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NIOSH
Fire Fighter Fatality Investigation and Prevention Program

Death in the line of duty...

A summary of a NIOSH fire fighter fatality investigation *December 7, 1998*

Volunteer Fire Fighter Killed During Wildland Fire-Texas

SUMMARY

On August 1, 1998, one male volunteer fire fighter died following an apparatus incident in which his right leg was crushed between the pumper on which he was riding and a utility pole (see figure). He was part of a mutual-aid response group that was fighting a 500-acre wildland fire that threatened 13 dwellings and additional outbuildings such as barns and sheds. The fire was also burning beside an interstate highway and was creating a dangerous smoke condition. The engine on which the victim was riding was going from house to house and extinguishing the wildland fire as it approached each dwelling and outbuilding. At the scene of the incident, the fire nearby had been extinguished. After loading the 1½-inch handline onto the hose bed, the victim was standing on the tailboard holding down the hose as the engine backed up in preparation for turning around. As the engine neared the utility pole, the victim tried to warn the driver/operator about the utility pole and apparently slipped off the tailboard. His right leg was crushed between the tailboard and the utility pole and was traumatically amputated at the knee. The victim was treated at the scene and went into cardiac arrest. Resuscitation efforts were begun and the victim was transported to the local hospital by ambulance. Resuscitation efforts were continued at the hospital where he was later pronounced dead. NIOSH investigators concluded that, to minimize the chances of similar occurrences, fire departments should:

- ***ensure that fire fighters are trained in the dangers of riding on the back step of fire apparatus***
- ***ensure that standard operating procedures are developed that address apparatus safety***
- ***ensure that driver/operators are trained in an approved driver training program***
- ***ensure that fire apparatus is equipped with a back-up alarm.***

INTRODUCTION

On August 1, 1998, a 71-year-old male volunteer fire fighter (the victim), died after his right leg was crushed between the pumper on which he was riding and a utility pole and was amputated at the knee. He was part of a 13-department mutual-aid response group that was fighting a 500-acre wildland fire that threatened 13 dwellings and additional outbuildings.

On August 5, 1998, NIOSH was notified of this incident by the United States Fire Administration.

On August 11, 1998, a Safety and Occupational

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. 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:

http://www.cdc.gov/niosh/firehome.html

or call toll free **1-800-35-NIOSH**

Health Specialist from the Division of Safety Research, traveled to Texas to conduct an investigation of this incident. Meetings were conducted with fire department officers and fire fighters who were on the scene at the time of the incident, ambulance service paramedics, and the Sheriff's Office dispatcher. Fire Department standard operating procedures, Sheriff's Office dispatch log, hospital emergency room report, and ambulance service run report were reviewed, a site visit was conducted, and photographs of the incident scene were taken.

The fire department involved in the incident consists of 33 volunteer fire fighters and serves a population of 1,000 in a geographic area of 66 square miles. The State of Texas requires all new volunteer fire fighters to complete 498 hours of training to become a certified Basic Fire Fighter (similar to NFPA Fire Fighter Level I). The required training is designed to cover protective clothing, safety, fire behavior, hose, appliances, streams, ladders, ventilation, building construction, SCBA, salvage, overhaul, forcible entry, fire fighter rescue, hazardous materials, rope rescue, incident command, and emergency care attendant. The victim had approximately 16 years of fire fighting experience.

The site of the incident was 13 miles from the fire station, was outdoors and consisted of about 500 acres of grass and mesquite trees that adjoined an interstate highway. The area included 13 dwellings and additional outbuildings such as barns and sheds. There was no wind on the day of the incident and the temperature was 106° F with low humidity.

INVESTIGATION

On August 1, 1998, the Sheriff's Office Dispatcher, who dispatches all fire calls for the county, was notified of a request for mutual aid from the Incident Commander (IC) at a wildland fire at 1442 hours. The Sheriff's Office then dispatched Tanker 601, Engine 602, and Engine 603 at 1444 hours. These units were part of a mutual-aid response group consisting of 13 fire departments from two counties. The IC was the Fire Chief from the neighboring town in whose district the fire occurred. Altogether 15 engines, 4 tankers, and 2 United States Forest Service helicopters and 40 personnel were on the scene.

Engine 603 (Chief and one fire fighter) responded at 1448 hours. Tanker 601 (two fire fighters) and Engine 602 (Assistant Chief, the victim and a second fire fighter) responded at about 1450 hours. These units arrived at about 1507 hours. There was heavy black smoke and intense heat in the area, and flame height was from 10 to 12 feet in some locations. Engine 603 met with the IC who advised there were 13 dwellings plus an unidentified number of barns and sheds to protect in their area of responsibility. The IC ordered the department involved in this incident to proceed from one house to another and extinguish the wildland fire as it approached each structure.

