M-79

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:
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SAFETY RECOMMENDATION(S)

M-79-81 through -87

At 1435, on December 9, 1978, the motor vessel HOLOHOLO, under bareboat charter contract to the Research Corporation of the University of Hawaii (RCUH), sailed from Honolulu harbor, and has been missing since it was seen about an hour later proceeding on a southeasterly course off Waikiki toward Diamond Head. The HOLOHOLO was engaged on the second of six planned 6-day voyages involving a project the University of Hawaii had contracted to perform over a 1-year period at a site centered about 17 miles west of Kawaihae, Island of Hawaii.

Despite an extensive air-sea search by the Coast Guard, the Air Force, the University, and others, the HOLOHOLO was not found. A joint U.S. Coast Guard/National Transportation Safety Board investigation into this accident is continuing. More than 40 persons testified during 12 days of public hearings which began on January 9, 1979, in Honolulu.

The 10 persons on board the HOLOHOLO included the owner, a Coast Guard-licensed master of research vessels, a hydraulic mechanic, and 7 scientists associated with the research to be conducted. The owner, who bought the HOLOHOLO on September 18, 1978, was not licensed by the Coast Guard and had little knowledge or experience in the operation of such vessels and in seamanship, vessel stability, watertight integrity, navigation, or shiphandling.

The evidence indicates that the owner was on board and had retained complete operational control of the vessel during the first voyage in October 1978, even though RCUH had engaged a licensed ocean operator under contract to serve as master and who was on board. The owner dismissed the licensed operator contracted by RCUH at the end of the first voyage. A few days before the second voyage commenced, the owner hired a licensed research vessel master. He probably retained a similar relationship with the new master during the second voyage. That master was highly qualified and had extensive experience at sea, but there is

no evidence that he had expertise in vessel stability. Although the master hired by the owner was much better qualified than the ocean operator, RCUH was not aware of the change in masters despite its contract with the operator.

The chief scientist (principal investigator), who was an employee of the University and in charge of the scientific project and personnel, was a highly regarded scientist with considerable knowledge and experience in ocean research. There is no evidence that he or the other scientists had expertise in vessel seaworthiness, stability, navigation, or shiphandling.

The investigation has obtained a great deal of evidence regarding the alterations made to the HOLOHOLO to accommodate the research equipment and related operations. Those alterations included the creation of openings in the weather deck, trunks, hatches, and bulkheads. The alterations also involved the installation of two large winches, a large spool of cable, and an A-frame cargo boom on the after part of the vessel. Some heavy items of equipment to be used in the scientific work were taken on board and stowed on the after main deck and bulwarks, and other equipment and supplies were stowed in various aft above- and below-deck locations. These circumstances may have adversely affected the seaworthiness of the vessel. Investigators are attempting to calculate the stability, hull strength, and the possibility of down-flooding in an effort to determine if some factor or combination of factors could have caused a catastrophic event which disabled or sank the vessel.

Since the HOLOHOLO was registered as a yacht and had never been surveyed for hull insurance purposes, or by the American Bureau of Shipping (ABS) for load line purposes, and was not built, maintained, or altered under ABS or Coast Guard inspection, there is a lack of information about the actual condition of the vessel. Therefore, the calculations will be based on incomplete information compiled from available drawings, photographs, documents, and witness testimony.

The HOLOHOLO had a cruising speed of about 9 kns and was equipped with VHF radio, loran, radar, two OMNI receivers, a magnetic compass, three liferafts, distress signal flares, liferings, and an adequate number of lifejackets. Deviation tables had not been prepared for the compass, and it had not been compensated in several years. The electronic navigation equipment had recently been installed near the compass in the wheelhouse, and alterations had been made to the vessel's structure and equipment which could have caused a large compass error.

The estimated 135-mile route from Honolulu to the site would have taken the HOLOHOLO no more than 25 miles from promontory shorelines, well within the range of the 36-mile radar. Therefore, an inaccurate compass should not have caused the vessel to be steered to an unintended position. Although some electrical problems had developed in the 32-volt system that powered the electronic navigation equipment during the

first voyage, all the items were operative a few days before the second voyage commenced. The VHF radio was operating just minutes before the HOLOHOLO sailed on December 9, 1978, since radio transmissions were exchanged between the vessel and the Honolulu harbormaster in Aloha Tower.

The voyage itinerary included plans for the vessel to put in at Kawaihae Bay at daylight on December 11, 1978, to rendezvous with two scientists who were waiting there to go on board. Since the HOLOHOLO did not arrive at the planned time, it is apparent that sometime during the more than 40 hours between 1535 on December 9, and 0800 on December 11, 1978, the vessel, crew, or both encountered a problem of unknown circumstances which interrupted the voyage. It is possible that some of the planned scientific work was done or commenced at the benchmark site since an instrument box, known to have been on board and to have contained an instrument for use at that site, was found several days later at a location off the southwestern coast of Hawaii. That wooden box was empty when it was found and showed evidence that the instrument had been removed in a technique usually practiced to make it apparent to the scientists visually that the box was empty.

It will be some time before the investigation is completed so that the Safety Board can analyze the evidence and reach conclusions regarding the probable cause of the accident. Meanwhile, notwithstanding the outcome of the efforts to determine the seaworthiness of the HOLOHOLO, the evidence leads us to conclude that several corrective actions should be taken now to improve the survivability aspects of similar operations.

