

**LINE OF DUTY
DEATH REPORT**
VISUAL EXTENSION



F2016-09

Career Captain Drowns After
Running Out of Air During
Technical Rescue SCUBA Dive—
North Carolina



Summary

- A 28-year-old male, part-time, career fire captain died after running out of air and suffering a pulmonary embolism during a technical rescue deep dive.
- The victim was a member of a local fire department dive team that was trying to recover the body of a civilian who drowned the day before.
- The captain (Diver 4 and victim) ran low on air at a depth of 80 feet.



Dive boat from fire department 4, from which Diver 4 was diving. It was not his department's boat. (Photo courtesy of mutual aid fire department.)



Summary

- After communicating with surface crews, Diver 4 and his dive partner (Diver 3) ascended to a depth of 12-14 feet.
- Diver 4 then experienced an uncontrolled out-of-air emergency and was unable to switch over to his or his partner's redundant air system.
- Diver 3 tried unsuccessfully to assist Diver 4, but Diver 4 pulled Diver 3's mask off forcing Diver 3 to kick away and swim to the surface while Diver 4 descended.



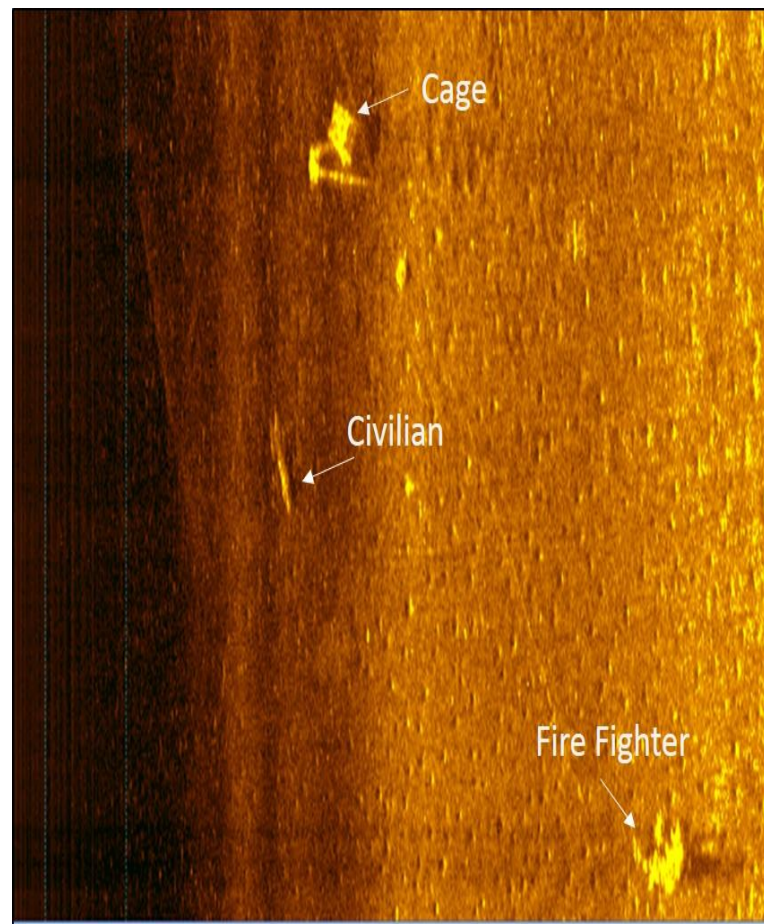
A career captain drowned after running out of air while searching for a civilian drowning victim during a technical rescue deep dive. Photo taken from Dive Boat 38 showing the bow of FD 4's dive boat and divers having to surface swim to the descent buoy. Photo taken before the drowning.

(Photo Courtesy of mutual aid dive team.)



Summary

- According to the medical examiner, Diver 4 experienced an arterial gas embolism, most likely from holding his breath on ascent and subsequent rupture of alveoli and drowned.
- Mutual aid technical rescue divers located Diver 4 on the lake bottom and removed him approximately 2 hours later, and he was pronounced dead at the scene.
- Mutual aid technical rescue divers then recovered the civilian victim.



Sonar image showing the location of the cage (metal cage that the descent line is attached to), the civilian drowning victim's location, and the downed firefighter/diver.
(Courtesy of mutual aid dive team.)