The crews began fire extinguishment at the first house in their assigned area. Tanker 601 experienced pump problems and would not pump. Two fire fighters stayed to work on the tanker while one fire fighter from Tanker 601 and the victim from Engine 602 proceeded to the second and then third houses. At each location, the victim would pull the 1½-inch handline, extinguish the fire, and loosely load the hose onto the hosebed. He would stand on the tailboard to hold the hose in place while the pumper was moved to the next location. After extinguishing the approaching fire at the third house, they

proceeded to the fourth house. Engine 602 was placed to the left of the fourth house. The victim removed the hose and began extinguishing the approaching fire. Upon completion, he again loaded the hose onto the hosebed and stood on the tailboard while the pumper was being turned around. While the driver/operator was backing up the pumper, he saw a tree in the reflection of the right-side mirror and attempted to avoid hitting it. In the attempt to avoid the tree, the back of the pumper struck a utility pole and the victim yelled for the driver to move the pumper forward. Upon moving the pumper forward, the driver/operator looked in the right mirror again and noticed the victim fall to the ground near the right rear corner of the pumper. The driver/operator stopped the pumper and went to where the victim was lying. The victim related to the driver/operator that he had tried to warn him about the utility pole. The driver/operator thought that the victim had received a broken leg and radioed to dispatch to request an ambulance at 1548 hours. Medic 6, a paramedic ambulance, was dispatched at 1548 hours and was enroute to the scene at 1549 hours. During this time, the fire had doubled back toward the pumper and the victim. Two other fire fighters operating nearby came over and began fire extinguishment in the area immediately around the pumper. A fire fighter retrieved a knife from his personal vehicle and cut the victim's bunker pants off the injured limb. The right leg had been amputated at knee level and the victim was losing blood. The bunker pants and boots had absorbed some blood and it was not readily ascertained how much blood was lost. Upon seeing the extent of the injuries, a tourniquet was applied to the victim's right leg. The IC, who was an Emergency Medical Technician-Intermediate, came to the scene and assessed the victim's condition. The IC began two IVs on the victim. The victim had no palpable radial pulse, but a rapid carotid pulse was present. The victim also had a low blood pressure and rapid respirations, and became cyanotic. Oxygen was administered, spinal immobilization was maintained, a cervical collar was applied to the victim, and he was placed onto a backboard and strapped down. The victim became unresponsive, stopped breathing, and cardiopulmonary resuscitation (CPR) was begun.

Medic 6 arrived on scene at 1601 hours and the victim was loaded into Medic 6 and transported to the hospital at 1611 hours. Enroute to the hospital, the victim was connected to a cardiac monitor which revealed pulseless electrical activity. Patient assessment also revealed low oxygen saturation, a distended stomach, and estimated blood loss of 2 to 3 pints. Two intubation attempts were made, then an oral airway was inserted into the trachea. A precordial thump was administered and a pulse returned. Shortly, the victim became pulseless again and CPR was resumed. Medic 6 arrived at the hospital at 1627 hours.

In the hospital emergency room, the victim received two units of blood and an endotracheal tube was inserted to assist ventilation efforts. His pupils were fixed and he remained cyanotic. Resuscitation efforts were continued but were unsuccessful. He was pronounced dead at 1704 hours.

CAUSE OF DEATH

The cause of death was listed by the attending physician as multiple trauma, traumatic amputation, hypovolemic shock, and cardiac arrest.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Fire departments should

ensure that fire fighters are trained in the dangers of riding on the back step of fire apparatus.[1,2,3]

Discussion: Certain riding positions on fire apparatus are safer than others. Riding while unrestrained on the rear step is the least safe, even unsafe. The driver/operator may not see the fire fighter or know when the fire fighter is in danger. A collision or slippery back step could cause the fire fighter to lose his grip and fall from the apparatus. Fire fighters should be discouraged from riding on the rear step or in a standing position anywhere on the apparatus.

Recommendation #2: Fire departments should ensure that standard operating procedures are developed that address apparatus safety.[2,3]

Discussion: A standard operating procedure should be developed addressing all safety aspects regarding apparatus operations to include permissible locations on the apparatus on which to ride during specific operations. Apparatus speeds will be increased when responding to or returning from an emergency and all fire fighters should be properly seated and wearing a seat belt.

Recommendation #3: Fire departments should ensure that driver/operators are trained in an approved driver training program.[3,4]

Discussion: The driver/operator involved in this incident had received in-house training on driving fire apparatus. Fire-department vehicles should be operated only by members who have successfully completed an approved driver training program or by student drivers under the supervision of a qualified driver. NFPA 1002, Standard for Fire Department Vehicle Driver/Operator Professional Qualifications, part 2-3 describes the components of an approved driver's training course. The fire department should develop standard operating procedures for safely driving fire department vehicles in both non-emergency travel and emergency response.

