



## Volunteer Fire Fighter Dies in Tanker Rollover Responding to Structure Fire—Oklahoma

### Executive Summary

On February 22, 2017, a 68-year-old volunteer fire fighter died in a tanker rollover while responding to a working structure fire. At 0617 hours, the local volunteer fire department was dispatched for the report of a possible structure fire. Two additional volunteer fire departments were dispatched for automatic mutual aid. The volunteer fire fighter responded to a text message from his fire chief at 0646 hours requesting him to bring Tanker 1 to the scene of the structure fire. It is unknown when the fire fighter left the station with Tanker 1. Visibility was limited due to extreme fog conditions, and the National Weather Service had issued a fog warning for the local area. While traveling south on a two-lane, paved county road, Tanker 1 ran off the right side of the road through a narrow soft shoulder into a ditch. The fire fighter steered Tanker 1 back onto the pavement. While attempting to maintain the direction of travel, Tanker 1 overturned to the left, rolled over one and one-half times, and came to rest upside down on the pavement. The fire fighter was ejected from the cab and killed instantly when the vehicle rolled onto him. At 0713 hours, a civilian motorist came upon the overturned tanker and called 911. The fire fighter was not wearing a seat belt.



**Photo 1. Front view of Tanker 1 involved in rollover.**  
*NIOSH Photo.*

### Contributing Factors

- *Low visibility caused by extreme fog conditions*
- *Seat belt not used*
- *Minimal shoulder on roadway at scene of crash*

### Key Recommendations

- *States and authorities having jurisdiction should ensure that all fire apparatus drivers complete a comprehensive driver training program that meets the requirements of NFPA 1451 Standard for a Fire and Emergency Services Vehicle Operations Training Program and NFPA 1002*

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Standard for Fire Apparatus Driver/Operator Professional Qualifications, *before allowing a member to operate a fire department apparatus.*

- *Fire departments should ensure that standard operating procedures (SOPs) regarding seatbelt use are enforced.*
- *Fire departments should ensure that department drivers/operators are trained in the unique characteristics of driving a tanker and maintaining control.*

Additionally, governing municipalities (federal, state, regional, and local) should:

- *Consider setting mandatory training requirements for volunteer fire fighters.*

The National Institute for Occupational Safety and Health (NIOSH), an institute within the Centers for Disease Control and Prevention (CDC), is the federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. In 1998, Congress appropriated funds to NIOSH to conduct a fire fighter initiative that resulted in the NIOSH “Fire Fighter Fatality Investigation and Prevention Program” which examines line-of-duty-deaths or on duty deaths of fire fighters to assist fire departments, fire fighters, the fire service and others to prevent similar fire fighter deaths in the future. The agency does not enforce compliance with State or Federal occupational safety and health standards and does not determine fault or assign blame. Participation of fire departments and individuals in NIOSH investigations is voluntary. Under its program, NIOSH investigators interview persons with knowledge of the incident who agree to be interviewed and review available records to develop a description of the conditions and circumstances leading to the death(s). Interviewees are not asked to sign sworn statements and interviews are not recorded. The agency’s reports do not name the victim, the fire department or those interviewed. The NIOSH report’s summary of the conditions and circumstances surrounding the fatality is intended to provide context to the agency’s recommendations and is not intended to be definitive for purposes of determining any claim or benefit.

For further information, visit [the program website](http://www.cdc.gov/niosh/fire) at [www.cdc.gov/niosh/fire](http://www.cdc.gov/niosh/fire) or call toll free 1-800-CDC-INFO (1-800-232-4636).

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### **Introduction**

On February 22, 2017, a 68-year-old volunteer fire fighter died when the tanker he was driving overturned while en route to a working structure fire. The apparatus was responding to a structure fire on a two-lane county road in extremely foggy conditions. On February 23, 2017, the United States Fire Administration notified the National Institute for Occupational Safety and Health (NIOSH) of this incident.

