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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 November 4, 1998

River Search and Recovery Attempt Claims the Life of One Fire Fighter/SCUBA Diver - Illinois

SUMMARY

On May 19, 1998, one male fire fighter/Self-Contained Underwater Breathing Apparatus (SCUBA) diver (the victim) assigned to the fire department's diving squad drowned during a river search in an attempt to recover the bodies of two civilians. The victim and his SCUBA partner, both fully equipped with diving gear and a rope, entered the swift, murky river to assist the fire department's Air and Sea Rescue divers, who were already in the river. The victim and his partner entered the river at the location where the two civilians were reported to have gone down to perform an independent sweep search pattern. The search lasted approximately 10 to 15 minutes at an approximate depth of 25 to 30 feet. Due to zero visibility and the underwater current, the victim and his partner decided to surface and return to the staging area where they changed over to their underwater communication masks and received further instructions from the dive supervisor. Once they returned to the staging area, the dive tender (back-up diver) changed their tanks, assisted with the removal of their gear, provided Gatorade to drink, and placed a 50 foot long, 4-inch round air float (rubber-jacketed fire hose) from shore to the U.S. Coast Guard Cutter that had just arrived. After a brief conversation with the dive supervisor, the divers decided to remove their SCUBA gear and free float to the Coast Guard cutter using the 4-inch float as a guide and flotation device, determining this would be the easiest way to enter the boat since it did not have a swim platform. Wearing his weight belt, the victim began his free float to the boat, holding on to his Buoyancy Control Device (BCD), tank, and the 4-inch air float as flotation devices. The weight belt consisted of three 10-pound lead weights secured around his waist. As the victim was approaching the boat he lost grip of the flotation devices and instantly went under the water due to the 30-pound weight belt that he did not release. His partner immediately went down after him, free diving with just his wet suit which created a buoyancy problem and limited his dive depth. After two attempts to reach the victim, he surfaced and called for assistance from the Air and Sea Rescue divers. One diver from the Air and Sea Rescue team descended to the area where the victim went down and located him. As the victim was pulled close to the water surface, the victim's partner grabbed him. The Air and Sea diver lost his grip on the victim while adjusting his own equipment, and because of the 30-pound weight belt around the victim's waist, the victim's partner was unable to hold on to him, and he descended for a second time. The victim was located and pulled from the water approximately 10 to 15 minutes later by the

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police rescue divers. The victim received immediate medical attention on shore before being loaded into the Air and Sea Rescue helicopter which transported him to an area hospital where he was pronounced dead.

NIOSH investigators concluded that, to prevent similar incidents, fire departments should:

- *ensure that whenever divers remove their diving gear, the first piece of equipment to be removed is their weight belt*
- *ensure that divers and their dive partners complete equipment inspections each time they enter the water*
- *ensure that whenever a dive boat is being used it is equipped with an adequate diving ladder or platform for the specific operation.*

INTRODUCTION

On May 19, 1998, a 38-year-old male fire fighter/SCUBA diver (the victim), drowned while attempting to complete a river search and recovery of two missing civilians. The victim and his dive partner, along with Air and Sea Rescue divers, entered the river and completed search patterns before they decided to exit the water and wait for a U.S. Coast Guard Cutter to arrive and assist in the search. Upon arrival of the Coast Guard Cutter, the dive supervisor directed the divers to remove their SCUBA gear and free float to the Coast Guard Cutter after determining this would be the easiest way to enter the boat since it did not have a dive platform. Using their diving gear and a 50 foot long, 4-inch flotation line, the divers started their float. Still wearing his 30-pound weight belt, the victim lost grip on his gear and the 4-inch float and immediately went under the water. The victim was subsequently retrieved from the water and immediately transported to an area trauma center by helicopter where he was pronounced dead.

On June 4, 1998, Frank Washenitz, Safety and Occupational Health Specialist, traveled to Illinois to conduct an investigation of the incident. Meetings were conducted with the Illinois Department of Labor compliance officer, assistant director of training and the director of public relations for the fire department, fire department officers and dive team members who responded to the incident, the vice-president of the International Association of Fire Fighters (IAFF) local union, and the assistant chief medical examiner for the city to review the autopsy report and examine the victim's weight belt. An additional meeting was conducted with the officers at the air-mask shop. This meeting was conducted to view the equipment that the victim was wearing and the equipment that the department uses. The equipment, consisted of 1 Viking Pro dry suit with boots, hoods and rings for gloves; 1 fin; 1 Dacor vest (BCD); 1 face piece with buddy phone and regulator; a secondary regulator; a Dacor compass gauge and pressure gauge; a SCUBA 80 tank; a Dacor lead weight belt (30 pounds); and a Dacor rechargeable light. These items all appeared to be in good condition and working properly. The Viking Pro dry suit was cut off the victim at the time of the incident, but all valves and seals were checked and appeared to be working properly. Maintenance records from the air-mask shop concerning their SCUBA equipment were also viewed and appeared to be accurate and sufficient.

