



NIOSH
Fire Fighter Fatality Investigation
and Prevention Program

Death in the line of duty...

A summary of a NIOSH fire fighter fatality investigation

September 24, 2004

Junior Volunteer Fire Fighter is Killed While Responding to a Brush Fire with an Intoxicated Driver - Wyoming

SUMMARY

On May 22, 2003, a 16-year-old female junior fire fighter died after the tanker truck she was riding in overturned while responding to a brush fire. The tanker truck drifted off the roadway causing the driver to lose control of the truck and to overturn. The driver crawled out a window. The victim was ejected and trapped beneath the front passenger door. She was extricated by emergency personnel and transported to a county hospital where she was pronounced dead upon arrival.

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

- *develop and enforce standard operating procedures (SOPs) that require mandatory use of seatbelts in all vehicles*
- *develop or revise existing SOPs to specify permissible and non-permissible tasks and activities for youth members participating in junior fire service programs*
- *provide training to driver/operators as often as necessary to meet the requirements of NFPA 1451, and incorporate specifics on rollover prevention in standard operating procedures (SOPs)*
- *adopt the International Association of Fire Chief's Zero-Tolerance Policy for Alcohol and Drinking to prohibit the use of alcohol by members of any fire or emergency services agency/organization at any time when they may be called upon to act or respond as a member of those departments. Departments should develop written policies and have procedures in place to enforce this policy*
- *select and utilize only the safest drivers to operate emergency vehicles*
- *use caution when retrofitting non-fire service apparatus to serve as tankers, and, when this a necessity, ensure that the vehicle does not exceed its load-carrying capacity and meets the requirements of NFPA 1901 Standard for Automotive Fire Apparatus*



Tanker truck prior to the incident. Courtesy of state highway patrol

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 #F2003-20

Junior Volunteer Fire Fighter is Killed While Responding to a Brush Fire with an Intoxicated Driver - Wyoming

INTRODUCTION

On May 22, 2003, a 16-year-old female junior volunteer fire fighter (the victim) was fatally injured when she was ejected from the cab of a tanker truck that overturned and then trapped her beneath it. On May 29, 2003, the U.S. Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH) of this fatality. On July 14, 2003, two Occupational Safety and Health Specialists from the NIOSH Fire Fighter Fatality Investigation and Prevention Program, Division of Safety Research, investigated the incident. The NIOSH team met with the Fire Chiefs for both fire districts (city and county), the Board of Directors of the fire department, attorneys for the city and for the insurance company, the highway patrol officer who investigated the incident, and fire fighters who were directly involved in the incident. NIOSH investigators visited the site of the crash and took photographs of the road. The tanker truck was viewed and photographed. Dispatch tapes and the State highway patrol traffic report were reviewed.

Fire Department. The volunteer fire department, which is funded by the county, is essentially two departments covering two different fire protection districts: the city and the rural or county area. Both departments function out of the same station but each has its own apparatus. At the time of the incident, in addition to the overall Department Chief, the District Fire Warden served as the chief of the county district. The fire department has 38 uniformed personnel, most of whom respond to both city and county calls. This incident occurred within the jurisdiction of the county fire protection district.

Explorer Program. The fire department participates in the Explorer program, part of Learning-for-Life's career education program. The overall goal of this national program is to "provide experiences to help young people mature and to prepare them to become responsible and caring

adults." The Fire Service component of Explorer Program provides participants with first-hand experiences in the fire service and often serves as a recruitment tool for future fire fighters. To participate as a Fire Explorer, individuals must be between the ages of 14 and 20 and have completed the eighth grade. The fire department maintains a list of permitted activities and functions, training requirements, and the by-laws of the Explorer Program. Training records for each Explorer were kept at this station.

