



# National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

*Log M-356A*

Date: November 7, 1989

In reply refer to: M-89-97 through -104

Mr. C. R. Palmer  
Chairman and President  
Rowan Companies, Inc.  
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At 1605 on December 15, 1988, the 297-foot-long U.S. mobile offshore drilling unit ROWAN GORILLA I capsized and sank in the North Atlantic Ocean about 500 nautical miles southeast of Halifax, Nova Scotia, Canada. The ROWAN GORILLA I, a self-elevating type drilling rig, was being towed by the 245-foot-long Bahamian tug SMIT LONDON from Halifax to Great Yarmouth, United Kingdom when the towline broke about 0220 on December 15, during a severe storm. At 1340 on December 15, the 27 persons aboard the ROWAN GORILLA I abandoned the rig using one of the rig's survival capsules. When the rig was abandoned, there were 50-foot-high seas and the wind was blowing at about 60 knots. About 1200 on December 16, when the seas had subsided to about 15 feet in height, the 27 persons were rescued from the survival capsule by the SMIT LONDON crew. The estimated value of the rig was \$90 million.<sup>1</sup>

For the ROWAN GORILLA I to capsize on December 15, 1988, either the rig did not have sufficient intact stability for the environmental conditions or its stability was reduced by flooding below a level capable of withstanding the overturning forces of the wind and seas. However, once the rig capsized, it would only be a matter of minutes before it sank as the result of flooding of internal compartments through ventilation openings on the main deck. To determine the cause of capsizing, the Safety Board requested that the Marathon LeTourneau Offshore Company, the designers and builders of the ROWAN GORILLA I, perform stability calculations representing the vessel and environmental conditions at the time of the capsizing. In addition, the Safety Board examined several sources of flooding before capsizing including hull structural failures, flooding through ventilation openings on the main

<sup>1</sup>For more detailed information, read Marine Accident Report--"Capsizing and Sinking of the U.S. Mobile Offshore Drilling Unit ROWAN GORILLA I in the North Atlantic Ocean, December 15, 1988" (NTSB/MAR-89/06).

deck, and flooding as the result of damage on the rig's main deck from loose cargo.

With its legs in the severe storm condition 25 feet below the hull, as they were at the time of capsizing, the intact ROWAN GORILLA I was designed to have sufficient stability to withstand the overturning forces imposed by a sustained wind of 100 knots during severe storm conditions provided that the rig was loaded properly. In addition, the rig was designed to withstand the overturning forces imposed by a sustained wind of 50 knots with any one compartment or tank, located within 5 feet of the exterior hull, flooded. Based on meteorological information from the rig, the tug, other vessels in the area, the National Weather Service and other meteorological sources, the Safety Board estimated that the maximum sustained wind speed at the time of capsizing to be about 60 knots. Thus, the wind speed at the time of capsize was well below the design maximum speed of 100 knots for the intact rig, but in excess of design maximum speed of 50 knots for the rig with one compartment flooded. However, the stability calculations performed by Marathon after the accident indicate that as loaded on December 15, 1988, and with both preload tanks 14 and 15 flooded, the ROWAN GORILLA I's righting moment was several times greater than the overturning moment from a 60-knot wind, and the rig would have almost no stern trim. Therefore, the Safety Board believes that the ROWAN GORILLA I, as loaded on December 15, 1988, had sufficient stability to withstand the overturning moment of the wind even with preload tanks 14 and 15 flooded.

The Safety Board next considered how much flooding would be required to reduce the rig's stability below a level at which a 60-knot wind could capsize the ROWAN GORILLA I. The rig crew testified that in addition to the water entering preload tanks 14 and 15 through hull cracks, water was entering both propulsion rooms through cracks on the main deck, water was entering the air compressor room through an opening in the main deck, and the mud pit room was flooding through an opening on the main deck whose hatch cover had been torn off by the loose container. In addition, the Safety Board assumed that water was being trapped in the shale shaker house on the rig's stern because the house was open near the top for ventilation but otherwise constructed of corrugated steel plating. The stability calculations performed by Marathon showed that with water in all the above tanks and compartments, the ROWAN GORILLA I's righting moment would still be about twice the overturning moment due to the 60-knot wind and the stern trim would be about 2° to 3°. Thus, the Safety Board does not believe that the ROWAN GORILLA I would have capsized from water in preload tanks 14 and 15, the propulsion rooms, the air compressor room, the mud pit room and the shale shaker house.