On March 21, 2017, a safety engineer and a safety and occupational health specialist from the NIOSH Fire Fighter Fatality Investigation and Prevention Program traveled to Oklahoma to investigate the incident. Photographs of the incident scene as well as the fire apparatus were taken. NIOSH investigators met with representatives from the State Highway Patrol, officers from the involved fire departments, the wife of the deceased fire fighter, and the medical examiner assigned to the case. Interviews were conducted with fire department officers who responded to the incident. No witnesses were reported. NIOSH investigators reviewed the department's standard operating procedures (SOPs), fire fighter's training records, and police photographs of the scene. NIOSH investigators were accompanied by the chief and the fire fighter's wife to inspect the incident scene and were accompanied by the chief and assistant chief to inspect the fire apparatus involved at a secured impound garage. Information regarding the tanker was obtained by NIOSH investigators through the vehicle identification number (VIN). NIOSH investigators obtained a copy of the Oklahoma Department of Public Safety, Oklahoma Highway Patrol accident investigation report and scene photographs.

### **Fire Department**

The volunteer department involved in this incident has one fire station serving a primary response geographical area of 58 square miles and responds to 85–100 emergency incidents per year. A total of 10 volunteer members serve a population of about 200 residents in a largely rural and agricultural area. Two neighboring volunteer fire departments are dispatched to all structure fires through an automatic mutual aid agreement.

The department's SOPs [Fire Department, no date] included sections on "Personal Safety On Apparatus" and "Responsibility For Vehicle Operation." The department had a written seat, waist, and shoulder harness equipment policy that stated: "All personnel will utilize seat, waist and shoulder harnesses (where applicable) when they are manning a position so equipped. As with all other restraint devices, this section requires the use of this equipment at all times when the vehicle is in motion." The department did not have any other written SOPs regarding driver training.

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### **Training and Experience**

To become a volunteer member, applicants submit a written application and photocopy of their personal identification. Following a background check, applicants are put on a 6-month probationary period. A final vote by the current membership is taken after the probationary period to determine full membership of the applicant. The department does not require new members to enroll in formal training and does not have a training requirement to join.

Training for fire department members is voluntary and available through Oklahoma State University. It is typically hosted at various fire departments in the area. Most training is free, with the majority focusing on wildland fire fighting. Fire schools are offered throughout the year. The department held monthly training events for members.

The fire fighter in this incident had approximately 7 years of experience completed at this fire department, and had a history of driving large water trucks, tankers, and agricultural equipment. He had training in various topics ranging from wildland fire fighting to hazardous materials. In 2011, he had training for Fire Tanker Safety Operations. The fire fighter had no emergency response activity in the past 24 hours before the incident.

### **Equipment and Personnel**

The department owned the following apparatus at the time of the incident:

- 2001 Freightliner FL70 American LaFrance pumper with Compressed Air Foam System Retrofit
- 2008 Ford F-350 Brush Truck with 300 gallon aspirated foam skid unit
- 2003 Freightliner FL70 2000 gallon water tender

The 2003 Freightliner water tender was the apparatus involved in the incident. NIOSH investigators inspected the tender and found the tank to have baffling intact and in apparent “good” condition (see Photo 2.)

Oklahoma Department of Public Safety, Oklahoma Highway Patrol (OHP) investigators conducted an inspection of the fire engine following the incident and found no defects that contributed to the collision. The Oklahoma Highway Patrol report of investigation for this incident listed unsafe speed as a contributing factor. The OHP report did not provide an estimate of speed.



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**Photo 2. Baffle in center of Tanker 1's 2000-gallon tank. Viewed through opening at top of tank.**  
*NIOSH Photo.*

### **Timeline**

This timeline is provided to set out, to the extent possible, the sequence of events according to the recorded radio transmissions. Times are approximate and were obtained from review of the dispatch records, witness interviews, and other available information. Times have been rounded to the nearest minute. This timeline is not intended, nor should it be used, as a formal record of events.

- **0617 Hours**  
Fire departments dispatched for possible structure fire.
- **0645 Hours**  
Chief texted the fire fighter requesting him to bring Tanker 1.
- **0646 Hours**  
Fire fighter responded to text message, “Headed that way.”
- **0647 Hours**  
Fire fighter responded to original text message, “What’s up?”