Driver. The 46-year-old driver was a 17-year veteran of the fire department and a former president of the fire district. He had a current Commercial Driver's License (CDL) from the State with a tanker endorsement. A tanker endorsement is necessary for driving certain commercial vehicles such as those designed to haul liquids in permanently mounted or portable tanks rated at 1,000 gallons or greater capacity. According to Wyoming state law, an operator is required to have a CDL to operate a vehicle with a manufacturer gross vehicle weight rating (GVWR) of more than 26,000 lbs. The driver had approximately 5 ½ years experience operating the tanker involved in the incident and, according to the Chief, had completed a driver's training program. No training records were provided to NIOSH investigators, however. The department does not provide driver training or conduct drug tests for drivers. The driver in this incident was prohibited from driving fire apparatus on the city-side of the fire department due to prior driving-under-the-influence (DUI) convictions.

Victim. The 16-year-old victim had been a Fire Explorer at this department for less than a year. During this time she received departmental training that included CPR, First Aid, Standards of Survival, Truck and Equipment Orientation, Vehicle Extrication and Smoke Trailer. She carried a department pager.



Junior Volunteer Fire Fighter is Killed While Responding to a Brush Fire with an Intoxicated Driver - Wyoming

Equipment. The tanker truck in the incident belonged to the rural fire district. It was a converted 1981 jet - fuel tanker. The tanker truck had an over-the-road chassis, a 4,500-gallon elliptical tank (with 3 baffles), 3 axles, 10 new tires, a manual transmission, and an air braking system. The GVWR was 50,000 pounds. According to the Chief, the fire department did its own vehicle maintenance and kept its own records. Vehicle maintenance records were not provided to the NIOSH investigators, however.

Road and Weather Conditions. The incident occurred on a rural road approximately 6 miles from the fire station (Photo 1). The 26-ft-wide roadway consisted of compacted dirt and gravel ("scorio") which had been graded earlier the day of the incident. The road had no shoulders; however, there was a gradual slope approximately 4 ½ feet from the edge of the road to the adjacent property. The road was dry and it was dark at the time of the incident; the road was unlighted. The posted speed limit was 65 mph. The State Highway Patrol traffic report estimated the driver's speed at 65 mph.

INVESTIGATION

On May 22, 2003, at 2219 hours, the county fire department was dispatched to a brush fire in a rural area near railroad tracks approximately 10 miles outside of the city limits. According to dispatch tapes, there had been a brush fire earlier in the day in the same general area and the embers had rekindled. An employee of the railroad who was driving past the area reported the fire.

Several fire fighters were at the fire department working a detail to maintain the grounds and vehicles when the call was dispatched; neither fire chief was there. The driver of the tanker reportedly left a drinking establishment approximately 15 minutes prior to the dispatch. When the tanker driver arrived at the department in his privately owned vehicle

(POV), he asked one of the firefighters to start the county tanker and get it operating for him. The fire fighter ignored his request because he knew the driver was prohibited from driving emergency vehicles for the city department. The driver started the tanker himself and prepared to depart for the brush fire. One of the fire fighters boarded the passenger compartment of the tanker but subsequently decided not to participate in the call. Another firefighter then boarded the tanker.

The victim, who carried a pager, was at home when she received the page for the brush fire. She traveled to the fire department in her POV. According to a fire fighter at the station, the victim seemed excited about participating in a call and asked the fire fighter in the passenger seat to give up his seat, which he did. As the tanker was ready to leave the station, the victim borrowed a pair of boots from one of the fire fighters. She was in the process of putting on the boots when the tanker departed the station.

At 2237 hours, the tanker was traveling in a southeast direction down a recently graded roadway. According to the investigating state highway patrol officer, the driver stated that he swerved to miss an antelope and the tanker drifted off the right side of the roadway. According to the traffic incident report, the driver overcorrected the steering of the vehicle and went into a skid. It then traveled down a gradual slope and overturned in a clockwise direction, 1 3/4 times. The tanker came to rest on the passenger side, facing west, approximately 50 feet from where it left the road. The victim was ejected from the vehicle and trapped beneath the passenger door (Photo 2).