Recommendation #4: Fire departments should ensure that fire apparatus is equipped with a back-up alarm.[5]

Discussion: The fact that the pumper involved in this incident was not equipped with a back-up alarm was not a contributing factor to the fatal injury. However, the NFPA recommends that all fire apparatus be equipped with a back-up alarm. The driver/operator cannot see the area immediately behind the pumper while backing due to vehicle construction and water tank location. A back-up alarm that meets the Type D (87 decibels) should be installed on all fire apparatus to alert nearby personnel that the vehicle is backing. The driver/operator should perform a walk-around prior to backing the apparatus. In addition, a ground guide should direct the apparatus any time it is backing. Fire fighters should be trained in directing a backing fire apparatus. The training should include looking for hazards near the apparatus such as overhead wires, trees, poles, and holes, and for personnel standing close by.

REFERENCES:

1. Dunn, Vincent, Safety and Survival on the Fireground, Fire Engineering, Saddle Brook, NJ, 1992.

2. International Fire Service Training Association (IFSTA), Essentials of Fire Fighting, Third Edition, Stillwater, OK, 1992.

3. National Fire Protection Association, NFPA 1500, Standard on Fire Department Occupational

Safety and Health Program, National Fire Protection Association, Quincy, MA, 1997 Edition.

4. National Fire Protection Association, NFPA 1002, Standard for Fire Department Vehicle Driver/Operator Professional Qualifications, National Fire Protection Association, Quincy, MA, 1993 Edition.

5. National Fire Protection Association, NFPA 1901, Standard for Automotive Fire Apparatus, National Fire Protection Association, Quincy, MA, 1996 Edition.

INVESTIGATOR INFORMATION

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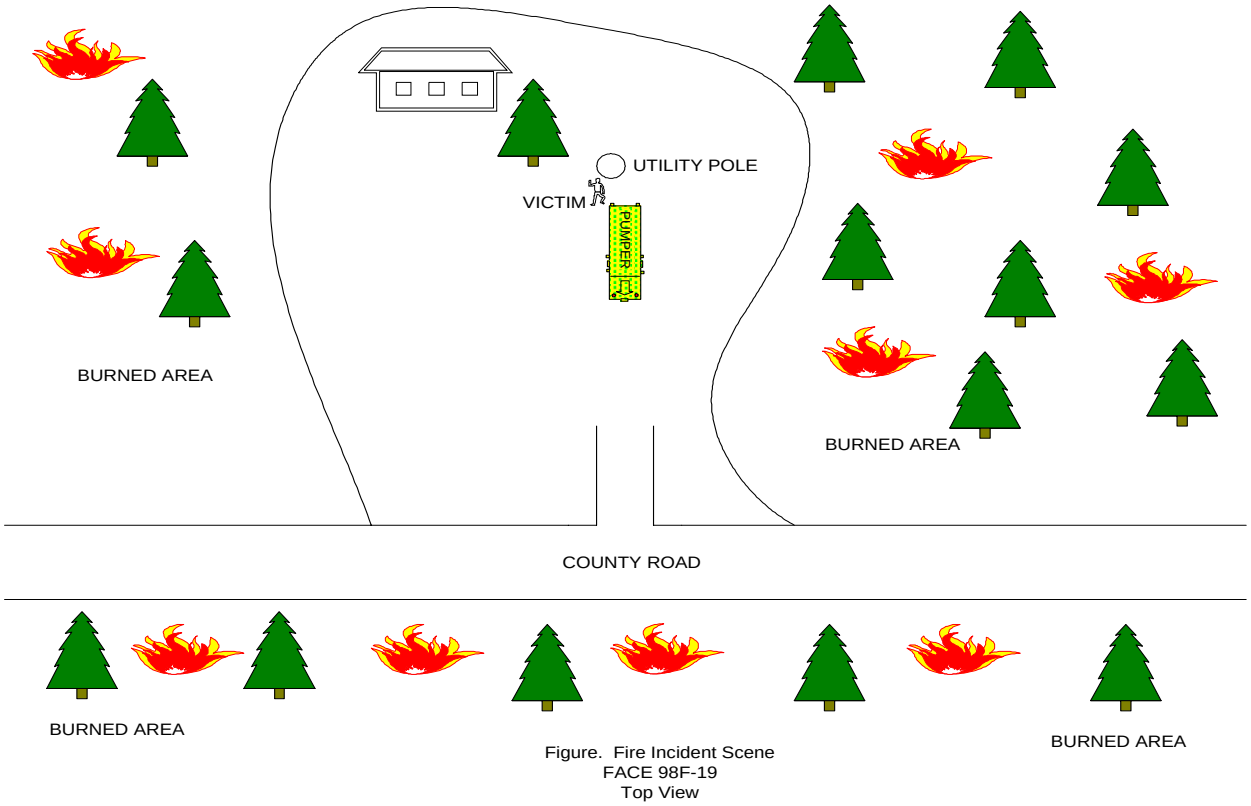

Figure. Fire Incident Scene
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Top View