

## DIVING FROM RESEARCH VESSELS

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*Research diving from an academic research vessel involves a different set of safety problems and concerns than those when diving from small boats or from shore. At first glance, diving is diving. A well trained and certified scientific diver should be able to enter the water from most any platform and proceed with the business at hand. One might think that the vehicle is transparent to the function of diving. This is not so. Science diving from research vessels presents myriad considerations, some obvious and others not so obvious. These considerations become more complicated when the divers are using a vessel from an institution other than their own and still more complex when the dive party is made up of scientists from various institutions and countries. The responsibility of the vessel's captain is a serious concern that needs to be understood by all parties. This paper focuses on these issues and attempts to heighten the awareness of scientific divers to the interests and responsibilities of the vessel operators.*

### INTRODUCTION

It is very important that a healthy dialogue remain open between research divers and ship operators. In February 1990, the workshop on shipboard scientific diving safety (Griffin, 1990) sponsored by the National Science Foundation (NSF) was significant in integrating the ship operating and diving communities. The report from this meeting should be a guide for all those who participate in scientific diving from ships and used by academic diving control boards for the planning and review of proposed shipboard scientific diving activities. Hard copies remain available at the UNOLS Office at URI, and the entire document is posted on the UNOLS home page.

In 1995, NSF felt that enough time had passed since the publication of the 1990 workshop report that a review was in order to ascertain whether or not the findings remained relevant and functional. UNOLS conducted a meeting at Scripps Institution of Oceanography in October 1995, and concluded that the report was indeed valid, and minor updates to the findings were suggested. An update to the original report is also on the UNOLS web site.

### THE ISSUE

Research vessel operators are not always comfortable with diving operations aboard their ships. Captains are often not trained divers. Although competent seamen, they often must rely completely on the diving supervisor for their information.

### THE CAPTAIN'S RESPONSIBILITY AND LIABILITY

Maritime law holds the captain fully responsible for the safety of his ship. This includes the safety of all persons aboard, seamen, passengers and scientists alike. On research vessels seamen

maintain a special status in the eyes of the law. Within the past year the Supreme Court has defined the role of the seaman as any person adding to the purpose of the vessel. If the vessel's purpose is research diving then divers are construed as seamen for that period. What this really means is that the ship's liability has significantly increased, placing the burden squarely on the shoulders of the captain.

A captain's level of responsibility is defined by maritime law which has developed in sea-going nations over hundreds of years. Some of it may seem archaic and probably is. Traditional maritime law is coupled with U.S. law designed to protect the seaman. This is often referred to as the "Jones Act". Case law refers to a causative factor known as "seaworthiness of the vessel." The vessel captain and owner are held legally responsible for an accident aboard the vessel if it is considered "unseaworthy" by the courts. A ship operator or captain is not relieved of responsibility even when the seaman is careless or acts negligently as illustrated by the following examples:

- A fisherman was departing his fishing boat tied up at a pier. It had just off-loaded its catch. He stepped on the gunwale and slipped on fish slurry. The resulting fall caused injury to his back. The ship was declared unseaworthy because of the slurry and a heavy judgment was decreed against the operator.
- A drunken seaman returning to his ship fell down the gangway and was injured. The ship was found unseaworthy because the captain/owners did not prepare the gangway appropriately to account for drunken seamen. A heavy judgment resulted.
- A seaman was swept off his feet by a wave over the deck and injured his back. The ship was found unseaworthy because of the wet deck.
- A scientist put his hand on a piece of moving machinery operated by another scientist. The ship was found negligent for not having proper safeguards.

Legal responsibility of a captain also is illustrated in the following case example involving navigational error: A ship was proceeding out of a river with a qualified river pilot aboard. The captain suggested that the ship turn. The pilot ordered a steady course and the ship ran aground. The captain was at fault even though the turn would have prevented the grounding.

## SAFETY AND OPERATIONS

Traditional tasks of ship operations have conformed to long-standing safety rules of which all experienced seamen are aware. A competent Captain not only understands these operations but knows his crew, their level of experience and training and supervises the activities accordingly. Mates give mandatory safety lectures, fire and boat drills covering routine shipboard activities (UNOLS, 1996). When hazardous materials or explosives are brought aboard as cargo or scientific outfitting, special rules are administered and an increased level of safety is observed.

