National Transportation Safety Board

Washington, D. C. 20594

Safety Recommendation

Date: May 20, 1991

In Reply Refer To: M-91-13 and -14

Admiral J. William Kime
Commandant
U.S. Coast Guard
Washington, D.C. 20593-0001

On Sunday, July 30, 1989, the liftboat M/V AVCO V was in the raised position in about 60 feet of water at Ship Shoal, Block 154, in the Gulf of Mexico with 3 crewmembers and 11 offshore workers aboard. Because of deteriorating weather and sea conditions caused by the development of hurricane Chantal in the gulf, the Chevron dispatcher at Leeville, Louisiana, recommended that the master bring the AVCO V into Leeville. About 0100 on Monday, July 31, the master had all persons on board assemble on deck wearing their life preservers while he lowered the liftboat. About 0230 the master headed the AVCO V northward toward the west end of Ship Shoal, intending to proceed around the west end and then eastward along the north side of the shoal to Leeville. While en route, except for the master and a deckhand, most on board slept.

While proceeding northward, the wind and the seas coming toward the vessel's starboard quarter increased in velocity and height, respectively. The vessel began taking water on deck in sufficient quantity to cause equipment stowed on the main deck to shift. About 0505 the AVCO V listed, capsized to port, and sank near the west end of Ship Shoal.[1]

This accident reveals a need for a severe weather action plan on board liftboats that addresses the environmental operating limitations of the vessel. Had such a plan been aboard the AVCO V, the master would have been better informed and could have made a more supportable decision about whether to proceed into port under the prevailing and predicted weather conditions. Lacking such information for guidance, he relied on his experience and the information from the Leeville base dispatcher to make his decision. Although the master had reservations about proceeding to Leeville, he felt pressured to do so by those involved with the

[1]For more detailed information, read Marine Accident Report--"Capsizing and Sinking of the U.S. Liftboat M/V AVCO V, Gulf of Mexico, July 31, 1989" (NTSB/MAR-91/02).

AVCO V's operations. The National Transportation Safety Board believes that liftboats should have on board a severe weather action plan tailored to the operating characteristics and limitations of the individual vessel that will provide guidance to the master when making a determination whether to operate in predicted severe weather conditions.

The AVCO V could have remained and probably would have survived the storm at its location; however, it was unknown whether the tropical depression would develop into a hurricane, or what path the hurricane would take as it moved northward in the gulf. Because the Chevron employees were already concerned during the afternoon of July 30 that the tropical depression would develop into a hurricane, earlier action could have been taken by the Leeville base to have support vessels or helicopters remove the offshore workers and the crew from the AVCO V, as had been accomplished for two other liftboats. If the hurricane did not develop, the persons removed could readily have been returned. The Safety Board in its comments on the U.S. Coast Guard's notice of proposed rulemaking (CGD 82-004 and CGD 86-074) for liftboats has expressed its opposition to the transporting of offshore workers on liftboats, except for the minimum number of such workers required to maintain contractor equipment on board. In this instance, had the number of offshore workers transported on the AVCO V been reduced, fewer persons would have perished in this accident.

Furthermore, at the time of the accident, the AVCO V had several pending repairs, including the stoppage of water seepage into the port forward rake void tank. It is likely that seepage along the gasketed edge of the manhole cover occurred from the vessel taking water on deck while en route to Leeville and contributed to the flooding of the port forward rake void tank. The Safety Board concludes that the owner and the master(s) of the AVCO V gave inadequate attention to vessel maintenance.

The AVCO V did not have an operating manual on board to provide information about the vessel's characteristics and operational limitations, nor was such a manual required. According to the owner, he was in the process of writing a manual. The master of the AVCO V had no training or other guidance in liftboat stability. Consequently, the master was unable to determine the limitations of the vessel under normal conditions, much less while operating in severe weather. Had the master been provided with specific guidelines on the vessel's operating limits under various shipboard and environmental conditions, he would have been better informed of the risks involved when deciding whether to lower the vessel and proceed to Leeville. The Safety Board believes that specifications for the operating manual should be published in a standard format to ensure that critical information is adequately addressed.

After the AVCO V was waterborne for Leeville, the diver tender had observed that water on deck had moved the 8,000 pound dive chamber about 1 foot aft and to starboard. According to the relief master, the vessel carried one 40-foot and one 60-foot length of chain, but this was insufficient to properly secure all the cargo. Furthermore, padeyes for securing cargo were at the sides of the deck, but not at the center of the vessel. Consequently, it would have been difficult to adequately secure equipment or other items on deck so they would not shift when the vessel rolled or took water on deck. Therefore, because the deck-stowed equipment was not adequately secured, the Safety Board believes that the equipment probably shifted to port and accelerated the capsizing of the AVCO V.