Contributing Factors

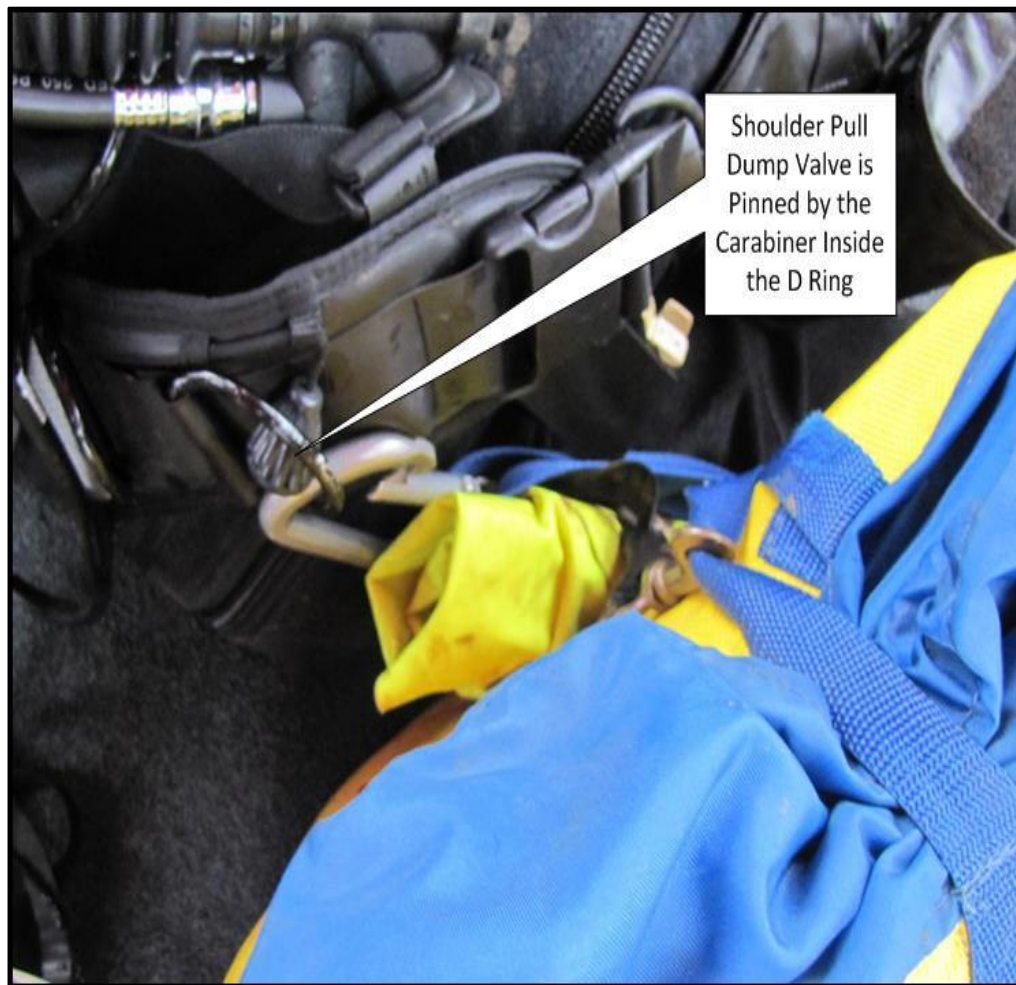
- Pre-dive safety check
- Air management
- Uncontrolled out-of-air emergency (not being able to use redundant air supply, redundant air regulator was routed under the air fill for the dry suit and also under the high chest strap for the BCD)
- Panic/rapid uncontrolled ascent while holding breath
- Training and experience
- SCUBA equipment issues affecting buoyancy control (dump valve was pinned open and unintentionally allowed air to escape)
- Lack of a safety officer trained in technical rescue SCUBA diving during the event.

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The photo shows the orientation of Diver 4's redundant air regulator is routed under the air fill for the dry suit and also under the high chest strap for the BCD. Although the final location of the mouthpiece would have been close to the diver's head, it would have been difficult to deploy. Diver 3 reported during interviews that Diver 4 was struggling with his redundant air regulator. Divers should always have easy access to the redundant and alternate air regulator. (Photo courtesy of the mutual aid dive team. The photograph was altered by NIOSH to obscure manufacturer's name.)

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Close up photo taken when the victim was recovered showed his shoulder dump valve was possibly pinned “open” by the body bag carabiner inside the D ring. This could have made maintaining positive buoyancy difficult as any air pushed into the BCD may have escaped here.

(Photo by mutual aid dive team. Analysis by Dive & Marine Consultants International, Inc.)



Key Recommendations

- Fire departments should ensure that public safety divers complete a pre-dive safety check (including adequate beginning air) with a qualified dive partner, witnessed by the dive safety officer.
- Fire departments should ensure that incident commanders and group leaders maintain frequent and accurate air status and accountability on all divers. Additionally, no diver should be allowed to start a deep dive with inadequate air and inadequate air reserves and resources at the dive site.



Key Recommendations

- SCUBA manufacturers and standard-setting organizations for public safety divers should consider including HUD in all full-face SCUBA apparatus due to the frequent zero-visibility conditions and silt-out in low-light conditions.
- Fire departments should ensure that public safety divers are properly trained to recognize and have the repetitive skills training to control out-of-air emergencies and be able to use their redundant air before anxiety leads to panic. Additionally, when dive teams mix full-facepiece regulators with stand-alone regulators from a pony system, the divers must be well-trained to accomplish the difficult removal and switch task.



Key Recommendations

- Fire departments should ensure technical rescue SCUBA dive teams have a Dive Safety Officer on site who is trained in technical rescue SCUBA diving before commencing a dive.
- Fire departments should provide annual training on dive hazards such as lung overexpansion injuries, out of air emergencies, emergency ascent procedures, including the dangers of breath holding, and emergency release of dive weights.



Key Recommendations

- Fire departments should recognize public safety SCUBA diving as high risk/low frequency events and ensure public safety divers are properly trained, equipped, and supported to perform public safety diving responsibilities and integrate the training and SOPs with regional dive and water rescue team(s) with whom they regularly respond.
- Fire departments and other public safety dive teams should consider advanced level training courses/agencies that closely match the public safety dive team needs.



Key Recommendations

- Fire department dive teams should ensure vessels are properly equipped when used for supporting dive operations or consider other options.
- Standards-setting organizations should consider adopting a national consensus standard for public safety SCUBA divers that includes minimum initial and refresher training and a SCUBA equipment standard that includes minimum respirator performance.
- Fire departments should consider implementing a body recovery procedure to reduce the time dive teams spend at depth recovering a victim.

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