



## Career Fire Fighter Dies After Engine He was Driving Collides with a Tractor Trailer - Alabama

### SUMMARY

On November 28, 2005, a 25-year-old male career fire fighter died from injuries he sustained after the engine he was driving collided with a tractor trailer. The victim was alone while driving an engine with lights and sirens operating to a dispatched medical emergency on a highway. He was following a rescue truck with an officer and a fire fighter who were dispatched from the same station. The victim was approaching an intersection as a tractor trailer pulled out in front of him. The victim struck the tractor trailer and the force of the impact pinned him in the driver's seat. Rescue crews extricated the victim and flew him to a local trauma center where he died as a result of his injuries. NIOSH investigators concluded that, to minimize the risk of similar occurrences, fire departments should:

- *develop and document an inspection, maintenance, and repair schedule that includes verification of appropriate vehicle operation prior to the apparatus being placed back into service*

- *ensure that all repairs are performed by a qualified technician*
- *provide training to driver/operators as often as necessary to meet the requirements of NFPA 1451, 1500, and 1002. This training should incorporate specifics on intersection practices*
- *ensure that adequate numbers of staff are available to immediately respond to emergency incidents*

Although it is unclear if the following contributed to this incident, States and local authorities having jurisdiction should

- *consider installing intersection control devices on all emergency vehicles and selected traffic lights*
- *consider developing programs to require and policies to facilitate emergency vehicle drivers obtaining a commercial driver's license*



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

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## Fatality Assessment and Control Evaluation Investigative Report #F2006-05

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#### **INTRODUCTION**

On November 28, 2005, a 25-year-old male career fire fighter died from injuries he sustained after the engine he was driving collided with a tractor trailer. On November 29, 2005, the U.S. Fire Administration (USFA) notified the National Institute for Occupational Safety and Health (NIOSH) of the fatality. On January 26, 2006, the International Association of Fire Fighters (IAFF) also notified NIOSH of the fatality. On March 7-10, 2006, an Occupational Safety and Health Specialist and a General Engineer from the NIOSH Division of Safety Research investigated the incident. Meetings were held with the State Police, representatives from the State Fire Marshal's Office, and the local IAFF. Interviews were conducted with officers and fire fighters who were directly involved in the incident. The NIOSH investigators reviewed the State Police report, the department's standard operating procedures (SOPs), the medical examiner's report, victim's training records, and photographs and drawings of the incident site. The incident site was visited and photographed.

#### **Department and Response Protocol**

The combination department involved in this incident is comprised of 26 career and 15 volunteer fire fighters who operate out of two stations. The department serves a population of approximately 6,000 residents in a geographic area of about 60 square miles.

The department's response protocol for a medical emergency involving a vehicle is to dispatch a rescue truck and engine from the nearest fire station along with a private ambulance service that is dispatched by the county.

#### **Training**

The State of Alabama does not require a commercial driver's license or any specialized

training for its fire fighters driving apparatus. The victim had received extensive training, including Fire Fighter I and II, Fire Officer I and II, Apparatus Pumper and Aerial Operator, and Fire Instructor I. He had more than 8 years of fire fighting experience.

#### **Apparatus**

The apparatus was a 1990 engine with a 1,000 gallon water tank that was acquired from a neighboring department in 2004. The design of the chassis placed the cab over the engine making the windshield flush with the front of the apparatus. The engine was equipped with air brakes, and both of the rear axles had dual tires on each side. The engine was equipped with red, flashing lights on top of the cab; red, rotating lights above the grill; and strobe lights on the back of the engine. It also had an electronic and mechanical siren. The engine was not equipped with a device to control traffic lights.

#### **Weather/Road Conditions**

The conditions were partly cloudy with the temperature averaging 62-degrees Fahrenheit. The average humidity was 87 percent with winds averaging around 8 miles per hour. The asphalt road was dry, clearly marked, and in good repair.

#### **INVESTIGATION**

On November 28, 2005, a 25-year-old male career fire fighter was alone while driving an engine with his lights and sirens operating to a dispatched medical emergency situation at approximately 0900 hours. The engine was following a rescue truck with an officer and a fire fighter who were dispatched from the same station. The victim was traveling north on a divided county road and approaching an intersection with turning lanes and a traffic light that controlled traffic entering the roadway from an interstate off-ramp (Diagram).



