

109# M-329B



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 21, 1987

In reply refer to: M-87-39 through -46

Mr. Jack Goldstein
President
OMI Corporation
280 Park Avenue
New York, New York 10017

About 1030 on October 28, 1986, explosions and fires occurred in the engineroom and starboard fuel oil tanks of the 811-foot-long U.S. tankship OMI YUKON which was en route from Hawaii to South Korea for scheduled vessel repairs and biennial inspection by the U.S. Coast Guard. At the time of the explosions, the tankship was located in the Pacific Ocean about 1,000 miles west of Honolulu, Hawaii, and was not carrying any cargo. There were 24 crewmembers, 2 U.S. welders, and 11 Japanese workers employed in cleaning the cargo tanks aboard the vessel. Four persons were killed; the other 33 persons safely abandoned the vessel and were later rescued by a Japanese fishing vessel. The estimated damage to the OMI YUKON was \$40 million. The vessel was towed to Japan and sold for scrap. ^{1/}

The fuel oil sampling and testing procedures as practiced by OMI Corporation (OMI), Hawaiian Refinery, Inc. (HIRI) Caleb Brett, U.S.A., Inc., and the OMI YUKON's two chief engineers were not adequate for preventing fuel oil with a flash point below 140° F from being loaded aboard the OMI YUKON. The Caleb Brett surveyor, who was aboard the OMI YUKON on October 23, testified that neither Caleb Brett nor OMI provided him with any verbal or written instructions regarding the sampling of the fuel oil. The Caleb Brett surveyor took one fuel oil sample at the beginning of the first load of fuel oil on October 23, and a second sample at the beginning of the second load. He did not sample near the end of either load nor was he required to take a sample near the end of each load where the fuel oil was probably contaminated with low flash point oil products. There is a need for standardized sampling procedures of fuel oils loaded aboard vessels that will ensure that the entire load of fuel oil is within required specifications.

Coast Guard regulations require that the chief engineer of a vessel obtain a half-pint sample of each load of fuel oil, but the regulations do not require that the sample be tested or specify how the fuel oil should be sampled. Coast Guard regulations only state that the chief engineer must obtain the flash point of the fuel oil as certified by the producer. In the case of HIRI, the refinery tested the fuel oil in their storage tank several days before loading of the OMI YUKON began. These test results were then given to the chief engineer as certification of the fuel oil's flash point. The test results of samples of fuel oil taken while it was loaded were normally not forwarded to the chief engineer until after the fuel oil was used. The fuel oil sample retained by the chief engineer and any

^{1/} For more detailed information, read Marine Accident Report—"Explosions and Fires Aboard U.S. Tankship OMI YUKON in the Pacific Ocean about 1,000 Miles West of Honolulu, Hawaii, on October 28, 1986" (NTSB/MAR-87/06).

test results of the fuel oil actually loaded were normally used to settle contract disputes after the fuel oil had been used and not to determine whether the fuel oil had a flash point above 140° F. The OMI superintendent engineer stated it was OMI's policy not to have the fuel oil samples tested before the fuel oil was used aboard its vessels because it took too long to obtain the results. Because of the contaminated fuel oil loaded aboard the OMI YUKON at HIRI in April 1986, the two OMI YUKON chief engineers had changed their practice from loading fuel oil directly into the fuel oil settler tanks to loading fuel oil into empty fuel oil storage tanks before transferring the fuel oil to the settler tanks. However, they still used the fuel oil before obtaining any test results from HIRI of the fuel oil samples taken during loading.

Testing of fuel oil samples for flash point can be done quickly. On December 1, 1986, when the chief engineer of the ASPEN questioned the fuel oil being loaded aboard his vessel at HIRI, HIRI tested samples of the fuel oil in about 4 hours. This accident indicates the need for improved testing practices for boiler fuel oil being loaded aboard vessels. The National Transportation Safety Board believes that the Coast Guard should require not only that samples be taken but also require that the samples be tested to ensure that the fuel oil actually loaded aboard vessels meets Coast Guard safety requirements. In addition, OMI should require that all fuel oil samples be tested before the fuel oil is burned on its vessels to ensure the fuel oil meets their specifications and is safe to use, and that HIRI should develop sampling and testing standards for all fuel oil loaded aboard vessels to ensure that the actual fuel oil loaded is not contaminated with other products.

Another area of concern to the Safety Board is the hot work procedures aboard the OMI YUKON. Testimony indicated that there were no written safety procedures aboard the OMI YUKON to be followed during flame cutting and welding operations except for a copy of the International Safety Guide for Oil Tankers and Terminals (ISGOTT). The chief engineer and OMI superintendent engineer both testified that they relied on the experience of the contracted welders aboard the OMI YUKON to perform their welding or flame cutting in a safe manner.