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- **0655 Hours**  
Chief responded to fire fighter’s text “house fire.”
- **0713 Hours**  
Automatic aid fire department that was on-scene for the structure fire was dispatched for a motor vehicle crash (MVC). Caller advised vehicle is a fire truck with one subject pinned underneath the vehicle.
- **0717 Hours**  
Second mutual aid fire department advised Signal 30. *Note: Signal 30 is motor vehicle crash (MVC) with fatality.*
- **0752 Hours**  
County Sheriff D-6 on-scene of the wreck.
- **1200 Hours**  
First due fire department advised all units clear of structure fire.
- **1222 Hours**  
D-6 cleared MVC scene.
- **1300 Hours**  
All units cleared of MVC scene.

### **Personal Protective Equipment**

The fire chief reported to the NIOSH investigators that the fire fighter was wearing his issued structural fire-fighting coat when he was found at the scene of the incident. The fire fighter was not wearing structural fire-fighting pants or boots. The NIOSH investigators did not inspect the personal protective equipment worn that day as it was not considered to be a contributing factor.

### **Weather and Road Conditions**

The time of the crash was just after sunrise, with reports of extreme fog and low visibility in the area. The temperature was 55 degrees Fahrenheit and winds were SSE at about 10 mph [Weather Underground 2017]. Members of the fire department reported that the National Weather Service had issued a fog warning for the local area that morning. The tanker was traveling south bound on a two-lane, paved state highway with a posted speed limit of 45 mph. The road surface was asphalt in good condition and was dry. There were no fog lines or roadway markings on the road.



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### **Seat Belt Laws**

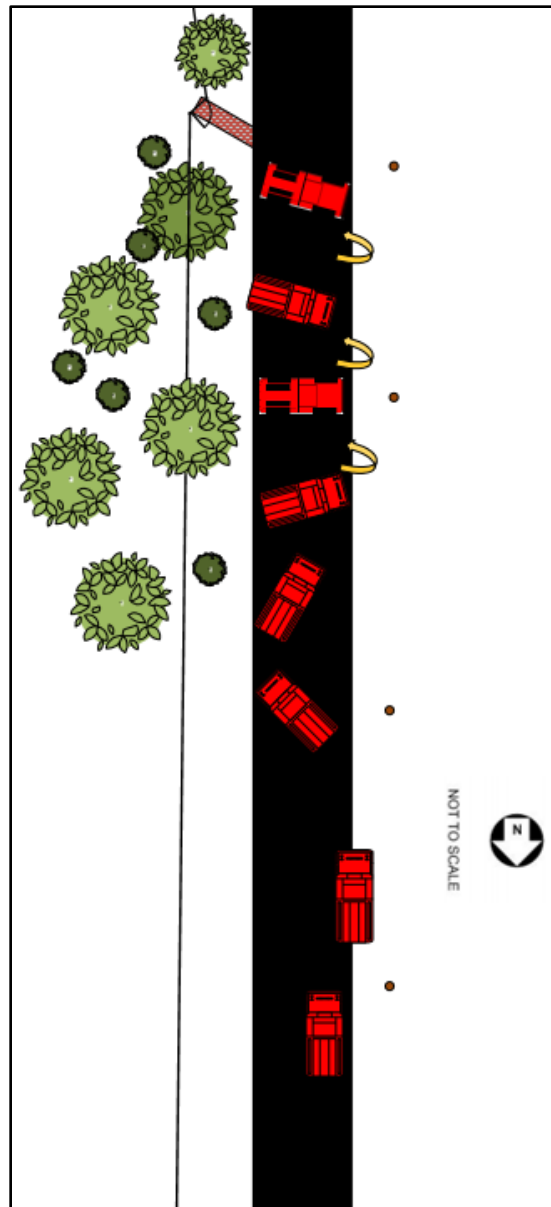
Oklahoma state law requires “drivers and their front-seat passengers to be contained by an appropriate safety system or seat belt when riding in a vehicle” [DMV.org 2017].