A civilian, who was first on the scene, reported the crash. The first emergency unit to arrive, Rescue 3, found the victim trapped beneath the tanker truck. Extrication was attempted using powered hydraulic systems. When this approach failed, crews switched



Fatality Assessment and Control Evaluation Investigative Report #F2003-20

Junior Volunteer Fire Fighter is Killed While Responding to a Brush Fire with an Intoxicated Driver - Wyoming

to using low-pressure air bags and cribbing to lift the wreckage. It took approximately 30 minutes to free the victim. At approximately 2300 hours, emergency personnel contacted the dispatcher and called for the medical examiner. The victim was transported by ambulance to a local hospital where she was pronounced dead on arrival.

After the tanker came to rest, the driver crawled out of the door on the driver's side. When the highway patrol officer arrived, he noted that the driver was slumped over in one of the vehicles on scene; he had minor facial cuts and appeared coherent; he refused medical treatment on the scene. The state highway patrol officer administered a portable \ test at the scene that registered twice the state legal limit. Approximately 2 ½ hours later the driver was taken to the hospital by the state highway patrol, and a blood sample was drawn. His blood alcohol content at that time was 0.086 units. State law defines legal intoxication at 0.08 units and the CDL defines legal intoxication at 0.04 units. The driver was arrested and taken into custody.

CAUSE OF DEATH

According to the medical examiner, the victim died of "massive trauma."

RECOMMENDATIONS

Recommendation #1. Fire departments should adopt the International Association of Fire Chief's Zero-Tolerance Policy for Alcohol and Drinking to prohibit the use of alcohol by members of any fire or emergency services agency/organization at any time when they may be called upon to act or respond as a member of those departments. Departments should develop written policies and have procedures in place to enforce this policy¹⁻⁴

Discussion: Fire departments should strictly prohibit any member of the fire department from responding

to a call if they have been drinking. According to the International Fire Chief's Association (IAFC) policy statement (#03.04) for Zero-Tolerance for Alcohol & Drinking in the Fire and Emergency Service, "if someone has consumed alcohol within the previous eight (8) hours, or is still noticeably impaired by alcohol consumed previous to the eight (8) hours, they must voluntarily remove themselves from the activities and function of the fire or emergency services agency/organization, including all emergency operations and training."

In addition, the IAFC policy states, "No member of a fire & emergency services agency/organization shall participate in any aspect of the organization and operation of the fire or emergency agency/organization under the influence of alcohol, including but not limited to any fire and emergency operations, fire-police, training, etc."

IAFC further recommends that fire and emergency service agencies/organizations develop written policies and have procedures in place to enforce such policies. These policies should include provisions for testing blood alcohol on individuals involved in an incident that results in "measurable damage to apparatus or property or injury/death of agency/organization personnel or civilians."

Recommendation #2. Fire departments should develop and enforce standard operating procedures (SOPs) that require mandatory use of seatbelts in all vehicles.⁵⁻⁹

Discussion: Fire departments should develop and enforce SOPs on the use of seat belts. The SOPs should apply to all persons riding in emergency vehicles and should state that all persons must be seated and secured in an approved riding position whenever the vehicle is in motion. An operator who is properly secured by a seatbelt has a better chance of maintaining control of the vehicle in an emergency



Junior Volunteer Fire Fighter is Killed While Responding to a Brush Fire with an Intoxicated Driver - Wyoming

situation and of surviving a crash. In its publication *Safe Operation of Fire Tankers*, the USFA cites a Department of Transportation (DOT) study of seatbelt use which revealed the following statistics: 1) 75 percent of the people ejected from vehicles suffer fatal injuries; 2) 80 percent of fatalities in rollover incidents involve occupants being ejected from the vehicle; and 3) in a rollover incident, occupants are 22 times more likely to be thrown from the vehicle if they are not wearing their seatbelts. The victim and the driver in this incident were not wearing seatbelts and the victim was ejected from the tanker. Wyoming has a mandatory seatbelt law and the Learning-for-Life Program, the parent organization for the Explorers, requires that members wear seat belts when riding in fire vehicles.