The AVCO V capsized so rapidly that the master was able only to send an abbreviated Mayday broadcast by radiotelephone. The master of the fishing vessel SPUR ROYAL received the Mayday broadcast shortly after he observed the lights of a passing vessel suddenly extinguish. The SPUR ROYAL and its accompanying fleet diverted from their course to investigate and found the capsized AVCO V. Having identified the AVCO V, the master of the CAJUN LOVE radioed the Coast Guard for assistance while the fishing fleet searched for and recovered survivors. Had it not been for the master of the SPUR ROYAL, the capsizing would have gone unnoticed. Because the AVCO V Mayday broadcast was cut short and the vessel was not equipped with an EPIRB, anyone receiving the abbreviated message would have been unable to determine the source or location of the broadcast. Furthermore, because of the weather conditions and the sunken condition of the vessel, it is doubtful that the AVCO V or the survivors would have been located for many hours after having been determined overdue. Finally, because the AVCO V master had diverted from a direct route to Belle Pass, the search would have been further complicated and delayed by the necessity to expand the search area beyond the expected route. The Safety Board is concerned about the failure of liftboat owners to equip their vessels with EPIRBs.

The AVCO V had sufficient life preservers and liferings, but the offshore workers' life preservers were stowed in the passenger quarters. Although the workers were probably aware of the life preserver stowage, only one of the three survivors who escaped from the passenger quarters had a life preserver. One survivor clung to debris for flotation. In previous accident investigations, the Safety Board has expressed its concern about stowing life preservers in passenger accommodations. In this instance, because the AVCO V capsized rapidly, most of the offshore workers had insufficient time to escape from the passenger quarters.

The 12-person lifefloat carried on the AVCO V was not adequate to accommodate the 14 persons on board. Furthermore, had there been a extensive delay in the rescue, it would not have provided out-of-the-water protection for those it could accommodate.

Shortly after leaving Block 154, the 11 offshore workers and 1 crewmember retired to their quarters, leaving the master and the deckhand on watch in the pilothouse. When the AVCO V capsized, the 12 were probably asleep and, consequently, thrown from their bunks. Only three offshore workers are known to have escaped from the passenger quarters through the starboard door on the second deck level. The three survivors described furniture being strewn about the passenger quarters and sea water rapidly filling the compartment. It is probable that some who did not survive were knocked unconscious or briefly stunned after being ejected from their bunks.

The AVCO V had an inadequate number of exit doors on the second deck level to provide rapid escape for the 12 persons who could be accommodated in the passenger quarters. Only one exit was on the starboard side of the second deck level. Had the vessel capsized to starboard rather than to port, this exit would have been unusable. The starboard door led into a vestibule. This outside door opened outward; the two inner doors of the quarters opened inward. Therefore, it would have been necessary to pull, rather than push, the inner doors open before being able to exit the quarters. As the compartment flooded, the inner doors could have closed as the water level rose. In addition, they could have been obstructed by loose objects that could block the exits. A stairway at the after end of the passenger quarters provided a second exit route, through the galley below. The galley had two

exit doors, one each on the port and starboard sides of the deckhouse. Although two windows were on the passenger quarters second deck level, one was located in the forward starboard stateroom and the other over the stairway at the after end of the passenger quarters; neither window was suitably located to provide rapid exit for 12 persons from the passenger quarters if an attempt were made to use the windows for exit. However, considering any disorientation experienced from abruptly being aroused from sleep, the capsized and unstable attitude of the vessel, and the darkness, it is not likely that anyone could have readily determined how to escape.

The stability criterion outlined in Navigation and Vessel Inspection Circular No 8-81, change 1, is based on the concept that a vessel will not capsize when subjected to specified, sustained windforces, provided its righting energy characteristics meet certain standards developed from empirical data. In order to account for wind gusts and waves, the area under the vessel's righting arm curve must exceed the area under the wind-heeling arm curve by at least 40 percent. The stability calculations performed by the Coast Guard showed that when subjected to the 70-knot wind specified in the criteria, the AVCO V (with or without the port bow void flooded) did not meet the restricted operation stability criterion under 46 Code of Federal Regulations 174 Subpart C because its available righting energy was about 5 percent below the minimum amount required by the criterion. However, these regulations were not mandatory for the AVCO V.

Based on a composite of the weather conditions at the accident site, the Safety Board estimated the maximum sustained wind speed at the time of the AVCO V capsizing was only 30 knots with gusts to 40 knots from the east; the wind velocity increased later. The Safety Board determined that the heeling moment generated by a 30-knot wind would have been approximately 1/5 of the vessel's maximum righting moment. Therefore, the Safety Board concludes that under the prevailing wind conditions, the AVCO V had more than adequate stability to resist the overturning force of the wind alone.

Nevertheless, the stability study performed by the Coast Guard showed that the AVCO V's stability was inadequate when subjected to the combined wind and wave conditions that existed on July 31, 1989. The study found that the AVCO V would capsize when rolling as a result of 10-foot-high waves. The master estimated the waves to have been 15 feet high before the capsizing, and the master of the SPUR ROYAL encountered waves 12 to 15 feet about 0800 while inbound after the rescue. The study also showed that the AVCO V would capsize with waves of lesser height when influenced by other factors, such as water on deck, beam seas, or combined rolling and pitching. Because of its low freeboard, the liftboat was taking water on deck while it pitched and rolled. Therefore, the Safety Board concludes that wave-induced motions probably caused the capsizing of the AVCO V.