On the morning of October 28, 1986, before the flame cutting on the storage crane, the chief engineer stated that neither he nor the first assistant engineer made any particular safety inspection of the area, that he did not discuss any safety procedures with the welders, and that no fire hoses charged with water were laid out for use. He also stated that no individual was designated as a fire watch, and that the second welder who was helping the welder doing the cutting was assumed to be the fire watch.

Coast Guard regulations required that the senior officer present, the chief engineer, conduct an inspection to determine that the flame cutting operation could be undertaken safely. ISGOTT states that the responsible officer (the chief engineer) should have tested and examined the area for flammable gases and should have had adequate fire extinguishing equipment ready for immediate use. The U.S. Maritime Administration fire prevention guide states that the fire watch should have no other duties and that proper fire extinguishers as well as a hose line charged with water to the nozzle should be provided during flame cutting operations.

The probable source of ignition for the fire and explosions aboard the OMI YUKON was the flame cutting operation on the starboard bulkhead of the engineroom casing. A check for explosive vapors from the fuel oil tank vents below where the flame cutting was going to take place probably would have indicated to the chief engineer and welders the danger of flame cutting in that area. Further, a check of the vents for flame screens

before the flame cutting began may have prevented the fires and explosions. It was the responsibility of the chief engineer to ensure safe hot work procedures. OMI should not have relied solely on the experience of the contracted welders, but should have provided written hot work safety procedures and required either the master or chief engineer to certify that the required safety procedures had been accomplished before the hot work began. The Safety Board believes that OMI should have also provided its vessels with a copy of the National Fire Protection Association's Standard No. 306, "Standard for the Control of Gas Hazards on Vessels," which is required by the Coast Guard as a guide for hot work.

Before the explosions, the OMI YUKON had undergone the required Coast Guard inspections and American Bureau of Shipping (ABS) surveys for classification. The inspections and surveys covered examination of the tankship's six fuel oil tank vents including the tank vent that was found without a flame screen after the explosions. The last Coast Guard inspection of the tank vents was on December 20, 1985. The last ABS survey was during August and September 1986. Records and witness statements indicate that the Coast Guard inspectors and ABS surveyors reported examinations of the fuel oil tank vents following their respective boardings of the OMI YUKON, and that the vents were in satisfactory condition at the conclusion of the inspections and surveys.

The Coast Guard inspectors, the ABS surveyors, and the crew of the OMI YUKON each had a unique responsibility in the inspection process. The Coast Guard inspector was responsible for enforcing Coast Guard regulations regarding the safe operation of the tankship. The ABS surveyor was responsible for confirming that the vessel was being maintained in accordance with ABS standards. OMI paid ABS for the surveys, and in turn, OMI was kept informed of the level of maintenance of their vessels to meet insurance and other requirements. The responsibility for inspections on the part of the crew was primarily to assess maintenance needs.

The specific tasks of Coast Guard inspectors within their responsibilities for fuel oil vents are to identify all vents for fuel oil tanks on the vessel, and to examine either a sample of one or more of the vents or to examine all vents to determine compliance with the standards in Coast Guard regulations. The tasks for ABS surveyors are similar to those of Coast Guard inspectors. Information for inspection schedules and procedures by the crew of the OMI YUKON were provided in various sources including machinery and equipment manuals, directives from OMI management, and the experience and training of the individual crew members. However, the inspection and replacement of flame screens was not contained in any periodic maintenance program, but was expected to be accomplished during normal periodic maintenance. Engineering crewmembers normally only inspected the fuel oil tank vent flame screens when they became fouled from dirt adhering to the drying residue from oily vapor on the mesh.

Coast Guard inspectors and ABS surveyors have several sources of information for obtaining the identification of all vents on a vessel before their examination. These sources include experience with similar vessels, knowledge of the particular vessel from previous inspections or surveys, labeling of the vents, and guidance from crewmembers. In the case of the OMI YUKON, the absence of labeling on any of the fuel oil vents and the unusual provision for two expansion trunks and two vents on each storage tank indicated the special need for identification. None of the vents were labeled, and it is not known if the after expansion trunks for the fuel oil storage tanks were labeled for fuel oil. After the explosions and fires, Safety Board investigators found that the after trunks for

the OMI YUKON fuel oil storage tanks were labeled as ballast tanks rather than fuel oil tanks. Testimony by crewmembers indicated that the labels were painted. Whether the trunks was properly labeled or not, there was a need for the after vents to be labeled so that they would not be mistaken for ballast tank vents (located a few feet aft of the after vents on the fuel oil storage tank) which do not require flame screens.

Since neither the port nor the starboard lifeboat was recovered for examination after the explosions and fire, the Safety Board's analysis of the OMI YUKON's lifeboat engine malfunctions was based primarily on witness testimony. The starboard lifeboat was damaged during the explosions and fell into the Pacific Ocean sometime between the time the crew was rescued on October 29 and when investigators boarded the OMI YUKON on November 7. The port lifeboat was abandoned when the crew was rescued by the Japanese fishing boat on October 29.