Recommendation #3: Fire departments should develop or revise existing SOPs to specify permissible and non-permissible tasks and activities for youth members participating in junior fire service programs.^{2,4,8,10,11}

Discussion. Junior fire/emergency service programs such as Learning-for-Life's Explorer provide young people with work-based learning experiences to help them become responsible and caring adults. The Fire Explorer Program in particular gives participants the opportunity to experience the fire service first hand and often provides future fire fighter recruits. Each Explorer post (a sponsor such as a fire department) must follow the guidelines set forth by the parent organization (i.e., Learning-for-Life) as well as the policies and procedures of the specific fire department. Programs involving junior fire fighters must be cognizant of the local and state laws for protection of youth from hazardous conditions, and should specify the permissible and non-permissible

tasks and functions for youth. Guidelines and procedures should be in writing, readily available to members of the fire department, and incorporated into departmental SOPs. In *Junior Fire and Emergency Services*, VFIS^a (p. 23) states, "Sound safety policies must be in place to stipulate what youth members are permitted to do and prohibited from doing in and around the fire station, en route to and from emergencies, and on the emergency scene. These policies must be consistent with fire department regulations, and State laws, and in the case of organizations which are Explorer Posts, must be consistent with guidelines from the Boy Scouts of America. These policies should be established through a comprehensive set of laws before group activities are initiated."

The volunteer department did not have written SOPs; however, they did have a copy of the written policies (i.e., activities and function, by-laws, and training requirements) for Explorers working at this Post. The written guidelines for Explorer members state that Explorers with appropriate training are permitted to respond to various emergency calls including structural and wildland fires, although they are prohibited from participating in fighting uncontrolled fires. Explorers are permitted to respond to wildland fire scenes if they have received training in Standards for Survival or the equivalent, and Truck & Equipment Orientation. The victim had taken Standards for Survival but not Truck & Equipment Orientation. These guidelines also included a provision that at least two adults must be present for all activities involving Explorers.

Fire department personnel should be made aware of the requirements, responsibilities and permitted activities of junior fire fighters (e.g., Fire Explorers)

^a Volunteer Fireman Insurance Services



Fatality Assessment and Control Evaluation Investigative Report #F2003-20

Junior Volunteer Fire Fighter is Killed While Responding to a Brush Fire with an Intoxicated Driver - Wyoming

to help ensure that they are assigned appropriate tasks and that they are appropriately supervised. Adequate supervision of the victim was not provided at the fire station or during the response in the tanker.

Recommendation #4: Fire departments should provide training to driver/operators as often as necessary to meet the requirements of NFPA 1451, and incorporate specifics on rollover prevention in standard operating procedures (SOPs).^{5,12,13,14}

Discussion: NFPA 1451 § 5.3 states that fire department personnel must be trained in and exercise applicable principles of defensive driving techniques under both emergency and nonemergency conditions. SOPs for driving fire department vehicles during nonemergency travel and emergency response should include, but not be limited to, the principles of skid avoidance and the effects of liquid surge, load factors, general steering reactions, and speed on vehicle control. Common causes for loss of control are driving too fast for road conditions, failing to properly appreciate weight shifts of heavy emergency vehicles/apparatus, driver distraction, and failing to anticipate obstacles.

Driver training should incorporate vehicle characteristics, capabilities and limitations. Tankers, for example, tend to be heavier and to have a higher center of gravity than other fire vehicles. Both of these factors affect the driver's ability to control a tanker. Based on simple physics and inertia, a top heavy vehicle like a tanker is inclined to tip over if driven through a curve at an unsafe speed or if the driver suddenly turns the wheel in an effort to bring the wheels back onto the road. VFIS lists some vehicle rollover prevention points to increase a driver's ability

to maintain control of a vehicle should he/she run off the road onto the shoulder. VFIS cautions that the vehicle should be slowed gradually by taking the foot off the accelerator, feathering the brakes, and downshifting. Only after the vehicle has been brought down to a safe speed^b, should it be gently steered back onto the road.