### **Investigation**

On February 22, 2017, a 68-year-old male volunteer fire fighter was fatally injured after being ejected in a tanker rollover. The crash occurred sometime between 0700 and 0713 as the tanker was responding to a structure fire. The fire fighter lost control of the truck as the right rear tire dropped off the side of the road. As the fire fighter brought the tanker back on the road, he overcorrected to the left, then to the right, causing the tanker to overturn one and a half times before coming to a stop on its roof, pinning the ejected fire fighter under the then-full tank. The fire fighter was the only occupant of vehicle. According to the OHP investigation, the fire fighter was not wearing a seat belt at the time of the incident. The vehicle crash was not witnessed; a passer-by found the overturned apparatus and called 9-1-1 at approximately 0713 hours. Automatic aid fire departments were called away from the structure fire to respond to the rollover.

The incident occurred on a straight stretch of paved highway in extreme fog conditions. The posted speed limit for the highway is 45 mph. Police investigations did not reveal an estimated speed of the tanker at the time of the incident. Fire fighters reported poor visibility as well as a fog warning from the National Weather Service. The road did not have fog lines or markings. Police Investigators determined from the tire marks on the road that Tanker 1’s right rear tire left the roadway onto the narrow soft shoulder between the road and a ditch. After leaving the roadway, the fire fighter re-entered the roadway, overcorrected to the left, crossed the roadway, and attempted to return the vehicle to the original direction of travel (see Diagram 1, Photo 3, Photo 4 and Photo 5). Tanker 1 then overturned to the left, rolled over one and one-half times, and came to rest upside down on the pavement (see Diagram 1, Photo 3 and Photo 6). The fire fighter was not using a seat belt. He was ejected from the fire apparatus cab and found pinned underneath the full water tank. He was pronounced dead at the scene.

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**Diagram 1. Recreation of the path of travel taken by Tanker 1 during the incident, based on information taken from the Oklahoma Highway Patrol crash report.**  
*NIOSH Diagram.*



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**Photo 3 Tanker 1 after rolling one and one half times coming to a rest on its top.**  
*Photo courtesy of Oklahoma State Highway Patrol.*



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**Photo 4: Tanker 1 drove into the narrow soft shoulder/ditch during dense fog conditions nearing zero visibility then re-entered the highway at this location. Note the marks caused by the front and rear tires.**

*NIOSH Photo.*

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**Photo 5. Point where Tanker 1 started to overturn.**  
*NIOSH Photo.*



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**Photo 6. Location where Tanker 1 came to rest after overturning.**  
*(Photo courtesy of the fire department.)*

### **Contributing Factors**

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. NIOSH investigators identified the following items as key contributing factors in this incident that led to the fatality:

- *Low visibility caused by extreme fog conditions*
- *Seat belt not used*
- *Minimal shoulder on roadway at scene of crash*

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### **Cause of Death**

According to the medical examiner's report, the cause of death was multiple blunt impact injuries.

### **Recommendations**

***Recommendation #1: Fire departments should ensure that standard operating procedures (SOPs) regarding seatbelt use are enforced.***

Discussion: The fire department involved in this incident had a standard operating procedure (SOP) requiring the use of seat belts at all times when the vehicle is in motion [Fire Department, no date]. The department's SOP falls in line with *NFPA 1500 Standard on Fire Department Occupational Safety and Health Program* stating that "all persons riding in fire apparatus shall be seated and belted securely by seat belts in approved riding positions at any time the vehicle is in motion." The standard further states that "seat belts shall not be released or loosened for any purpose while the vehicle is in motion" [NFPA 2013b].

The U.S. Fire Administration's Safe operation of fire tankers states, "Some crash reconstruction specialists have speculated that particular incidents may have occurred after the unrestrained driver of a truck was bounced out of an effective driving position following the initial contact with a bump in the road or another object" [USFA 2004].

A Department of Transportation National Occupant Protections Use Study revealed the following statistics for 2012: (1) 77 percent of passenger vehicle occupants who were totally ejected from the vehicle were killed, (2) lap/shoulder seat belts, when used, reduce the risk of fatal injury to front-seat passenger car occupants by 45 percent and the risk of moderate-to-critical injury by 50 percent, (3) only 1 percent of the occupants reported to have been using restraints were totally ejected, compared with 30 percent of the unrestrained occupants [NHTSA 2014].