About 0900 on December 15, the rig superintendent stated that the stern trim had increased from about 2° to 6° although all the equipment on deck, except for the containers which had broken loose earlier, was still in place. The Safety Board estimated that it would take a 5° to 6° stern trim for the after edge of the main deck of the ROWAN GORILLA I to be under water in still water. Therefore, with a 6° stern trim, the rig's after deck was now almost constantly under water. The barge engineer stated that although the crew was dewatering preload tanks 14 and 15, the stern trim continued to increase

indicating to him that other after tanks must be flooding. Since both the rig superintendent and the barge engineer stated that up to the time the crew abandoned the rig, the crew was able to pump out the internal compartments as fast as the water entered the compartments, the Safety Board believes that additional after preload tanks had to be flooding to cause the 6° stern trim.

Because the ventilation openings for the after preload tanks were only about 30 inches above the main deck which was about 10 feet above the mean water level with a 2° stern trim, and about 50-foot-high waves were breaking over the rig's stern, it is probable that the after preload tanks were taking on water through their ventilation openings. It is also possible that hull structural failures had occurred in additional after preload tanks resulting in their flooding. Another possible cause of flooding of after preload tanks was flooding through their 30-inch-high access hatches. The crew reported that on December 14, they had found some access hatch covers loose and had attempted to tighten all hatch covers, but could not reach those hatch covers near the stern because of the waves breaking on deck. Because the rig sank in about 16,000 feet of water and there are no plans to salvage the rig, the Safety Board was not able to examine the hull of the ROWAN GORILLA I after the sinking to determine what caused the flooding of after preload tanks. The Safety Board believes that the flooding of after preload tanks was probably due to a combination of hull structural failures, loose access hatch covers, and ventilation openings.

Once the after trim reached 6°, the after main deck would be constantly under water and the ROWAN GORILLA I would rapidly lose stability. In addition, other empty tanks and compartments would begin taking on water through ventilation openings as the after main deck sank deeper into the water. When the stern trim reached 12° just before the crew abandoned the rig, probably the entire main deck aft of the deckhouse was under water and all internal compartments and tanks in this area were taking on water through their main deck ventilation openings. Thus, as tanks and compartments flooded, the ROWAN GORILLA I slowly lost stability, the overturning forces of the wind and waves exceeded the righting ability of the rig, and it capsized.

Rowan Companies, Inc. (Rowan) and the tug master chose a southerly route along latitude 40° north versus a great circle route across the North Atlantic to minimize the exposure of the tow to severe weather. Historic meteorological information compiled by the U.S. Navy showed that although the greatest probability of encountering wind speeds over 34 knots along the intended trackline of the SMIT LONDON master occurs in December, the probability of winds greater than 48 knots along this trackline between Halifax and the accident site was only about 1 percent. In addition, the probability of encountering wind speeds over 34 knots along the intended trackline does not decrease significantly until March. The information also showed that there was about a 40 percent decrease in probability of encountering wind speeds over 34 knots by taking the intended route versus a great circle route. A more southerly route along latitude 32° north would further reduce the probability of encountering wind speeds over 34 knots by 35 percent but would take the tow through the same area where it encountered the severe storm on December 15 and would expose the tow for a longer time to

the potential of severe weather. The chairman of the board of Rowan stated that the moving of the ROWAN GORILLA I aboard a heavy lift ship was not considered because Rowan anticipated difficulty unloading the rig in the North Sea where unfavorable weather conditions are prevalent in January and February. The Rowan vice president also stated that the reason a heavy lift ship was not considered was that he had observed in 1983 extensive damage to a rig which arrived in Halifax aboard a heavy lift ship. The Rowan vice president also stated that it would not be practical to remove portions of the legs for the tow because of the cost, time involved, and the requirement for an additional vessel to transport the legs. Since neither ABS nor the U.S. Coast Guard had placed any restrictions on the ROWAN GORILLA I regarding the time of year or the waters where the rig could be towed and the rig was designed for a maximum wind speed of 100 knots, the Safety Board believes that Rowan's decision to tow the ROWAN GORILLA I across the North Atlantic Ocean in December on the southerly route along latitude 40<sup>0</sup> north was reasonable.

