



NIOSH
Fire Fighter Fatality Investigation
and Prevention Program

Death in the line of duty...

A summary of a NIOSH fire fighter fatality investigation

July 27, 2004

Volunteer Fire Fighter/Fire Service Products Salesman Dies After Being Struck by Dislodged Rescue Airbag - South Dakota

On July 10, 2003, a 50-year-old male volunteer fire fighter/fire service products salesman (the victim) died after being struck by a rescue airbag (high pressure lifting device). The victim was demonstrating the use of rescue airbags when the incident occurred. A set of three airbags had been placed under the rear bumper of a front end loader, coupled together and inflated. The airbags were being deflated when they separated and burst out from under the loader. The middle airbag struck the victim on the head and chest. The victim was immediately treated at the scene by volunteer emergency medical technicians and transported by helicopter to a local hospital where he was pronounced dead later that day.

NIOSH investigators concluded that, to minimize the risk of similar incidents, fire departments and fire service products distributors should:

- **provide training to all fire fighters and employees expected to use or demonstrate rescue airbags**
- **follow safety rules for airbag lifting operations (e.g., use cribbing)**
- **provide and enforce the use of personal protective equipment during airbag demonstrations and use**

Additionally, fire service product manufacturers should:

- **ensure that information and photographs contained in catalogs, operator's manuals and internet web sites correspond with one another and provide consistent safety information**



Inflated airbags just prior to the incident. Airbags are positioned under the rear bumper of a front end loader

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
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Volunteer Fire Fighter/Fire Service Products Salesman Dies After Being Struck by Dislodged Rescue Airbag - South Dakota

INTRODUCTION

On July 10, 2003, a 50-year-old male volunteer fire fighter/fire service products salesman (the victim) was killed while demonstrating the use of rescue airbags. On July 13, 2003, the International Association of Fire Fighters (IAFF) notified the National Institute for Occupational Safety and Health (NIOSH) of this fatality. On September 30, 2003, the senior investigator for the NIOSH Fire Fighter Fatality Investigation and Prevention Program investigated the incident.

The NIOSH investigator met with the County Detective, Training Officer of a neighboring City Fire Department and one of the owners of the fire service products retail distributor. The Chief of the victim's department, the State Occupational Safety and Health Administration (OSHA) investigator, and an executive working for the company that manufactured the airbags were subsequently interviewed via telephone. The Sheriff's Department incident report, OSHA incident report, video tape, photographs, and coroner's report were reviewed. Photographs of the airbags involved in the incident were taken, and an examination of the airbags was also performed.

Fire Department

This volunteer department has 36 uniformed personnel and serves a population of approximately 2,130 in a rural area of about 75 square miles covering two counties. The victim had been a volunteer fire fighter for 7 months.

Training

The State does not require training for volunteer fire fighters; however, the victim had completed State fire fighter Level I and II and basic wildland fire fighter training. The victim had worked for the Fire Service Products Distributor about 2 years as a salesman. The company had been in business for 55 years and this was their first fatality. Two days prior to the incident, the victim had attended a one

hour demonstration on the use of rescue airbags provided by a representative of the airbag manufacturer. He had not received any formal training on how to demonstrate the use of the rescue airbags.

INVESTIGATION

On the evening of July 10, 2003, a volunteer fire fighter/fire service products salesman (the victim) assembled approximately 30 members from several area volunteer fire departments to observe a demonstration of rescue airbags (high pressure lifting devices [see Photo 1]).

The specifications for the rescue airbags are as follows:

Weight	-	66.1 lb
Lifting height	-	26.2 inch
Min. lifting capacity	-	13,200 lb
Max. lifting capacity	-	290,400 lb
Working pressure	-	147 psi
Min. dia. Deflated	-	34.37 inch
Max. dia. Inflated	-	51.2 inch

The bags had been purchased by two local volunteer fire departments from the victim who decided to demonstrate the use of the bags. A local volunteer



Photo 1. One of three rescue airbags (deflated) involved in the incident.