Two aspects of vessel operations at sea are important to all mariners; one is the ability of the vessel and its crew to accomplish the intended voyage and the other is a means for the persons on board to survive if conditions arise which are beyond those abilities. One of the most important survival considerations is the ability to communicate promptly that help is needed so that rescue efforts can be undertaken at an early time. In the case of the HOLOHOLO, no formal cruise plan was prepared or disseminated; there was no plan to report or to monitor the progress of the voyage; and about 48 hours elapsed after it sailed before University officials learned that it had not arrived at Kawaihae. The Coast Guard was first advised of the case at 0920 on December 12, 1978, nearly 67 hours after the vessel had sailed from Honolulu.

If the vessel had been equipped with an emergency position indicating radiobeacon (EPIRB), and if it had been activated, the fact that a distress situation had developed and its location could have been known promptly by potential sources of help. A radio report of progress on a set schedule to supervisory officials ashore would also have provided a means to determine that a problem had developed. That reporting system would have helped rescuers to narrow the possible time and location of the accident.

The electronic equipment on the HOLOHOLO was powered by batteries installed about 18 inches above the deck in the engineroom. Therefore, any significant amount of water in the engineroom could have disabled the power to the radio and all of the other electronic equipment. An alternate source of power was not provided. If the power to that equipment was disabled, it is possible that the HOLOHOLO was sailed away from the islands unwittingly, based on courses determined from the magnetic compass which had an unknown but possibly large error. Thus, the vessel's crew could have become lost or disoriented and proceeded outside the search areas which rescuers calculated from known and predictable forces that would have acted on a disabled vessel and caused it to drift. The search efforts ultimately extended to vast areas of the ocean but, because of the elapsed time, severe weather, and the increasingly diverse variables, became progressively less likely to succeed.

The success of efforts to assist or rescue is often inversely proportional to the elapsed time between the onset of the emergency and the commencement of assistance efforts. Since no radio transmission was received from the HOLOHOLO, it is apparent that the radio became inoperative, some circumstance prevented the crew from using it, or both. In any event, the time, place, and circumstances surrounding the lack of radio transmissions were unknown, and the delay may have permitted a large number of variable and unknown forces to act before the search was started. That delay resulted in the proliferation of multiple probabilities and possibilities as to the status and whereabouts of the vessel which greatly complicated the ensuing search effort. There is no evidence that the HOLOHOLO would have been located if the search had begun earlier, but an earlier search would have had a better statistical chance for success.

In May 1976, the University-National Oceanographic Laboratory System (UNOLS), which is an association of university oceanographic institutions, promulgated voluntary guideline safety standards for research vessels. 1/ Those guidelines were compiled by a group of UNOLS members, and the membership was encouraged to adopt them as applicable and appropriate to vessels owned and operated by member institutions.

The guidelines are intended to supplement existing laws and regulations, and include an excellent array of standards and procedures which would be applicable to most research vessel operations. The University of Hawaii was a member of UNOLS but had not applied the guideline standards to vessels contracted for its use by RCUH. Therefore, the operation of

1/ "Research Vessel Safety Standards," May 1976, UNOLS Office, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543.

the HOLOHOLO apparently relied on the charter contract for vessel seaworthiness, the contract with the master for safe operation, and on the judgment of the chief scientist as to the suitability of the vessel to serve as a platform for the research projects to be conducted. There is no evidence that any of the guideline standards were considered or applied by the three individuals involved or by other officials of the University or RCUH.

In view of the circumstances discussed herein, the National Transportation Safety Board recommends that the University of Hawaii take the following actions in an effort to improve the safety of research vessel operations:

For each voyage made by vessels engaged in research conducted under the auspices of the University, provide EPIRB equipment and necessary operating instructions for each voyage to the chief scientist on board, and ensure that the master is familiar with the EPIRB's operation and use. (Class I, Urgent Action) (M-79-81)

Establish a system of scheduled radio communications between its research vessels and appropriate officials ashore to monitor the progress of such vessels, and require all departures and arrivals to be reported. (Class II, Priority Action) (M-79-82)

Require the chief scientist to compile and disseminate a formal cruise plan for each voyage to include at least the planned itinerary and a roster of all persons actually on board. (Class I, Urgent Action) (M-79-83)

Require the chief scientist to report all significant changes to the cruise plan to appropriate officials ashore. (Class I, Urgent Action) (M-79-84)

Review the guideline standards promulgated by UNOLS, and formally prescribe appropriate specific minimum requirements from among those standards to be applicable to all vessels used by the University, and for each particular voyage made by such vessels. (Class I, Urgent Action) (M-79-85)

Review the procedures used by RCUH to contract for the service of masters and the charter of vessels for University use, and prescribe the relationship and responsibility of each entity involved to provide for the safety of each voyage or series of voyages, as appropriate. (Class I, Urgent Action) (M-79-86)

Develop a formal procedure to ensure that the terms of all charter and master contracts related to safety are known and understood by the chief scientist, and fulfilled to his complete satisfaction before a vessel sails on each voyage. (Class I, Urgent Action) (M-79-87)

KING, Chairman, DRIVER, Vice Chariman, GOLDMAN and BURSLEY, Members, concurred in these recommendations. McADAMS, Member, did not participate.

By: James B. King
Chairman