Rowan retained the services of a recognized surveying and consulting company to supervise and approve the preparations for the tow. The October 14, 1988 survey report prepared for the ROWAN GORILLA I tow recommended that the advice of a long range forecasting service should be used for the tow. However, the rig manager stated that Rowan did not interpret this statement as meaning that Rowan should employ a long range forecasting service, but that the weather information obtained by the tug would be sufficient. The Rowan vice president stated that Rowan does not use their contracted private weather service during towing because they do not have the proper radio equipment for receiving the information. The Safety Board believes that Rowan should have employed a long range forecasting service before the tow departed Halifax. Meteorologists from local government forecast offices or private companies can augment information contained in official marine forecasts. Meteorologists, with some skill, can provide weather outlooks out to 4 to 5 days. Information such as this would have been useful in determining an appropriate time to begin a tow across the North Atlantic Ocean from Halifax and would have provided updated weather predictions during the tow. The weather information could have been relayed to the rig via the tug during the tow.

As a result of its investigation of the capsizing and sinking of the self-elevating MODU OCEAN EXPRESS,<sup>2</sup> the Safety Board issued Safety Recommendation M-79-51 to the International Association of Drilling Contractors (IADC):

Recommend that its members use private meteorological services which provide the special information needed when engaged in weather-sensitive operations.

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<sup>2</sup>Marine Accident Report--"Capsizing and Sinking of the Self-Elevating Mobile Offshore Drilling Unit OCEAN EXPRESS Near Port O'Connor, Texas, April 15, 1976," (NTSB/MAR-79/05).

On May 9, 1979, IADC replied:

The International Association of Drilling Contractors has received your NTSB Safety Recommendation M-79-51, issued on April 17, 1979. We have reproduced this Recommendation and have sent it to our Offshore Committee. I am certain that this topic will be discussed at the Committee's next-scheduled meeting which will be held in mid-June.

On June 1, 1989, IADC again replied:

The use of private weather services has long been routine during weather-sensitive offshore operations such as the moving of mobile offshore drilling units. In the case of long range moves, it is not uncommon for the unit's owner to consult more than one private weather service....

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I am attaching a copy of the Proceedings for the Second International Conference on Offshore Safety which [IADC] co-sponsored with the Rosenstiel School of Marine and Atmospheric Science of the University of Miami in 1986. [IADC's] primary purpose in approaching the Rosenstiel School to co-sponsor this conference was to focus attention on the importance of accurate offshore weather forecasting to our industry.

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The Safety Board believes that had Rowan requested their contracted weather service to provide them with a 4- to 5-day outlook before the tow departed Halifax, the weather service may have noted the potential for the development of a severe storm about December 15 in the area of the capsizing. Rowan could have also requested the local Canadian government weather service to provide Rowan with a 5-day outlook. Thus, the tow could have been delayed until the potential for encountering a severe storm had passed.

There were numerous items stored on the main deck of the ROWAN GORILLA I during the tow including seven containers. Despite 50-foot-high waves breaking on deck, the only deck cargo reported broken loose were several of the containers. Based on the testimony of the ROWAN GORILLA I crew, the SMIT LONDON crewmember aboard the rig, the Rowan personnel responsible for preparing the rig for the tow in Halifax, and the survey report prepared for the tow by the surveying company, the Safety Board believes that all deck cargo was secured in accordance with good marine practice. The containers that broke loose had been placed in a protected location near the center of the main deck and were secured by angle irons placed on the four corners of the containers and welded on three sides to the deck and three sides to the container. The Safety Board believes that the force of the waves breaking over the stern on December 15, was greater than normal securing procedures

could be expected to withstand. However, both the ROWAN GORILLA I and the DAN PRINCE<sup>3</sup> accidents show the potential hazard of carrying deck cargo on self-elevating MODUs during ocean tows. Deck cargo also broke loose on the DAN PRINCE causing damage on its main deck that resulted in flooding of internal compartments and tanks. The Safety Board believes that the amount of deck cargo stowed on the main deck of self-elevating MODUs during ocean tows should be minimized.

According to the stability calculations performed by the ROWAN GORILLA I barge engineers on December 8, 1988, the rig departed Halifax with all the preload tanks nearly empty except for 2 or 3 inches of water and the main deck about 14 feet above the mean water level. The vents for the preload tanks were located about 30 inches above the main deck and were designed to minimize water from entering the tanks through the vents. The purpose of these vents was to prevent over pressurization or implosion during filling or discharge. However, the rig preload tanks were located around the periphery of the hull where boarding seas during a storm could easily reach the opening to their vents. The Safety Board believes that because the preload tanks were not being used during the voyage and they were all nearly empty, their vents should have been made watertight for the tow to prevent entry of any water into the tanks.