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fire department had made arrangements with a local quarry to use their maintenance garage and a front end loader to demonstrate the lifting capabilities of the airbags. The front end loader (weight approximately 191,000 lbs.) was backed into the garage, parked, brakes set and the bucket put in the down position. The victim then explained the airbag operation to the fire fighters, and with the aid of several other fire fighters, placed the airbags beneath the bumper on the rear end of the loader and coupled them together. [Note: the airbags were coupled together by means of a closed connector and top load plate located on top of the airbag (see Photo 2).] The height from the floor to the center of the loader bumper was about 37 inches. Depending on the height of the object to be lifted, several airbags can be coupled together for higher lifting capability.



Photo 2. Closed connectors and top load plate used to couple airbags together

Next the hose connections were made between the airbags, air controllers, and air supply/air bottles. The bags were then inflated until the rear tires of the loader began to rise. [Note: Cribbing (wooden 2x2s, 4x4s, 2x6s, 6x6s), which is used to secure an object in its position and recommended by the airbag manufacturer in the operator's manual, was not being used during the lifting of the loader (see Illustration).]

After the airbags were inflated, the air pressure was slowly released to deflate the airbags. As the airbags

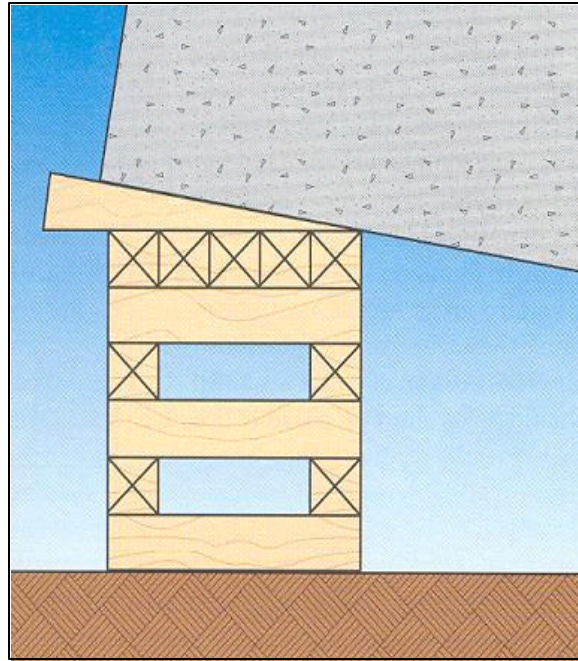


Illustration. Example - Wooden cribbing

were being deflated, one of the fire fighters observed that the airbags were leaning out away from the loader (see cover photo). The leaning was brought to the attention of the victim who responded that the leaning was acceptable because the airbags were coupled together. As the airbags continued to deflate, the leaning became more pronounced and the victim stepped closer to the airbags in order to observe the lean and then stepped away about 8-10 feet. Suddenly, all three airbags separated at the coupling mechanisms and burst out from beneath the loader. Evidence suggests that after the airbags were tightly coupled together, they were repositioned (partially unscrewed) to allow for alignment of the air valves. The partial unscrewing of the coupling mechanism may have contributed to the separation of the airbags.

The middle airbag struck the victim on the head and chest while the other two airbags were propelled in different directions. The victim was provided



Fatality Assessment and Control Evaluation Investigative Report #F2003-34

Volunteer Fire Fighter/Fire Service Products Salesman Dies After Being Struck by Dislodged Rescue Airbag - South Dakota

immediate medical assistance by volunteer emergency medical technicians who were onsite. He was then transported to the local hospital by helicopter where he died the following day from the injuries he sustained in the incident.