Testimony by the crew indicated that the port lifeboat's engine did not operate except for short periods of time after the boat was launched. It was the opinion of the chief engineer and first assistant engineer that the engine was overheating which prevented continuing operation. While in the lifeboat, the first assistant engineer diagnosed the problem of overheating as the result of inadequate cooling water. He testified that he confirmed that water was available to the pump through the sea valve and that the inadequate cooling water was probably due to air in the system or the pump not taking suction. He also stated that he was unable to vent the system because of the number of people in the lifeboat.

Testimony by the crew indicated that there was no regular inspection or maintenance program for the cooling water pumps for the lifeboat engines. The crew did not determine the condition and integrity of the lifeboat cooling water systems after modifications were made in early 1986. Testimony indicated that neither lifeboat had been run in the water since January 2, 1986, when the port boat was operated as part of the required Coast Guard midperiod inspection.

The crew inspection procedures for the cooling systems on the lifeboat engines were inadequate in two instances. First, the cooling water pumps were not inspected internally. This type of pump required periodic inspection to determine whether the flexible impeller, which is commonly installed in these pumps and has a service life of from one to several years, had deteriorated. Prudent engineering practice suggests regular internal inspections and maintenance of these pumps. The 3- to 4-year shoreside overhaul of lifeboat engines presently practiced by OMI is probably not sufficient. The inspection and regular replacement of flexible impellers is not a major expense or time consuming item. In addition to the normal operational test of lifeboat engines, the Safety Board believes that the Coast Guard should inspect nonmetallic impellers at midperiod and biennial inspections and conduct a design study to determine the life expectancy of nonmetallic impellers in lifeboat engines.

The second deficiency in the maintenance procedures for the cooling system was the failure of the crew to run the OMI YUKON's lifeboat engines in the water after new piping and fittings had been installed. The use of pressurized water does not provide a test of the operation of the self-priming pumps found on the OMI YUKON lifeboats. Pressurized water would not detect air leaks or the condition of the impeller. Prudent and careful engineering practice would dictate confirmation that there were no leaking fittings and that the modified piping enabled the cooling water pumps to take and maintain suction in the water.

Therefore, as a result of its investigation, the National Transportation Safety Board recommended that the OMI Corporation:

Require that the fuel oil loaded aboard OMI vessels be sampled at the beginning and near the end of each load, that each sample be tested for flash point and viscosity, and that the results of the tests be provided to the chief engineer before the fuel oil is used. (Class II, Priority Action) (M-87-39)

Establish written fuel oil sampling practices to insure that all the fuel oil loaded aboard OMI meets specifications. (Class II, Priority Action) (M-87-40)

Require before hot work is conducted at sea that the master or chief engineer on each OMI vessel inspect the general work area in accordance with Coast Guard requirements and issue a written document specifying the work to be conducted and the requirements necessary to maintain safe conditions. (Class II, Priority Action) (M-87-41)

Provide to each OMI master written guidance on safe practices while conducting hot work. (Class II, Priority Action) (M-87-42)

Provide each OMI vessel with at least one copy of the National Fire Protection Association Standard No. 306, "Standard for the Control of Gas Hazards on Vessels." (Class II, Priority Action) (M-87-43)

Appropriately label the fuel oil tank vents on OMI vessels. (Class II, Priority Action) (M-87-44)

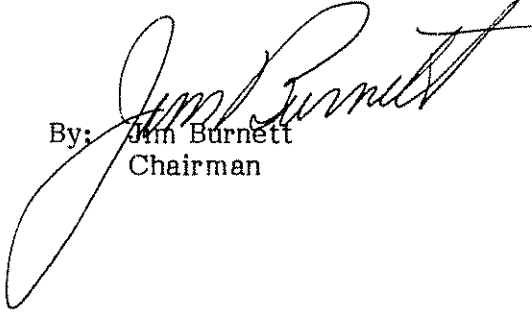
Require the operation of lifeboats in the water after any replacements or modifications to the lifeboat cooling water system. (Class II, Priority Action) (M-87-45)

Require the periodic inspection of nonmetallic impellers in lifeboat cooling water pumps about every 12 months. (Class II, Priority Action) (M-87-46)

Also, as a result of its investigation, the Safety Board issued Safety Recommendations M-87-28 through -37 to the U.S. Coast Guard, M-87-38 to the American Bureau of Shipping, M-87-47 and -48 to the Hawaiian Independent Refinery, Inc., M-87-49 to Caleb Brett U.S.A., Inc., M-87-50 to the American Petroleum Institute, and M-87-51 to the Federal Aviation Administration.

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. Please refer to Safety Recommendations M-87-39 through -46.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER, NALL, and KOLSTAD, Members, concurred in these recommendations.

By: 
Chairman