The ROWAN GORILLA I was not equipped with a remote method of determining the amount of liquid in its preload tanks. The only method available to the crew of the rig was to go out on the main deck and measure the amount of liquid in each tank through either its tank sounding tube or access opening. The rig superintendent stated that from about noon on December 14 to the time they abandoned the rig, the crew was not able to safely go on deck because of the waves breaking on deck. The Safety Board believes that had the ROWAN GORILLA I been equipped with remote gauges for its preload tanks, the crew would have been able to determine that preload tanks in addition to 14 and 15 were flooding and they may have been able to repair or plug the leaks, drain those tanks, and thereby reduce the loss of freeboard and the amount of boarding seas.

Both the Rowan chairman of the board and the Rowan vice president stated that their rig managers and rig superintendents are trained and capable of moving rigs, and they believe it is safer to have a Rowan employee be in charge of all rig operations, whether moving or drilling. The chairman of the board stated, "we consider our personnel to be better qualified to move our rigs than a 'rig mover.' Typically, a Rowan rig manager has been employed by Rowan for more than twenty years." Although the ROWAN GORILLA I rig manager may have been qualified to serve as a rig mover, he was not aboard the ROWAN GORILLA I for the intended month-long tow to the North Sea. A rig mover has responsibilities before, during, and after a tow. In addition to preparing the rig for the tow as done by the ROWAN GORILLA I rig

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<sup>3</sup>Republic of Liberia--"Decision of the Commissioner of Maritime Affairs, R.L. and Report of the Preliminary Investigation In the Matter of the Loss of the Jack-Up Drilling Rig DAN PRINCE (O.N. 6178) Which Sank in Alaskan Waters on 22 October 1980," 18 May 1981, Monrovia, Liberia.

manager, a rig mover is also responsible for the safety of the rig underway including maintaining adequate stability, maintaining the watertightness of the hull, and planning the tow according to weather forecasts and actual wind and wave conditions. The Safety Board does not believe that a shoreside manager can serve as a rig mover during a month-long tow across the North Atlantic Ocean.

Based on the statements by the chairman of the board and vice president of Rowan, the ROWAN GORILLA I rig superintendent should also have been qualified as a rig mover. The Rowan vice president stated that Rowan rig superintendents get on-the-job experience in moving rigs and that the ROWAN GORILLA I rig superintendent had experience under North Atlantic sea conditions while the rig was operating off the east coast of Nova Scotia. In addition, he stated that the rig superintendent had taken the mandatory Canadian survival training, had a U.S. Coast Guard Able Seaman document, had on-the-job training in stability, had been taught how to use the maximum motion curves in the ROWAN GORILLA I operations manual which indicate the structural design limits of the rig, and had been given written guidance on what to do regarding rig motions in anticipation of a storm.

Although the rig superintendent had been aboard the ROWAN GORILLA I while the rig was operating off the east coast of Nova Scotia for about 5 years, the December 1988 tow was his first ocean tow. The Safety Board does not believe that one short field move and one tow in good weather during the 5 years off the coast of Nova Scotia provided the rig superintendent with sufficient experience in ocean towing to supervise the December 1988 tow. The Rowan vice president stated that a rig superintendent had to have some experience with rig motions to interpret the maximum motion curves; the ROWAN GORILLA I rig superintendent had no experience with large amplitude rig motions. Also, when the SMIT LONDON master informed the rig superintendent about 1130 on December 15, that the rig was listing astern and the similar circumstances experienced by the DAN PRINCE, the tug master stated that the rig superintendent asked, "Do you think this is an emergency situation?" and requested that the tug master advise him concerning the situation because "Please appreciate that we are drilling men, and not seamen." The Safety Board believes that a qualified rig mover aboard the ROWAN GORILLA I would have realized that when the rig motions exceeded design limits on the morning of December 15 and the rig's stern trim increased from 2° to 6°, that the rig was probably in a dangerous condition and would not have had to rely on the advice of the tug master, who stated that he was not familiar with rigs, regarding the condition of the ROWAN GORILLA I. The Safety Board believes that the circumstances of this accident and the historical accident record of self-elevating MODUs indicates a need for trained rig movers aboard self-elevating rigs under tow.