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The fire department involved in the incident serves a metropolitan population of 2.7 million in a geographical area of 224 square miles. The fire department is compromised of approximately 5,000 employees, of whom 4,200 are fire fighters and approximately 100 are certified SCUBA divers (4 squads), which includes Air and Sea Rescue's divers. The fire department provides all new fire fighters with an extensive 4-month (65-day) training program at their fire department's training academy. The program covers all aspects of Level I and Level II fire fighter training, as recommended by the National Fire Protection Association. Upon successfully completing academy training and passing the Fire Fighter Level II examination, a fire fighter is assigned to a station. The SCUBA divers from each squad are certified under the Professional Association of Diving Instructors (PADI) guidelines and train on a day-to-day basis. The training consist of search and rescue, search and recovery, search patterns, assisting distressed divers, rescue procedures, equipment maintenance, and emergency situations. The SCUBA dive squad trainer is a certified PADI dive instructor. The victim had 3 years of experience as a certified rescue SCUBA diver with the fire department, 10 years as a certified PADI SCUBA diver and 11 years of experience as a fire fighter.

INVESTIGATION

On May 19, 1998, at approximately 1240 hours, Squad 5 received a call from dispatch of two missing civilians in the river. The squad, which consisted of two units, Squad 5 (dive supervisor, two divers and a dive tender) and Squad 5A (two detailed dive assistants), responded to the incident site. As the squads were en route, the victim suited up in his dry suit and his partner suited up in his wet suit. When the squad arrived on scene, two Air and Sea Rescue divers from the fire department were in the water being assisted by a civilian's pontoon boat as the U.S. Coast Guard was en route to the scene. One of the detailed dive assistants from Squad 5A started clearing a path through heavy brush for the divers to gain access to the river. Soon after, the second detailed dive assistant carried the divers' gear and supplies to the river's edge, which was used as the staging area. The dive supervisor (Lieutenant) on Squad 5 surveyed the situation as the two divers, with assistance from the Squad 5 diver tender, donned their equipment. After a quick observation, the dive supervisor guided the two divers to the area where the civilians were reported to have gone down. Both divers submerged under water approximately 25 to 30 feet using the buddy system and began their search. After searching approximately 10 to15 minutes, they decided to return to the staging area and change to their underwater communication masks due to zero visibility and a swift undercurrent. As the two divers returned to the staging area they were met by the detailed dive assistants and the diver tender who assisted them in removing their equipment. Because the water was knee deep at the staging area, the divers decided to sit down rather than exit the water completely. At this point both divers had removed all of their equipment except for the victim, who was still wearing his 30-pound weight belt around his waist. Because they were sitting in the water, the victim's dive partner was unable to see that the victim was still wearing his weight belt and did not remind him to remove it. While waiting for the Coast Guard Cutter to arrive, the dive supervisor explained to the divers that they would board the boat and act as the 2nd rescue team. The divers then rested at the staging area and were served Gatorade for

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approximately 10 to 20 minutes. When the Coast Guard Cutter arrived, the dive tender placed an air filled 50 foot long, 4-inch round air flotation device (rubber-jacketed fire hose) in the water from the shore to the Coast Guard boat, as the divers donned their fins and inflated their Buoyancy Control Devices (BCD). As the dive supervisor watched, the Air and Sea Rescue divers attempted to board the Coast Guard Cutter wearing their equipment. He noticed that Air and Sea Rescue divers were having trouble getting on the boat while wearing their equipment because the boat did not have a swim platform. He advised his divers that it would be easier to free float (float with no equipment on) to the Coast Guard boat and hand their equipment to the boat's crew members. As the victim and his partner started their free float to the Coast Guard boat, the dive supervisor noticed that the victim, who was approximately 15 to 20 feet from the staging area, appeared to be in distress. The dive supervisor asked the victim if he was O.K. Without giving any response, the victim slipped off his BCD and the 4-inch air float and immediately went under water with his 30-pound weight belt still secured around his waist. Thinking that the victim was in distress, the dive supervisor advised the victim's dive partner to assist him. Neither the dive supervisor nor the victim's dive partner knew the victim was still wearing his weight belt. The victim's dive partner descended in the area where the victim went down; however, the dive partner was unable to reach the victim's depth because the wet suit he was wearing created buoyancy problems. The victim's dive partner made two rescue attempts before calling the Air and Sea Rescue divers for assistance. A diver from Air and Sea Rescue immediately responded and retrieved the unconscious victim, pulling him close to the water surface with his weight belt still secured around his waist. The victim's dive partner grabbed the victim by the rubber hood of his dry suit while the Air and Sea Rescue diver attempted to adjust his own equipment. The dive partner was unable to hold on to the victim because of the buoyancy problem created by his wet suit and the victim's weight belt. The victim slipped out of his dive partner's grip and descended for a second time. At this point, police rescue divers arrived on scene and joined the Air and Sea Rescue divers to search for the victim. Extensive search efforts on the part of the fire department along with the police department continued for approximately 15 to 20 minutes before police divers located the victim and pulled him to the surface. The victim's dive partner and the Squad 5 dive supervisor pulled the victim from the water and onto the shore where he received immediate medical attention. The victim did not have a pulse and the decision was made to transport him immediately to an area trauma center. The Air and Sea Rescue helicopter, on the scene (which responded only to assist in the rescue attempt, not for patient transport) was used to transport the victim to a local trauma center as resuscitation efforts continued throughout the flight. The victim was later pronounced dead at the trauma center.

