

NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.

ISSUED: November 21, 1984

Forwarded to:

Mr. William N. Johnson  
Chairman and President  
American Bureau of Shipping  
65 Broadway  
New York, New York 10006

SAFETY RECOMMENDATION(S)

M-84-74 through -76

About 2355 on October 25, 1983, the 400-foot-long United States drillship GLOMAR JAVA SEA capsized and sank during Typhoon LEX in the South China Sea about 65 nautical miles south-southwest of Hainan Island, People's Republic of China (PRC). Of the 81 persons who were aboard, 35 bodies have been located, and the remaining 46 persons are missing and presumed dead. The GLOMAR JAVA SEA currently is resting on the bottom of the sea in an inverted position in about 315 feet of water; its estimated value was \$35 million. <sup>1/</sup>

An underwater videotape survey of the wreck performed shortly after the accident showed a 40-foot-long transverse fracture in the starboard side and a separate longitudinal fracture in the deck plating of wing tanks Nos. 6 and 7. If the large transverse fracture occurred while the vessel was afloat on the surface, starboard wing tanks Nos. 6 and 7 would have flooded and could account for the undetermined 15° list reported at 2341 since the drillship's pumps would not have been able to overcome the subsequent rate of flooding. The Safety Board examined a number of factors which could have caused this fracture. A review of the videotapes did not show any evidence of an external explosion. Thus, sabotage by outside interests or a stray mine that had come adrift was ruled out. Because the hull plating was deformed inwardly, a deliberate or accidental internal explosion also was rejected. A deliberate ramming or accidental collision by another vessel was considered. The fracture showed no evidence of a collision with a steel vessel, and no vessel was reported as being in the area at the time of the accident. However, a wooden vessel such as a fishing vessel could have hit the GLOMAR JAVA SEA during the storm. The sharp blow of the wooden vessel striking the drillship could have initiated the fracture while not leaving any visible damage to the hull. However, the likelihood of a wooden vessel operating near the GLOMAR JAVA SEA during Typhoon LEX is remote.

The longitudinal fracture about 5 feet long and 8 inches wide in the main deck where the forward starboard leg of the derrick connected into the bulkhead at frame 91 also could account for the 15° list reported at 2341. The fracture was large enough to lead to

<sup>1/</sup> For more detailed information, read Marine Accident Report—"Capsizing and Sinking of the United States Drillship GLOMAR JAVA SEA in the South China Sea, 65 Nautical Miles South-Southwest of Hainan Island, People's Republic of China, October 25, 1983" (NTSB/MAR-84/08).

rapid flooding of starboard wing tanks Nos. 6 and 7 with the waves washing over the deck. As the vessel heeled, the rate of flooding would have increased, and the drillship's pumps probably could not have kept up with the flooding. The Safety Board could not determine the cause of this structural failure. The failure could have occurred while the vessel was afloat on the surface or when it hit the ocean floor.

Under current U.S. Coast Guard (USCG), American Bureau of Shipping (ABS), and International Maritime Organization (IMO) standards, drillships similar to the GLOMAR JAVA SEA are required to be designed to withstand the accidental flooding of one wing tank. The October 25 accident illustrates the limitations of this standard. The structural failures at frame 91 resulted in the flooding of both wing tanks Nos. 6 and 7 and probably led to the capsizing and sinking of the drillship. If the GLOMAR JAVA SEA had been designed to withstand the flooding of two wing tanks or if an operational restriction had been placed on the vessel not to have two adjacent wing tanks empty, the GLOMAR JAVA SEA might not have capsized and sunk. There is a need for the USCG, the ABS, and the IMO to revise their stability standard for drillships to require drillships to withstand the flooding of two adjacent wing tanks.

Since the metallurgical analyses of the transverse fracture showed no preexisting fractures or defects and the structural calculations showed moderate stress levels, there is a need for both the USCG and the ABS to review the structural design of the other five Global Marine drillships similar to the GLOMAR JAVA SEA. Drillships are required to be designed and built to withstand severe weather conditions. The GLOMAR JAVA SEA's structural failure indicates there may be a structural design problem that was not detected by the standard structural calculations performed by the ABS. There should be a comprehensive review of the structural design, including environmental assumptions, steel distribution in the hull plating near the derrick, and dynamic loads.

The drydock inspection by the USCG inspector and the ABS surveyor during November 1982 and the USCG inspector's and ABS surveyor's inspections during October 1983 were thorough and comprehensive. However, the USCG and the ABS could improve the thoroughness of their inspections and surveys of mobile offshore drilling units (MODU's).

Although the metallurgical tests and examinations of the two fractures in starboard drill water wing tank No. 6 indicate that they could not have been anticipated by a visual inspection before the fracture, the internal examination of tanks could be improved. The investigation showed that neither the USCG nor the ABS entered starboard drill water wing tank No. 6 during either the November 1982 drydocking or the October 1983 inspections and survey. USCG policy does not require that USCG inspectors inspect a tank unless there is an outstanding ABS survey requirement or the USCG inspector suspects some problems. With the introduction of improved exterior hull coatings, an examination of the exterior hull of a vessel may no longer be an indication of the condition of the hull plating and internal framing. However, the internal structure of saltwater ballast tanks generally is not coated. Furthermore, an examination of the external hull plating does not indicate the condition of the internal plating.

ABS survey rules require that specific tanks be examined internally at each special survey about every 4 to 5 years but not at any intermediate surveys. With the increase in time for required drydocking and the exemption from drydockings for MODU's, the ABS should put more emphasis on internal tank inspections. The ABS should require surveyors to inspect a representative sample of nonfuel oil tanks on a vessel during drydocking between special surveys. The number of tanks inspected should be increased as the vessels get older.

Therefore, the National Transportation Safety Board recommends that the American Bureau of Shipping:

Revise the stability criteria contained in the Rules for Building and Classing Mobile Offshore Drilling Units to include the capability of drillships to survive the flooding of any two adjacent compartments or tanks within 5 feet of the hull. (Class II, Priority Action) (M-84-74)

Review the structural design in conjunction with the U.S. Coast Guard of the five Global Marine drillships, similar in design to the GLOMAR JAVA SEA, and, if necessary, require design modifications to prevent a structural failure similar to that which occurred on the GLOMAR JAVA SEA. (Class II, Priority Action) (M-84-75)

Require that a representative sample of nonfuel oil tanks be inspected internally at least once every 30 months for vessels in saltwater service and that the sample of tanks to be inspected be increased as the vessel gets older. (Class II, Priority Action) (M-84-76)

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 actions taken as a result of its safety recommendations and would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member, concurred in these recommendations.

  
By: Jim Burnett  
Chairman