The Safety Board is concerned also that present Rowan procedures and policies regarding the stowage of survival capsules and inflatable liferafts during ocean tows does not give sufficient emphasis to the protection of personnel. The U.S. Coast Guard Certificate of Inspection for the ROWAN GORILLA I required that the rig be equipped with four survival capsules with a total capacity for 172 persons. Two of the capsules were required to be stowed on the port side and two on the starboard side. Additionally, the

certificate of inspection required that the rig carry four inflatable liferafts with a total capacity for 100 persons. U.S. Coast Guard regulations required that the survival capsules and the liferafts be stowed in their U.S. Coast Guard approved launching equipment at all times and that the rig superintendent ensure that each item of lifesaving equipment was maintained in operative condition. However, contrary to these U.S. Coast Guard requirements, the Rowan alternate rig superintendent, under instructions from Rowan shoreside managers, removed the rig's four survival capsules and four inflatable liferafts from their U.S. Coast Guard approved launching equipment while preparing the rig for its tow across the North Atlantic Ocean. Rowan managers stated that the reason for removing the survival capsules and liferafts from their approved launching equipment was to protect the survival equipment from being washed overboard during the tow. The Rowan vice president was not aware of any Rowan policies regarding the stowage of U.S. Coast Guard required lifesaving equipment during ocean tows, and the ROWAN GORILLA I operations manual did not address the stowage of lifesaving equipment during ocean tows.

Fortuitously, Canadian Coast Guard inspectors boarded the ROWAN GORILLA I before the rig left Halifax and told the alternate rig superintendent that the survival capsules should not have been removed without U.S. Coast Guard approval. As a result, the two 36-person survival capsules were replaced in their launching equipment. Because there were only 27 persons on board the rig, the two 36-person survival capsules were probably sufficient for safety. However, Rowan managers never contacted the U.S. Coast Guard for permission to remove any of the survival capsules or liferafts from their launching equipment and none of the liferafts was replaced in approved launching equipment.

The Safety Board believes that the location of the ROWAN GORILLA I launching equipment for liferafts was inappropriate for an ocean tow. If the rig's liferafts had remained in their launching equipment on top of the rails near the edge of the main deck for the ocean tow, the hydrostatic releases for the liferafts would probably been activated and the liferafts would have been washed overboard during the severe storms encountered during the tow. The Safety Board believes that for the ocean tow, Rowan should have provided alternate U.S. Coast Guard approved liferaft launching equipment in locations on the ROWAN GORILLA I that would be protected from waves during severe weather. In addition, the Safety Board believes that Rowan should have provided explicit instructions in the rig's operations manual regarding the proper stowage of lifesaving equipment during ocean tows. Had the ROWAN GORILLA I proceeded to sea without any of its survival capsules or liferafts in their approved launching equipment, the Safety Board believes that there may have been serious injuries and loss of life when the rig capsized and sank on December 15, 1988, because the crew would not have been able to launch the survival capsules and liferafts. Although the crew's immersion suits would have provided them with thermal protection, they may not have been able to swim away from the rig before the rig capsized on top of them. If any of the crew were able to escape the sinking rig, they would probably have become separated in the high seas and darkness, and may not have been found by rescue aircraft or the SMIT LONDON. The Safety Board believes that the U.S. Coast Guard should examine the location of liferaft launching



equipment on all U.S. self-elevating MODUs to ensure that the liferafts are protected from being washed overboard during storms while the rig is being towed. It may be necessary to require alternate liferaft launching equipment for ocean tows.

The incorrect position titles and the absence of names identifying the certificated lifeboatmen on the ROWAN GORILLA I fire and abandon platform bill did not affect the evacuation on December 15 because only one survival capsule was used and the rig superintendent took charge. However, if two survival capsules had been used, the Safety Board believes that there may have been confusion as to who was in charge of the second survival capsule and Rowan should revise any rig fire and abandon platform bills that have incorrect titles. Because MODU position titles do not identify the required U.S. Coast Guard Certificated lifeboatmen who should take charge of survival craft during an emergency, the Safety Board issued the following Safety Recommendation M-83-11 to the U.S. Coast Guard as a result of its investigation of the capsizing and sinking of the OCEAN RANGER:<sup>4</sup>

Require that the station bill on mobile offshore drilling units identify by name the certificated lifeboatmen required by the U.S. Coast Guard Certificate of Inspection.