Scientific operations present another level of challenge. They are unique in several aspects: Sampling equipment is often new or only occasionally used, and it may have features never before tried; research sites are often remote, away from normal shipping channels; the scientific party may include members who are at sea for the first time; and scientists tend to get deeply engrossed in their work, which may divert their attention from seamanly behavior. There are also professional concerns. Going to sea for science is expensive, and grants are difficult to obtain. Scientists work hard to get to sea and want to make the most of every moment. Their equipment is often very expensive and their data unique. This adds to the intensity of the scientist's reason for being at sea and provides a diversion from often less interesting safety concerns. To obtain the maximum benefit from a research cruise the scientific party will stretch their endurance capacity with fatigue as a likely result. Coupled with this is the potential for seasickness. Experienced captains and crews of research vessels are aware of these factors and are prepared to assist.

Scientific diving operations include the elements discussed above and present yet another dimension. By their very nature, diving operations cannot be directly supervised from the ship. Divers

are removed from the watchful eye of the captain. A positive connection must be made between the divers and the ship's captain. This must include well understood protocol as well as a level of trust. Both of these elements demand planning, communication and coordination and cannot be taken for granted. An enhanced level of comfort between the parties provides for a better research operation.

### DIVING REGULATIONS AND CRUISE PLANNING

Planning must start early for cruises ranging from simple to very complex. A simple cruise might be with divers from a single institution aboard that institution's ship operating in local waters. A complex cruise might involve a principal investigator (PI) from a different institution than the ship, divers from many institutions, including foreign nationals, and the operation in a blue water, remote location. Key players are the principal investigator, the chief scientist, diving safety officers from all institutions represented in the diving operation, the on-board diving supervisor, the lead institution's diving control board, the marine superintendent of the operating institution, the ship's captain and of course the scientific diving party. However, the lead institution's diving safety officer must control the early planning. Final planning and execution falls on the shoulders of the on-board diving supervisor.

The American Academy of Underwater Sciences (AAUS) has been very effective in promulgating diving regulations with its organizational member institutions, approving diving safety manuals and authorizing reciprocity among member institution divers (AAUS, 1996). The scientific diving regulations are clear, function, and need not be discussed here. The interface with the ship is, however, of concern. From an operational side the marine superintendent of the operating institution must take an active role in reviewing the pre-cruise dive plan. The marine superintendent must be knowledgeable about the dive planning. Because diving happens infrequently from some vessels, this individual may need to be coached, a responsibility of the lead institution's diving safety officer. The marine superintendent should be concerned with the scientific diving qualifications of the divers but even more importantly must understand the equipment needs of the dive party as well as the emergency plans. It cannot be taken for granted that ships will be properly equipped for an extensive research diving cruise. Each element of ship-supplied equipment needs to be reviewed, checked and rechecked. Evacuation plans must be written and discussed and communications links exercised. The marine superintendent is vital in this role.

Captains are acutely aware of their responsibility and must assure themselves that all activities aboard their ship are conducted in a safe manner. When the captain is not experienced with diving operations it is incumbent upon the dive party to provide information to him/her so that sound decisions can be made. It is always desirable to involve the ship's captain in the early planning stages but it is often not possible. If captains cannot attend pre-sailing meetings they must be brought up to speed as soon as the science party comes aboard. Science parties, and obviously marine superintendents, should be concerned with a captain who is too busy to pay close attention to the myriad details of a research diving cruise. The on-board diving supervisor must establish a close working relationship with the ship's captain and review, to everyone's satisfaction, the dive plan. This should be done before sailing as well as before each day's dive. The captain can only be as responsive as good planning allows. Failure to properly plan and coordinate can be fatal. Diving is a team effort and the ship, its captain and crew are an integral part of the team.

A final thought would be that if a ship's captain is not well informed and not comfortable with a research diving operation, he/she is likely to impose restrictions on that operation to protect the safety of the ship. A well informed captain will give research diving operations the maximum latitude.

### LITERATURE CITED

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