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As the engine approached the intersection the traffic light turned red. The light for the off-ramp turned green and a dump truck drove into the intersection just in front of the engine, and proceeded south on the county road in the opposite direction. A tractor trailer in a lane adjacent to the dump truck also entered the intersection. The engine missed the dump truck and struck the tractor trailer. The front driver's side of the engine contacted the tractor trailer at the beginning of the trailer section (see Diagram). *Note: The angle of the tractor trailer behind the dump truck could have shielded it from the line of sight of the victim. There weren't any skid marks on the road indicating that the engine's brakes possibly failed or the driver's vision was obscured. The collision could also have been a combination of both the brakes and obscured vision. There were reports from multiple fire fighters who drove this apparatus that the brakes would fail without warning. The department reportedly attempted to fix the problem in house and through the city's maintenance department. The department also reported that they had the brakes changed in the spring of 2005 by an outside mechanic who had previously been certified and employed by a fire apparatus dealer.*

The force of the impact drove the tractor trailer through the intersection and lodged the engine under the trailer. Due to the cab over engine design of the chassis, the cab on this type of apparatus does not place anything in front of the driver's compartment (i.e. motor, bumper, frame) to provide protection from a frontal collision. The front driver's side area received the full impact of the collision. The front of the engine and dashboard were crushed inward trapping the victim's lower extremities. The steering wheel was pushed in toward the victim who was wearing a lap belt. The seat was forced up lodging the victim's torso against the steering wheel.

Rescue crews arrived on the scene within minutes of the crash. Due to the extensive damage, the crews had to operate for approximately 45 minutes to remove the victim, who was responsive throughout the extrication. He was flown to a local trauma center where he died as a result of his injuries.

### **CAUSE OF DEATH**

The medical examiner listed the cause of death as blunt force injuries.

### **RECOMMENDATIONS/DISCUSSIONS**

***Recommendation #1: Fire departments should develop and document an inspection, maintenance, and repair schedule that includes verification of appropriate vehicle operation prior to the apparatus being placed back into service.***

Discussion: Fire departments should establish a vehicle inspection and scheduled maintenance program that includes inspections, maintenance and a recordkeeping system. All fire department apparatus and vehicles need to be scheduled for routine preventive maintenance. Driver/operators should conduct pre-trip inspections which, at a minimum, should include tires, brakes, warning lights and devices, headlights and clearance lights, windshield wipers, and mirrors. The apparatus should be started and the operation of pumps and other equipment should be verified. Fluid levels should also be checked regularly. These inspections should be performed by career personnel at the beginning of each tour of duty and by volunteer personnel on a weekly or bi-weekly basis.

Vehicles should be removed from service until all unsafe conditions are corrected.<sup>1</sup> In this case, the proper operation of the brakes were still in question. Reported statements of brake failure continued



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after the work was completed by the outside mechanic.

***Recommendation #2: Fire departments should ensure that all repairs are performed by a qualified technician.***

Discussion: National Fire Protection Agency (NFPA) 1500 states “All repairs to fire department apparatus shall be performed by personnel meeting the requirements of NFPA 1071, *Standard for Emergency Vehicle Technician Professional Qualifications*, or personnel trained to meet the requirements identified by the manufacturers in their specifications and procedures for fire department vehicles and protective equipment.”<sup>1</sup>

The 1990 apparatus involved in this incident was acquired from another department in 2004. Reported statements from the victim and other drivers from the department involved in this incident, along with reports of members from the previous department, were that the brakes would completely fail and then return to normal on a regular basis. Attempts were made to fix the problem in house and by the city garage. Neither the garage, nor any individual at the department was qualified to work on the apparatus to properly diagnose or fix the problem. The department had an outside mechanic change the brakes, but the braking system was never diagnosed to determine the actual cause of brake failure. The manufacturer was not contacted for assistance, nor were there any known recalls on this apparatus.

***Recommendation #3: Fire departments should provide training to driver/operators as often as necessary to meet the requirements of NFPA 1451, 1500, and 1002. This training should incorporate specifics on intersection practices.***

Discussion: In NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program*,<sup>2</sup> Chapter 5.3.1 states that fire department personnel must be trained in, and exercise applicable principles of, defensive driving techniques under both emergency and non-emergency conditions. To reduce the risk of crashes and injury or death, Chapter 6.2.8 states that fire apparatus must come to a complete stop in a number of situations including red traffic lights, stop signs, negative right-of-way intersections, blind intersections, and when the driver cannot account for all lanes of traffic in an intersection. These requirements should be included in written SOPs and incorporated into fire fighter training.