Frequency of training. Driver training should be documented and given 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 #5: Fire departments should select and utilize only the safest drivers to operate emergency vehicles.^{5,15}

Discussion: Emergency vehicles are one of the most important assets to a fire organization. According to USFA statistics, twenty-five percent of all fire fighter fatalities occur in an emergency or privately owned vehicles. The safe operation of these vehicles, particularly during emergency response, depends greatly on the ability and skills of the driver. According to the VFIS communiqué, *Emergency Vehicle Driver Selection Criteria*, "Knowing drivers on and off duty driving habits and records is an important tool in both selecting and maintaining

^bAccording to USFA/FEMA (p.113) the appropriate speed at which to remount the paved surface is estimated to be 20 mph or less.



Junior Volunteer Fire Fighter is Killed While Responding to a Brush Fire with an Intoxicated Driver - Wyoming

the safest drivers for your emergency vehicles. Routine administrative reviews of all drivers MVRs^c is the most effective way to know specific driving habits of individual drivers.” VFIS recommends reviewing MVRs annually (minimally every three years) and that copies be retained in each member’s personnel file. VFIS further recommends that anyone convicted of a Class A^d violation have his/her (fire vehicle) driving privileges suspended for 18 months.

Recommendation #6. Fire departments should use caution when retrofitting non-fire service apparatus to serve as tankers, and, when this a necessity, ensure that the vehicle does not exceed its load-carrying capacity and meets the requirements of NFPA 1901 Standard for Automotive Fire Apparatus.^{5,16,17}

Discussion: Retrofitting non-fire service vehicles such as fuel oil or gasoline tankers is a common practice among fire departments with limited financial resources. The USFA cautions the fire service that converting surplus vehicles designed for another purpose to water tankers may create serious maintenance issues. If, for example, the vehicle was donated because it was worn out and the donor did not want to deal with maintenance issues, the department that acquires it may be starting with a vehicle in “questionable mechanical and safety condition.” Even if the donated vehicle is in excellent condition when acquired by the fire department, the chassis may not be designed to safely carry water. Water weighs 8.3 lbs/gal - more than fuel oil (7.12 lbs/gal) or gasoline (5.6 lbs/gal). This extra weight

can create substantial safety issues for the vehicle. To determine if the chassis can safely carry a load, subtract the unloaded weight of the vehicle from the maximum weight it is rated to carry (GVWR or gross vehicle weight rating). Load-carrying (payload) capacity (amount left to carry passengers, water, equipment and so forth) = GVWR – unloaded weight of vehicle. The vehicle involved in this incident had a GVWR of 50,000 lbs. If we assume an unloaded weight^e of 16,800 lbs for this chassis, the load-carrying capacity is 50,000 lbs – 16,800 lbs or 33,200 lbs. The weight of the water in a full 4500-gal tank is 37,350 lbs. In this incident, therefore, the load-carrying capacity of the chassis was exceeded. Although it is unknown if exceeding the load-carrying capacity contributed to this incident (it was not identified in the state highway patrol report), some cautionary comments are in order. According to the National Highway Traffic Safety Administration (NHTSA) “It is very dangerous to drive any vehicle whose load carrying capacity has been exceeded. Too much weight in a vehicle can cause difficulty steering and braking. It can also compromise a vehicle’s safety by causing the tires to wear more quickly and unevenly and suspension parts and axles to wear more quickly. In extreme cases, overloading may cause catastrophic failure of any of these components.”