CAUSE OF DEATH

The coroner identified the cause of death as a closed head wound.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Fire departments and fire service products distributors should provide training to all fire fighters and employees expected to use or demonstrate rescue airbags.¹

Discussion: Personnel assigned to use and/or demonstrate rescue airbags should be trained in the safe procedures necessary to use or demonstrate these devices. Training and education are paramount to an effective occupational safety and health program. It is critical that employees are trained before they perform specific tasks. The victim had not received any formal training on how to demonstrate the use of rescue airbags.

In this incident, the victim had observed a single demonstration on the use of rescue airbags prior to the fatal incident. The demonstration did not include the use of cribbing.

Recommendation #2: Fire department personnel and fire service product demonstrators should follow safety rules for airbag lifting operations (e.g., use of cribbing).²

Discussion: Airbags give rescuers the ability to lift or displace objects that cannot be lifted by hand or with other rescue equipment. Following safety rules are vital to a safe and effective operation. The following safety rules, at a minimum, should be followed while demonstrating or using rescue airbags:

- The lifting operation should be planned before starting, and the equipment should only be used by trained personnel
- Operators should be thoroughly familiar with the equipment, its operating principles and methods, and its limitations
- Operators should follow the manufacturer's recommendations for the specific system being used
- All components should be kept in good operating condition with all safety seals in place
- Operators should have an adequate air supply and sufficient cribbing available before beginning operations
- The bags should be positioned on or against a solid surface
- The bags should never be placed against sharp objects or near heat sources such as vehicle exhaust systems
- When multiple airbags are used, they should be tightly screwed to one another and no space should exist between any of the cover plates
- The bags should be inflated/deflated slowly and monitored continually for any shifting
- Rescuers should never work under a load supported only by airbags
- The load should be continuously shored up with enough cribbing to adequately support the load in case of bag failure

Additionally, when lifting with airbags, the area around the bags and load should be kept clear of personnel.

Recommendation #3: Fire departments and fire service product distributors should provide and enforce the use of personal protective equipment during airbag demonstrations.²

Discussion: Providing and enforcing the use of personal protective equipment (PPE) such as helmets, eye glasses/goggles and protective clothing will not necessarily guarantee the user's safety; however,



Volunteer Fire Fighter/Fire Service Products Salesman Dies After Being Struck by Dislodged Rescue Airbag - South Dakota

injuries and fatalities can be minimized if PPE is used properly. A clear and effectively implemented policy addressing the use of PPE and protective clothing is the cornerstone of ensuring that fire fighters/product demonstrators will understand the importance of using this vital equipment on a routine basis. In this incident, the proper use of PPE and protective clothing may have provided a degree of protection to the victim and fire fighters who helped setup the airbags.

Recommendation #4: Fire products manufacturers should ensure that information and photographs contained in their catalogs, operator's manuals and internet web sites correspond with one another and provide consistent safety information.

Discussion: Effective communication requires consistency between written materials and photographs used to explain or represent safety procedures. Photographs that are contained in catalogs, operator's manuals and on internet web sites should correspond to the specific written safety instructions to which they refer. At the time of the investigation, an advertising catalog and operator's manual for the airbag manufacturer were obtained.

The written information contained in the catalog and operator's manual, as well as internet web site information, contained pictures that did not directly relate to the written instructions. For example, cribbing was not demonstrated in the photographs in the operator's manual, but cribbing was listed in the manual as part of the safe operating procedures. *Note: at this time, the airbag manufacturer is in the process of changing the photographs in the catalogs to represent the written safety instructions.*

REFERENCES

1. Brauer RL [1994]. Safety and Health for Engineers. John Wiley & Sons, Inc. New York, NY.
2. International Fire Service Training Association [1998]. Essentials of fire fighting, 4th ed. Stillwater OK: Fire Protection Publications.

INVESTIGATOR INFORMATION

This incident was investigated by Richard Braddee, Senior Investigator, Fire Fighter Fatality Investigation and Prevention Program, NIOSH, Division of Safety Research, Surveillance and Field Investigation Branch.

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