The state police officers investigating this incident determined the fire fighter was not wearing a seat belt at the time of the rollover. Oklahoma state law states, "Drivers and their front-seat passengers must be contained by an appropriate safety system or seat belt when riding in a vehicle" [DMV.org 2017].

Training and enforcement of SOPs should include all levels of the organization, from the apparatus driver and fire fighters riding in the apparatus to the officer on the apparatus and chief officer levels. The SOPs should apply to all persons driving or riding in all emergency vehicles, and they should state that all persons should be seated and secured in an approved riding position before the vehicle is put in motion.



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***Recommendation #2: Fire departments should ensure that department drivers/operators are trained in the unique characteristics of driving a tanker and maintaining control***

Discussion: The key to safe emergency vehicle operation is understanding the unique characteristics of each apparatus. It is the driver's responsibility to transport fire fighters and equipment to and from an incident scene in a manner that is both safe and efficient. Under all circumstances, the fire apparatus driver/operator must exercise care for the safety of others and must maintain complete control of the vehicle [IFSTA 2006]. The U.S. Fire Administration provides a publication *Safe Operation of Fire Tankers* that details four factors that have been known to cause fire department tanker crashes. These include Human Factors, Apparatus Design Factors, Driving Surface Factors, and Emergency Scene Factors. This publication notes that "a significant percentage of crashes involving fire department tankers is attributed to the vehicle being driven at a speed that is excessive for the given conditions" USFA [2004].

Tankers and water haulers have different design characteristics that will affect their operation and handling. "Quite commonly, fire department tankers are the heaviest apparatus to be operated by any particular fire department" [USFA 2004]. Drivers should take this into account when considering speed and stopping distance. The USFA document mentions that "If the tanker's right wheels get too close to the edge of a weak road surface, that surface may crumble or otherwise fracture. This could immediately cause the apparatus to begin a rolling motion toward the right." Add a partial load of water, and an unbaffled tank, and the sloshing can increase this rolling motion known as a liquid surge. NFPA 1901, *Standard for Automotive Fire Apparatus*, contains specific requirements for the proper baffling of water and foam concentrate tanks on fire department tankers.

The Tanker in this incident did have a full water load and the tank was properly baffled. The fire fighter driving the tanker had a career's worth of experience driving large water trucks and heavy equipment, and served 7 years with this fire department. He was cleared to drive the apparatus through the process outlined in the fire department's SOP. An investigating police officer and other fire fighters (who had responded to the original structure fire) reported heavy fog that morning. There were also no markings or fog lines on the road, and the fire fighter may not have noticed he was driving near the shoulder in the extreme fog. Marks on the roadway indicate that the right wheels of the apparatus left the roadway onto a narrow soft shoulder and dropped into a ditch (Photo 4 and Photo 7). Additional marks on the pavement show that the tanker was steered to the left to bring the tanker back onto the highway, then steered back to the right in an attempt to regain forward momentum. The tanker overturned to the left and came to rest on its top, facing North-West across the highway.

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***Recommendation #3: States and authorities having jurisdiction should ensure that all drivers complete a comprehensive driver training program, such as NFPA 1451 Standard for a Fire and Emergency Services Vehicle Operations Training Program and NFPA 1002 Standard for Fire Apparatus Driver/Operator Professional Qualifications, before allowing a member to operate a fire department apparatus.***

Discussion: Fire departments should provide adequate resources and training to ensure the safe arrival to and return of members from an emergency scene. Fire departments should develop, implement, and enforce written standard operating procedures for emergency vehicle driving and ensure fire fighters are thoroughly trained and qualified before being allowed to drive and operate emergency vehicles. The minimum requirements for a fire service vehicle operations training program are contained in NFPA 1451 *Standard for a Fire and Emergency Services Vehicle Operations Training Program* [NFPA 2013a]. The objective of the program is to prevent crashes, injuries, and fatalities, both civilian and fire service. Fire departments must also ensure that fire fighters are familiar with the different models of fire apparatus that they may be expected to operate. The members should be trained to operate specific vehicles or classes of vehicles before being authorized to drive or operate such vehicles.

