



The Cost of Complacency: Lessons Learned from Science at Sea

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**National Science Foundation
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Introduction

- Difficult year for personnel and property casualties in US and abroad
- Highest number of fatalities (6) on research vessels in recent memory
- Major collision with German research vessel and Greek ferry
- New Chilean research vessel lost to tsunami hours before launching

Introduction

- Norwegian gear explosions and weld failures
- Major fire aboard Japanese vessel from welding in shipyard
- High pressure washing destroyed multibeam sensors on US vessel
- British vessel trawled up sunken yacht

Presentation themes:

- Science above and below the water is inherently more dangerous
- UNOLS and AAUS have cultivated a safety culture to manage the risk
- Human error will always be present, responsible for 85% of casualties

UNOLS and AAUS

- Histories of AAUS and UNOLS are similar; created or grew in response to casualties
- Science creates legal issues whether afloat or diving
- Safety standards only help if they are used; double-edged sword
- High-profile casualties have focused attention on research vessels and diving

UNOLS History



- Public investment in oceanography in 1960's
- Passage of the Oceanographic Research Vessels Act of 1965 affects legal status of scientists
- UNOLS founded in 1972 to enhance efficient ship and science scheduling
- Safety standards discussed immediately, but not adopted until 1976 after the M/V Gulfstream was lost
- Loss of the M/V Holoholo in 1978 may have been prevented if standards had been enforced
- Chapter 16 of RVSS requires application of AAUS standards for all dives from UNOLS vessels



AAUS History

- 1951 deaths of two scientific divers at Scripps leads to the formation of the first scientific diving program in the U.S.
- Like UNOLS, the goals were to facilitate science while managing risk and liability exposure
- 1977 OSHA Commercial Diving Regulations had major impact on scientific diving
- AAUS formed in 1977 to petition OSHA for a scientific diving exemption, succeeding in 1982

Seamen Scientists and Diving Scientists

- ORVA holds that scientists are not entitled to the Jones Act and ORVs are not passenger vessels
- OSHA exemption permits scientific diving to take place if an institution has a Diving Safety Manual and a Diving Control Board
- In both cases, safety record is outstanding – but not perfect
- Burden of proof is on the institution to prove that either exemption is appropriate

Role of Safety Standards

- UNOLS RVSS now 58 pages, and incorporate many other standards by reference (Like AAUS and ISM Code)
- AAUS Scientific Diving Standards now 76 pages, and operationally more complex to follow
- Although both have a positive effect on safety, they are the primary tool used against an institution when a casualty does occur

Recent Casualties – 2006

Healy

- Two divers lost, including the dive officer
- Despite highly detailed safety protocols, a shallow water Arctic familiarization dive turned tragic as the result of human error
- The Commandant's 29 page Final Decision Letter was a shocking indictment of Coast Guard diving operations; the Captain was relieved of command and discharged



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Photos by USCG (above) and NOAA (below)

Recent Casualties – 2007

Alaska SeaLife Center

- Student diver lost during scientific training dive
- Diving partner was the Diving Safety Officer, who was the only witness
- Alaska SeaLife Diving Control Board conducted an investigation, as required under the OSHA scientific diving exemption, but OSHA attempted to assert violations of commercial diving rules
- Litigation is pending

Recent Casualties – 2008

NOAA



Photo by NOAA

- Very experienced NOAA diver lost in the Dry Tortugas after running out of air while ascending
- Findings included: “NOAA should more clearly delineate what constitutes scientific diving” and “the NDP should cease NITROX diving in SCUBA gear as they currently stand in direct violation of federal law.”
- Issued 33 “Corrective Recommendations” that significantly affected NOAA dive operations

Recent Casualties – 2009

NOAA Aquarius Habitat

- Experienced NURC diver died
- Rebreather failed due to forces from hydraulic impact hammer
- Buddy system failed



Recent casualties – 2009

Revelle Crewmember lost

- Seaman failed to report for watch after several days of acting strangely
- Extensive search in mid-Pacific was unsuccessful



Recent Casualties - 2009



- A rigger was working on top of a diving bell when the winch for the diving bell's cursor suddenly rendered, allowing the cursor to fall on top of him. He suffered severe crush injuries, and later died.
- The vessel's owner has implemented a major revision of its systems and processes to reduce the potential for future accidents, and has promulgated the lessons learned from this accident to its offshore and onshore personnel, contractors and clients.

Recent Casualties -2009

HMS Endurance

- Crew error
cleaning salt
water strainer
nearly sank
vessel
- Disabled, flooded
vessel towed to
Chile for repairs



1994 - Most Embarrassing Casualty in UNOLS Fleet

- RV Columbus Iselin grounded on coral reef it was studying
- Univ. of Miami paid NOAA \$3.76 million in damages



Final Thoughts

- Safety standards are no guarantee of a safe program, but we must make every effort to stay current with technology and reduce the potential for human error through redundant safety systems
- Assume that the worst case scenario **WILL** happen on your watch, and plan accordingly