While approaching Ship Shoal, the AVCO V encountered waves disturbed by the sea bottom configuration. Ship Shoal is an elongated shoal area oriented approximately east-west with convex bottom contours to the south and a ridge of shallower water extending southeast from the western edge of the shoal and turning to the east-southeast. As waves approached the shoal waters near the accident location, they would "feel" the bottom when the water depth became 1/2 the wave length, which for 6- and 8-second waves would be 92 and 164 feet, respectively. At this point, the wave speed slows, the wave length shortens, and the wave crests steepen. The sea bottom configuration would refract waves approaching from the east-southeast to a northerly direction.

If different wave trains intersect due to refraction, there would be periods of reinforcement when waves are higher and periods of cancellation when waves are lower. Consequently, the Safety Board concludes that the AVCO V encountered higher waves near Ship Shoal than it might have encountered in deeper water more distant from the shoal.

The Safety Board believes that the additional 5 percent of righting energy required by the Coast Guard criterion would not have been sufficient to withstand the wave action that the AVCO V encountered at the time of the accident. Therefore, even if the AVCO V had been in compliance with the Coast Guard stability criteria, it would probably still have capsized because the wave conditions were the governing factor. The Safety Board believes that the Coast Guard should consider wave-induced motions when establishing the liftboat stability criteria.

According to the contractor employees who survived, neither the master(s) nor the crewmembers of the AVCO V gave any instructions about the lifesaving and other safety equipment aboard. Additionally, no one gave instructions on emergency procedures or abandon ship drills. Considering how little time the offshore workers had to escape during the capsizing, attempting to leave through the single available exit while wearing or carrying life preservers would have been even more difficult. The Safety Board believes that emergency drills might have alerted the master and offshore workers to the difficulties encountered in rapidly exiting the passenger quarters through the single, second deck level door while wearing life preservers. Such drills can lead to improvements in emergency procedures and vessel design changes.

Not only must an offshore worker observe the safety precautions related to his work, he must perform that work in a marine environment. Therefore, it is critical that when offshore workers first board, they receive a safety briefing which includes what actions to take in an emergency. The Safety Board believes that liftboat masters should be required to give safety briefings about emergency actions to all embarked persons before departing on assignment and again to persons boarding later offshore. Liftboat masters should regularly hold emergency drills and record these in the logbook. Further, the Safety Board believes that owners of liftboats should regularly monitor the activities of their vessels to ensure that safety procedures are being implemented.

Therefore, the National Transportation Safety Board recommends that the U.S. Coast Guard:

> Require that liftboats have on board a severe weather action plan that is tailored to the operating characteristics and limitations of the vessel. (Class II, Priority Action) (M-91-13)
>
> Limit the number of offshore workers transported on liftboats between United States continental ports and offshore worksites to the minimum number required to maintain the contractor equipment carried on the vessel. (Class II, Priority Action) (M-91-14)

In addition, the Safety Board reiterates the following safety recommendations issued to the Coast Guard on January 14, 1991, as a result of its investigation of the capsizing and sinking of the liftboat TITAN [2] on June 29, 1989:

M-90-87

Expedite the publication of final rules which include inspection and structural standards for new and existing liftboats.

M-90-88

Publish a standard outline of liftboat operating manual contents to provide guidance and to ensure that critical information, as prepared by naval architects and liftboat owners, is adequately addressed in language readily understood by liftboat masters.

M-90-89

Require that liftboats be fitted with adequate cargo and equipment securing devices on the main deck so that tackwelding of equipment is not needed.

M-90-91

Require that all liftboats operating offshore be equipped with an approved float-free, automatic emergency position indicating radio beacon.

M-90-92

Require that liftboats be equipped with primary lifesaving equipment that protects persons from water immersion.

M-90-93

Require that an adequate number of exterior doors be installed on all accommodation deck levels of liftboats for the rapid exit of persons in an emergency.

M-90-95

Require that liftboat stability criteria allow for the adverse effects of raised flooded legs, wave-induced motions, and sea water on deck.

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[2]Marine Accident Report--"Capsizing and Sinking of the U.S Self-propelled Liftboat M/V TITAN, Gulf of Mexico, June 29, 1989" (NTSB/MAR-90/07).

M-90-97

Require that before departing on assignment liftboat masters give briefings about the vessel's safety features and appropriate actions to be taken in an emergency to on-board persons and persons boarding later offshore be similarly briefed. Such briefings should be required to be logged by the master.

M-90-98

Require liftboat owners to monitor regularly the safety procedures conducted on board their vessels to ensure that on-board persons are briefed about the vessel's safety features, emergency drills are held regularly, and briefings and drills are logged by the master.

Also, as a result of its investigation, the Safety Board issued Safety Recommendations M-91-12 to the U.S. Department of Transportation; M-91-15 through -18 to Avis Bourg & Company, Inc.; and M-91-19 through -21 to Chevron, USA.

KOLSTAD, Chairman, COUGHLIN, Vice Chairman, and BURNETT, LAUBER, and HART, Members, concurred in these recommendations.

By: James L. Kolstad
Chairman