The Volunteer Firemen’s Insurance Services (VFIS)<sup>3</sup> recommends the following specific practices for controlled intersections such as existed in this incident (those controlled by a stop sign, yield sign, or yellow or red traffic lights):

- Scanning the intersection for possible hazards, e.g., right turns on red and vehicles traveling fast, and not relying on warning devices to clear traffic.
- Beginning to slow down well before reaching the intersection and continuing to scan in all directions.
- Changing the siren cadence at least 200 feet from the intersection.
- Scanning the intersection for possible passing options, avoiding the use of the opposing traffic lane if possible.
- Bringing the vehicle to a complete stop if the driver cannot account for traffic in all lanes in an intersection
- Drivers establishing eye contact with other vehicle drivers.

Driver qualifications: NFPA 1500 *Standard on Fire Department Safety and Health Program*<sup>1</sup> and NFPA 1002 *Standard for Fire Apparatus*

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*Driver/Operator Professional Qualifications*<sup>4</sup> describe the requisite knowledge and skills individuals need to be a driver/operator. These include intersection practices, preventive maintenance inspections, and demonstrating how to properly operate an apparatus under a variety of conditions.

Frequency of training: NFPA 1451<sup>2</sup> states 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. NFPA 1451<sup>2</sup> also states that during the training, each driver should operate the vehicle and perform tasks that he/she is expected to encounter during normal operations to ensure the vehicle is safely operated in compliance with all applicable State and local laws.

***Recommendation #4: Fire departments should ensure that adequate numbers of staff are available to immediately respond to emergency incidents.***

Discussion: NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, recommends that a minimum of four members respond on each engine and each ladder company for structural fires or emergency responses. This recommended staffing helps ensure adequate staffing for rescue or vehicle extrication. NFPA 1710 also recommends that in jurisdictions with high-hazard occupancies, which is consistent with this incident (neighborhoods with structures in close proximity to one another) a minimum of five or six members on each engine and each ladder company.<sup>5</sup>

The presence of other fire fighters in an apparatus or vehicle can improve safety by having additional fire fighters assessing potential hazards and safe vehicle operations. For example, NFPA 1500 suggests that officers and other fire fighters engage drivers/operators in a “challenge and response” dialogue. This dialogue can be used to assess the driver’s intentions when approaching any perceived or identified hazards, and for officers and other occupants to help identify hazards and reiterate department procedures and safe practices. This type of dialogue can help ensure that department policies and procedures are followed and that drivers/operators are aware of potential hazards and not focusing solely on arrival at the emergency scene.<sup>1</sup>

In this incident, due to inadequate staffing, the driver was responding alone. Adequate staffing is needed for an apparatus to carry out its duties and operate safely, not only once it arrives on-the-scene, but also while responding. SOPs for a specific company and function must include the required number of personnel to accomplish the mission in a safe and efficient manner.

***Recommendation #5: States and local authorities having jurisdiction should consider installing intersection control devices on all emergency vehicles and selected traffic lights***

Discussion: NFPA 1451, A.7.1.3<sup>2</sup> recommends the installation and use of intersection control devices to allow emergency vehicles to control traffic lights. This would allow an apparatus approaching an intersection to change the light to green giving the apparatus the right-of-way through the intersection.

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***Recommendation #6: States and local authorities having jurisdiction should consider developing programs to require and policies to facilitate emergency vehicle drivers obtaining a commercial driver's license.***

Discussion: NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program*,<sup>2</sup> recommends that fire departments encourage their operators to obtain an appropriate commercial driver's license as required by the federal government for commercial vehicle drivers. States and local authorities having jurisdiction should consider developing a program to require fire fighters to obtain a commercial driver's license prior to operating a fire apparatus. The policies could include a means to provide the necessary funding or develop a payback program with local vendors to facilitate acquiring a license. This could help to ensure that drivers are knowledgeable of their State and local codes, vehicle safety check inspections, maintenance and repair requirements, and that they perform driving skill tests.

**REFERENCES**

1. NFPA [2002]. NFPA 1500: Standard on fire department occupational safety and health programs. Quincy, MA: National Fire Protection Association.