In a letter dated April 13, 1987, the U.S. Coast Guard stated:

The Coast Guard concurs with the intent of this recommendation. The Coast Guard published Navigation and Inspection Circular No. 7-82 which revised station bill requirements to identify billets with emergency stations. Although the Board recommended identification by name, we believe our alternate action satisfies the intent of this recommendation. Therefore, no further action on this recommendation is anticipated.

On August 1, 1987, the Safety Board classified Safety Recommendation M-83-11 as "Closed--Unacceptable Action." The Safety Board believes that this accident again shows the confusion that can exist with MODU station bills if the U.S. Coast Guard certificated lifeboatmen are not identified and urges the U.S. Coast Guard to reconsider its position.

The tug master stated that he was not able to locate the position of the rig's survival capsule in the dark because it did not have an external light, and therefore, the SMIT LONDON had to stay some distance away to avoid colliding with the capsule. The officer in charge of the Halifax Rescue Coordination Center stated that because the survival capsule did not have an external light and it was made of fiberglass (a poor radar reflector), the

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<sup>4</sup>Marine Accident Report--"Capsizing and Sinking of the U.S. Mobile Offshore Drilling Unit OCEAN RANGER Off the East Coast of Canada, 166 Nautical Miles East of St. John's, Newfoundland, on February 15, 1982" (NTSB/MAR-83/2).

Canadian aircraft pilots found the survival capsule very difficult to see at night and that they often lost contact with the capsule on radar. The 1983 amendments to SOLAS 1974 require a light on the top of survival capsules visible for at least 2 miles and for an efficient radar reflector. However, these requirements only apply to vessels built after July 1, 1986 on international voyages and the U.S. Coast Guard has not implemented these requirements for U.S. vessels. The Safety Board believes that the circumstances of this accident show the need for lights and radar reflectors for all survival capsules on U.S. vessels.

Therefore, the National Transportation Safety Board recommends that Rowan Companies Inc.:

Employ a weather service to provide long-range forecasts whenever towing self-elevating mobile offshore drilling units across the ocean. (Class II, Priority Action) (M-89-97)

When towing self-elevating mobile offshore drilling units on routes where severe weather can be expected, make the ventilation openings for empty tanks watertight. (Class II, Priority Action) (M-89-98)

Provide remote gauges for all tanks on self-elevating mobile offshore drilling units. (Class II, Priority Action) (M-89-99)

During ocean tows, employ rig movers with experience in ocean towing and the motions of self-elevating mobile offshore drilling units under severe sea conditions. (Class II, Priority Action) (M-89-100)

Provide alternate launching equipment in a protected location for the inflatable liferafts on self-elevating mobile offshore drilling units (MODU) to protect the liferafts from being washed overboard by waves when the MODU is being towed. (Class II, Priority Action) (M-89-101)

Provide explicit instructions in mobile offshore drilling unit operations manuals regarding the proper stowage of lifesaving equipment during ocean transits. (Class II, Priority Action) (M-89-102)

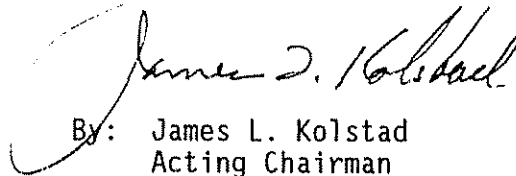
Revise mobile offshore drilling unit (MODU) fire and abandon platform bills to correctly state the position titles of the persons aboard the MODU and to identify by name the certificated lifeboatmen required by the U.S. Coast Guard Certificate of Inspection. (Class II, Priority Action) (M-89-103)

Provide enclosed lifeboats and survival capsules with a light on the top visible for at least 2 miles and an efficient radar reflector. (Class II, Priority Action) (M-89-104)

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "... to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, it would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations M-89-97 through -104 in your reply.

Also, the Safety Board issued Safety Recommendations M-89-88 through -96 to the U.S. Coast Guard; M-89-105 to the American Bureau of Shipping; M-89-106 to Marathon LeTourneau Offshore Company; and M-89-107 through -110 to the International Association of Drilling Contractors. The Safety Board also reiterated Safety Recommendations M-83-8 through -10 and M-87-32 to the U.S. Coast Guard and M-84-48 to the Secretary of the U.S. Department of Transportation.

KOLSTAD, Acting Chairman, and BURNETT, NALL and DICKINSON, Members, concurred in these recommendations. LAUBER, Member, did not participate.

  
By: James L. Kolstad  
Acting Chairman