Standard operating guidelines for driving fire department vehicles should include the principles of skid avoidance and how vehicle control is effected by liquid surge, load, steering reactions, entering and negotiating curves, and excessive speed. Training in accordance with NFPA 1002 should be included.

Approximately 25 percent of all fire fighter fatalities occur during traffic crashes, with tanker crashes being the second most common vehicle involved (21.9%), preceded by fire fighters' personal vehicles (42.3%). The most common factors for tanker crashes are: wheels leaving the right side of the road, excessive speed, overcorrection by the driver when attempting to bring the right wheels back onto the road surface, and failure to negotiate a curve [USFA 2004].

Prior to this incident, the fire fighter's department did not have a written comprehensive driver training program. The fire department's standard procedure was for new drivers operating a fire department vehicle to be supervised by the fire chief and line officers until both were comfortable that the member could operate the vehicle safely. The fire fighter in this instance had driven this tanker and others similar to it for many years and was said to be very experienced.

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**Photo 7. Marks on the pavement caused by the right wheel leaving the highway into the ditch**  
*NIOSH Photo.*

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***Recommendation #4: Governing municipalities (federal, state, regional, and local) should consider setting mandatory training requirements for volunteer fire fighters.***

Discussion: In 2008, the National Volunteer Fire Council (NVFC) adopted a policy position that all volunteer fire departments should establish a goal to train all personnel to a level consistent with the mission of the fire department, based on the job performance requirements outlined in *NFPA 1001 Standard for Fire Fighter Professional Qualifications*. The NVFC is committed to ensuring that volunteer fire fighters have an appropriate level of training to safely and effectively carry out the functions of the department(s) to which they belong, and this issue actually encompasses the entire fire service and not just the volunteer ranks:

The roles and responsibilities of the fire service have evolved over the years. As the breadth and scope of what it means to be a firefighter has expanded, to varying degrees depending on the jurisdiction, the necessity for training within the fire service has grown. Unfortunately, a large number of volunteer fire departments are still operating with personnel who are not trained to a level consistent with national consensus standards for basic firefighter preparedness. This can lead to ineffective and unsafe responses that put lives and property at risk.

As the need for proper training has become more urgent, many volunteer fire departments are finding it increasingly difficult to attract new members. The average age of volunteer firefighters has risen steadily over the past two decades, as many young people move out of rural areas and the ones who stay find themselves with less free time to devote to training [NVFC 2010].

Standard setting organizations, states, and authorities having jurisdiction should consider developing national standards so that fire fighters across the United States are trained to the same minimum levels.

In this incident, the state did not have mandatory training requirements for volunteer fire departments. The fire department involved in this incident also did not have mandatory training requirements in their SOPs. The department encourages fire fighters to participate in training at their convenience.

***Recommendation #5: Fire Departments should ensure the fire service culture does not contribute to fire fighter occupational injuries and fatalities when making decisions to ensure that both the fire service culture and departmental safety climate can be moved forward together in a common-sense, safety-oriented approach.***

While there is no clear evidence that this recommendation contributed to this fatality, the recommendation is being given as a reminder of fire service best practice.

The National Safety Culture Change Initiative (NSCCI) is a joint partnership of the U.S. Fire Administration (USFA) and the International Association of Fire Chiefs (IAFC) aimed at identifying both positive and negative culture and climate found in the American fire and emergency services



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community [USFA 2015]. The NSCCI project is aimed at identifying the aspects of fire and emergency service culture that contribute to preventable occupational illnesses, injuries and fatalities and subsequently changing those cultural norms that either promote or tolerate excessive risk behaviors. USFA publication FA-342 covers the study of behavioral motivation on reduction of risk-taking behaviors in the fire and emergency services. This publication is based on the perspective that the expansion of a more appropriate safety culture should not be seen as a challenge to the overall fire service nor contrary to the mission of saving lives and protecting property. USFA Publication FA-342 focuses on integrating safety into the fire service culture without diminishing any of its existing positive aspects.