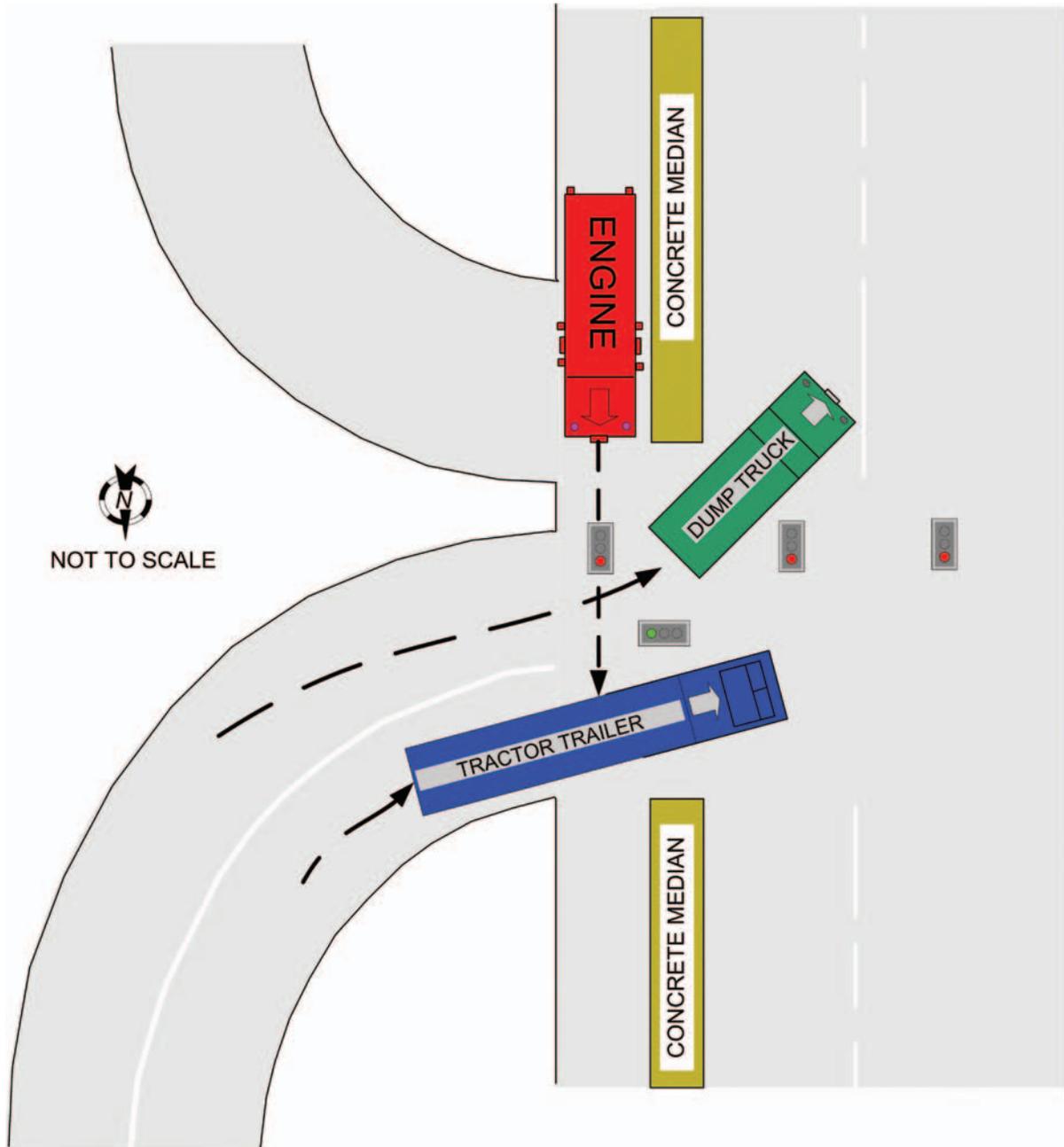
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5. NFPA [2001]. NFPA 1710, standard for the organization and deployment of fire suppression operations, emergency medical operations, and special operations to the public by career fire departments. Quincy, MA: National Fire Protection Association.

**INVESTIGATOR INFORMATION**

This incident was investigated by Matt Bowyer, General Engineer and Jay Tarley, Safety and Occupational Health Specialist, Division of Safety Research, NIOSH.



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*Diagram. Aerial view of the incident scene*

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