Additionally, SOPs on the use of seat belts should be implemented and should apply to all persons riding in all emergency vehicles. It is important that all occupants are seated and wearing their seat belts before the vehicle is moved.

Additionally, municipalities should consider

Recommendation #6: Establishing and maintaining regional mutual-aid radio channels to coordinate and communicate activities involving units from multiple jurisdictions. ¹²

Discussion: An effective radio communication system is a key factor in fire department operations. The communication system is used for receiving notification of emergencies, alerting personnel and equipment, coordinating the activities of the units engaged in emergency incidents, and providing nonemergency communications for the coordinating fire departments. Units responding to or engaged at incidents should have the necessary radio frequencies/channels to be in contact with other units.

The department which was providing mutual aid has portable radios that operate on an ultra high frequency (UHF) radio band. Truck 301 (from a different department) was transmitting on a very high frequency (VHF) radio band. Consequently, the crew of the victim's department was unable to hear the radio transmission from Truck 301 regarding the loss of brakes on their portable radios.

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INVESTIGATOR INFORMATION

This incident was investigated by Nancy T. Romano and Linda J. Frederick, Safety and Occupational Health Specialists, Division of Safety Research, Surveillance and Field Investigations Branch, NIOSH.

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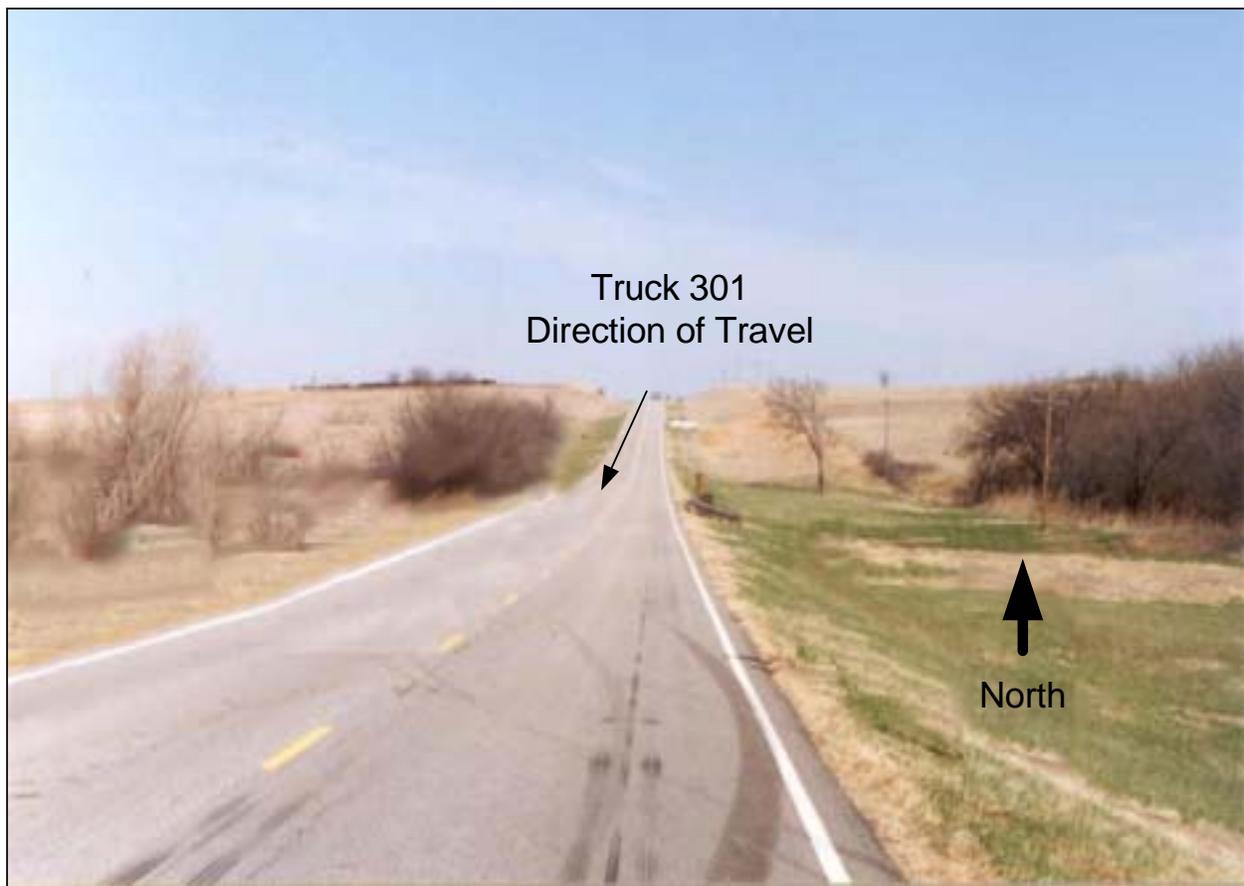