REFERENCES

1. International Association of Fire Chiefs [2004]. Policy statement #03.04: Zero-tolerance for alcohol & drinking in the fire and emergency service [<http://www.iafc.org>]. Date accessed: July 6, 2004.

^c Motor Vehicle Report

^d According to VFIS, examples of Type A violations include *driving while intoxicated, driving under the influence of drugs, and negligent homicide arising out of the use of a motor vehicle (gross negligence).*¹⁵

^e The Unloaded Weight estimate is based on a conversation with a representative of the company that sold this particular vehicle to its original owner.



Fatality Assessment and Control Evaluation Investigative Report #F2003-20

Junior Volunteer Fire Fighter is Killed While Responding to a Brush Fire with an Intoxicated Driver - Wyoming

2. Cook, JL [1998]. Standard operating procedures and guidelines, Rules and regulations, SOP 103.01 *Controlled Substances*. Saddlebrook, New Jersey: Penn Well Publishing Company.
3. USFA/FEMA [2003]. Alive on arrival: Tips for safe emergency vehicle operations. Emmitsburg, MD: U.S. Fire Administration.
4. Brunacini AV [1985]. Standard operating procedures. In: Fire command. College Park, MD: YBS Productions.
5. USFA/FEMA [2003]. Safe operation of fire tankers. Emmitsburg, MD: U.S. Fire Administration.
6. NFPA [2002]. NFPA 1500, Standard on fire department occupational safety and health program. Quincy, MA: National Fire Protection Association.
7. Wyoming Statutes [2004]. Chapter 5, Article 14 (#31-5-1402). [<http://legisweb.state.wy.us/statutes/titles/title31/c05a14.htm>] Date accessed: July 13, 2004.
8. Learning for Life [2002]. Safety first: Learning for life guidelines. [www.learning-for-life.org/exploring]. Date accessed: July 6, 2004.
9. NIOSH [2001]. NIOSH Hazard ID: Fire fighter deaths from tanker truck rollovers. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2002-111.
10. VFIS [1998]. Junior fire and emergency service programs. York, PA: VFIS.
11. Wyoming Volunteer Fire Department Explorer Post Standard Operating Procedures.
12. NFPA [2002]. NFPA 1451, Standard for a fire service vehicle operations training program. Quincy, MA: National Fire Protection Association.
13. VFIS [2000]. Technical reference communiqué - vehicle rollover prevention. [www.vfis.com]. Date accessed: February 2004.
14. NFPA [2003]. NFPA 1002, Standard on fire apparatus driver/operator professional qualifications. Quincy, MA: National Fire Protection Association.
15. VFIS [2000]. Technical reference communiqué - emergency driver selection criteria [<http://www.vfis.com>]. Date accessed: April 2004.
16. NFPA [2003]. NFPA 1901, Standard for automotive fire apparatus. Quincy, MA: National Fire Protection Association.
17. National Highway Traffic Safety Administration website. Frequently asked questions on the exemptions to the make inoperative prohibition. Issues pertaining to load carrying capacity. [www.nhtsa.dot.gov]. Date accessed July 13, 2004.

INVESTIGATOR INFORMATION

This incident was investigated by Linda Frederick and Carolyn Guglielmo, Safety and Occupational Health Specialists, NIOSH Division of Safety Research, Surveillance and Field Investigation Branch.



Junior Volunteer Fire Fighter is Killed While Responding to a Brush Fire with an Intoxicated Driver - Wyoming



Photo 1. Incident site. Courtesy of state highway patrol.



Photo 2. Overturned tanker. Courtesy of state highway patrol.

U. S. Department of Health and Human Services

Public Health Service

Centers for Disease Control and Prevention

National Institute for Occupational Safety and Health

4676 Columbia Parkway, MS C-13

Cincinnati, OH 45226-1998

OFFICIAL BUSINESS

Penalty for private use \$300



**Delivering on the Nation's promise:
Safety and health at work for all people
through research and prevention**