The victim's dive partner stated that when he finally pulled the victim from the water he pulled him out by his weight belt. He also stated that as they laid the victim on the shore he pulled the weight belt buckle and the weight belt fell off the victim, indicating that the weight belt's quick release was working properly. The NIOSH investigator also examined the weight belt and determined that it was in proper working condition. It is unclear why the victim did not release his weight belt using the right-hand release method. The autopsy report indicated the

victim had a contusion to the back right side of the head, but it is undetermined when the contusion occurred.

The information contained in this investigative report is based upon the facts that were gathered through the NIOSH investigation. Reports of this incident compiled by other investigations may present additional and/or possibly conflicting information from the NIOSH report.

CAUSE OF DEATH

According to the medical examiner, the cause of death was listed as an accidental drowning.

RECOMMENDATIONS / DISCUSSION

Recommendation #1: Fire departments should provide training to ensure that whenever divers remove their diving gear, the first piece of equipment to be removed is their weight belt.

Discussion: Since the weight belt is one of the heaviest pieces of equipment on the diver, it should be the last piece of equipment donned by the diver, and the first piece of equipment removed upon exit from each dive. The weight belt is designed to be placed around the waist and secured by a plastic or metal buckle that can be easily released in an emergency situation. The weight belt should be placed around the waist so that the buckle can be released by the diver's right hand. This is called the right-hand release and is recommended by PADI.

Divers are equipped with a Buoyancy Control Device (BCD) and a tank of compressed air, which create a buoyancy problem. Weight belts are used to assist divers to reach their dive depths because they can use their BCD to control their buoyancy and assist them when they need to surface. In this incident, the victim removed all of his equipment except his weight belt. When the victim became separated from the 50 foot long, 4-inch air float and his BCD, which he was using as flotation devices, he immediately went under the surface of the water. For reasons unknown, the diver did not use the right-hand release and also could not control his buoyancy without his BCD. For this reason it is recommended that each time divers are to remove their equipment, the first piece of equipment removed should be the weight belt. (1, 2)

Recommendation #2: Fire departments should ensure that divers and their diver partners complete equipment inspections each time they enter the water.

Discussion: It is recommended by PADI [1, 2] that each time a dive is to take place the buddy system should be used. The buddy system consists of two divers who should remain in verbal or physical contact at all times during a dive. The buddy system recommends that for each dive, divers and their buddies should assist each other when donning their equipment. It is also recommended that the divers and their buddies complete an equipment check, ensuring that all their equipment works properly and that all equipment is placed on correctly for the dive. In this incident, the divers were going to be free floating to the Coast Guard Cutter. During this particular assignment the divers were going to remove all of their equipment and hand it up to the Coast Guard crew members when they reached the boat. As the divers removed their equipment, the victim did not remove his weight belt which later caused him to sink under the water. Before divers enter the water, divers and their dive buddies should complete an equipment check to assure that all equipment is working properly or that all equipment is suitable for the

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particular dive.

Recommendation #3: Fire departments should ensure that whenever a dive boat is being used, it is equipped with an adequate diving ladder or platform for the specific operation.

Discussion: It is recommended by the Consensus Standards for Commercial Diving Operations [1] that each dive ladder must be capable of supporting the weight of at least two divers, extend 3 feet below the water surface, and be firmly in place. Each diving stage should have an open-grating platform and be available for a diver to enter or exit the water from the dive location while wearing a heavy-weight diving outfit.

In this incident the U.S. Coast Guard Cutter that arrived was described to have a swim platform that is much higher than a dive platform. When the divers from Air and Sea Rescue boarded the boat, they had to use a rope ladder to board the platform which was difficult because they were wearing their equipment. For this reason, the victim and his dive partner were directed to free float to the boat, hand their equipment to the boat's crew members and board without wearing their equipment.

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REFERENCES

1. Professional Association of Diving Instructors (PADI). Open Water Divers Manual, 1994.

2. Association of Diving Contractors, Inc. "Consensus Standards for Commercial Diving Operations" Fourth Edition, 1992, Change 1, 1994.