The summery section of the USFA (2015) National Safety Culture Change Initiative report states:

“The culture of the American fire and emergency service community is rich and time-honored. The culture has aspects that provide superior protection for life and property, while it also has portions that contribute unnecessarily to fire fighter and emergency worker injury and death. The culture can be changed at national, state and local levels without diminishing the quality of services provided by enhancing firefighter competencies needed at emergency scenes. Both the culture and climate can be moved toward a common sense, safety-oriented approach to balance the risks and rewards of questionable behaviors better” [USFA 2015, 23].

One way for fire departments to ensure both the fire service culture and their departmental safety climate is moved forward in a positive manner is by embracing a zero tolerance policy regarding SOPs. A strong policy statement accompanied by serious enforcement policy is usually effective in achieving a high level of compliance [USFA 2015]. In this manner, fire departments can foster a proactive, safety-driven culture.

***Recommendation #6: Governing municipalities (federal, state, regional, and local) should consider installing white edge lines/Delineators on county and state roads.***

White edge lines improve motorist safety by making the road edge more visible during low visibility situations, such as rain, snow, and fog. While it is not mandatory, fog lines could help reduce the possibility of drivers unintentionally leaving the roadway, then over-correcting and causing a crash.

The Federal Highway Association Manual for Uniform Traffic Control Devices Section 3B.06 Edge Line Pavement Markings states:

“Edge line markings have unique value as visual references to guide road users during adverse weather and visibility conditions.” [FHA MUTCD 2009]

The MUTCD in Section 3B.07 Warrants for Use of Edge Lines outlines several situations where edge line markings may be utilized for improved safety, including placement on “streets and highways with or without center line markings.” Engineering studies will help determine if edge lines are needed.



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A literature search showed no specific criteria in the State of Oklahoma regarding white edge lines.

The roadway involved in this incident was a paved two lane state highway with a narrow soft shoulder on each side. A drainage ditch ran along the soft shoulder on the side of the road the fire fighter was traveling. There were no edge lines, center lines or markings on the road. Due to heavy fog in the area that morning, it is likely that visibility played a major role in this incident, causing the fire fighter to partially leave the roadway, and subsequently over-correct causing the tanker to roll.

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### **Investigator Information**

This incident was investigated by Timothy R. Merinar, Safety Engineer, and Karis Kline, Safety and Occupational Health Specialist, with the Fire Fighter Fatality Investigation and Prevention Program, Surveillance and Field Investigations Branch, Division of Safety Research, NIOSH, located in Morgantown, West Virginia. An expert technical review was provided by Dr. Burton A. Clark, EFO Principal at [www.AmericanFireCulture.com](http://www.AmericanFireCulture.com). A technical review was also provided by the National Fire Protection Association, Public Fire Protection Division.

### **Additional Information**

Responder Safety Institute Emergency Responder Safety Institute serves as an advisory group of public safety leaders and transportation experts committed to reducing deaths and injuries to America's emergency responders. <http://www.respondersafety.com/>

United States Fire Administration, Safe Operation of Fire Tankers, Emmitsburg, Maryland. [Safe Operation of Fire Tankers](http://www.usfa.fema.gov/downloads/pdf/publications/fa-248.pdf) <http://www.usfa.fema.gov/downloads/pdf/publications/fa-248.pdf>

In 2015 the US Fire Administration published a report titled *National Safety Culture Change Initiative. Study of Behavioral Motivation on Reduction of Risk-Taking Behaviors in the Fire and Emergency Service*. The work group that developed this report includes these organizations: Cumberland Valley Volunteer Firemen's Association, IAFC, IAFF, NFFF, NFPA, and NIOSH. The Staff for this report come from: IAFC, NVFC, NAFTD, University of Illinois Fire Service Institute, USFA, and Johns Hopkins Bloomberg School of Public Health. [National Safety Culture Change Initiative. Study of Behavioral Motivation on Reduction of Risk-Taking Behaviors in the Fire and Emergency Service](https://www.usfa.fema.gov/downloads/pdf/publications/fa_342.pdf)  
[https://www.usfa.fema.gov/downloads/pdf/publications/fa\\_342.pdf](https://www.usfa.fema.gov/downloads/pdf/publications/fa_342.pdf)

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