Photo. Northbound View of the Road Where the Incident Occurred

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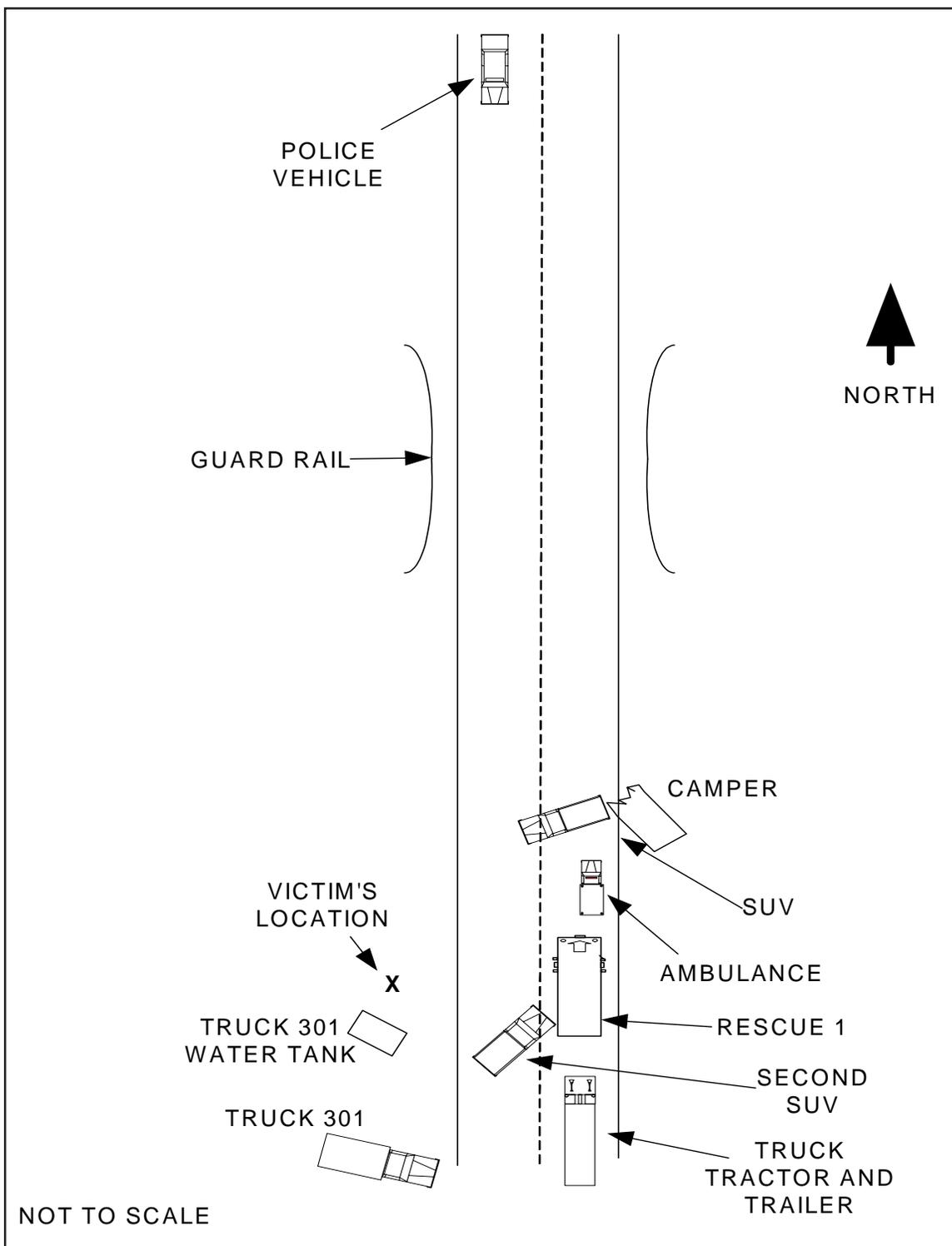


Diagram. Incident Site

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Public Health Service

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