

Log M-231

NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.

ISSUED: December 7, 1983

Forwarded to:  
  
Admiral James S. Gracey  
Commandant  
U.S. Coast Guard  
Washington, D.C. 20593

SAFETY RECOMMENDATION(S)  
M-83-82 and -83

About 0410 on September 26, 1982, the outbound Dutch bulk carrier M/V AMSTELVOORN, owned by Nedlloyd Bulk Shipping of Rotterdam, Holland, experienced a steering gear malfunction and rammed the pier facility of the Bayou Steel Company, located 2 miles south of LaPlace, Louisiana, on the left descending bank of the Lower Mississippi River at mile 132.4 above Head of Passes (A.H.P.). The ramming severely damaged the 961-foot pier used for vehicular traffic and destroyed the 275-foot T-wharf and associated cargo handling equipment. The AMSTELVOORN sustained moderate damage to the bow above the waterline. There were no deaths or injuries, but property damage was estimated at over \$8 million. 1/

The steering gear system installed on the M/V AMSTELVOORN had been in service 14 months. The system was of a modern design with redundancy provided through two separate electrohydraulic steering systems; it conformed to Lloyd's Register of Shipping Rules and Regulations and international standards. However, the system had experienced a history of excessive vibrations, failures of pipe and fittings, and hydraulic system leaks from the day following its delivery to the owners to the day of this accident.

When the steering gear malfunctioned, no steering system alarm was activated to indicate the source or type of failure. About 0411, the steering malfunction became apparent to the navigation watch on the bridge, and about 0415, the AMSTELVOORN struck the pier facility. During the intervening 4-minute period, however, the bridge navigation watch failed to make any attempt to switch to an alternate mode of control or operation in an effort to regain rudder control.

The steering system failure on September 26, 1982, probably was caused by the sticking of the spring-centered spool piece in the starboard solenoid-actuated hydraulic control valve. The malfunction occurred while the port and starboard main steering pumps were in the follow-up control mode. Sticking of the spool piece in the aft position opened ports within the control valve which allowed hydraulic oil pressure to hold the rudder in the port position. When the helmsman moved the helm to starboard to bring the rudder to midship, only the port side solenoid-actuated hydraulic control valve positioned

1/ For more detailed information, read Marine Accident Report—"Ramming of the Bayou Steel Pier Facility by the Dutch Bulk Carrier M/V AMSTELVOORN on September 26, 1982" (NTSB-MAR-83-08).

its spool piece for starboard rudder movement. Consequently, one-half of the hydraulic control system was positioned for a port rudder movement and the other half of the control system was positioned for a starboard rudder movement. The existence of this condition prevented rudder movement because equal hydraulic forces were acting in direct opposition to each other, thereby creating a hydraulic lock.

The sticking of the spool piece may have been caused by foreign particle contamination of the hydraulic fluid. The main steering gear system is equipped with four strainers. Each strainer consists of a doughnut shaped magnet, surrounded by a shaped screen of 25-micron mesh. The port and starboard solenoid-actuated hydraulic control valves have operating clearances of 4 microns, so nonmagnetic particles passing through the strainer could cause sticking of the control valve spool piece. The AMSTELVOORN's chief engineer stated, that after a pipe rupture or a fracture, sometime before the accident, the leaked hydraulic fluid was collected, filtered twice, and returned to the steering system. Foreign, nonmagnetic particles probably were entrained in the reclaimed hydraulic fluid and were introduced to the hydraulic system. In addition, the repeated repairs to the hydraulic oil side of the system, the pipe and flange fractures, and the removal and replacement of pipe created conditions which favored the introduction of foreign particles into the hydraulic oil system.

Further, the AMSTELVOORN's crew was handicapped in coping with a steering system malfunction onboard the AMSTELVOORN because no instructions, signs, charts, or block diagrams were posted, either on the bridge or in the steering gear space, to indicate the procedures to follow to correct a steering failure. Such block diagrams and emergency steering drills have been required on all vessels since May 1, 1981, by the Protocol of 1978 relating to the International Convention for the Safety of Life at Sea 1974. This requirement has not been domestically implemented in the U.S. Code of Federal Regulations except for tank vessels over 10,000 gross tons.

As a result of a steering gear failure onboard the Spanish freighter M/V POLA DE LENA on February 9, 1979, the Safety Board recommended that the U.S. Coast Guard:

Require each self-propelled vessel of 1,600 gross tons or greater navigating in confined or congested waters of the United States to have operating instructions and a block diagram that clearly and simply explain the changeover procedures for the remote steering gear control systems and steering gear power units on the vessel. The instructions and block diagrams should be permanently displayed both on the navigation bridge and in the steering engine room. (M-80-42)

In a letter dated August 28, 1980, the U.S. Coast Guard responded that it concurred in the recommendation and had included it in its proposed rulemaking. As a result, the Safety Board on October 27, 1980, classified recommendation M-80-42 as "Open—Acceptable Action." However, in 1981 this proposed rulemaking was cancelled.

The manufacturer's operating instruction manuals and all data relating to the steering system were written in Polish, English, and Bulgarian but were not written in Dutch, which was the native language of the crew. The Safety Board believes that it is imperative that instructions for vital ship's systems be printed in a language that the crew

understands. As a result of its investigation of a fire onboard the PROTECTOR ALPHA, 2/ the Safety Board recommended that the Coast Guard:

Propose adoption of a resolution by the International Maritime Organization to the effect that operating instructions for vital emergency equipment and vital ship data, such as stability information, be printed in a language which is readily understood by the ship's officers. (M-83-3)

The Coast Guard responded that it concurred in the intent of the recommendation and that the content of the recommendation would be appropriately raised at the International Maritime Organization's (IMO) Subcommittee on Ship Design and Equipment.

In a number of investigations, the Safety Board has had occasion to consider the need for and the adequacy of redundancy in steering systems to allow personnel on the navigation bridge to shift to alternate means of steering in the event of a failure. The failure of the steering gear system on the AMSTELVOORN demonstrated that redundancy alone in a system's design is not enough to prevent accidents unless personnel are adequately trained to make full use of the alternate steering systems and control modes. The mechanical malfunction of the steering gear which precipitated this accident might have been corrected had the crew been properly trained and drilled in the use of all available operating procedures.

The Safety Board has previously investigated other steering failure accidents which support its position that steering gear rooms on oceangoing vessels should be manned by qualified personnel when vessels are operating in restricted or confined waters. As a result of its investigation of the collision and fire on the S.S. CV SEA WITCH and the S.S. ESSO BRUSSELS 3/ on June 2, 1973, in New York Harbor, the Safety Board recommended that the Coast Guard:

Establish a requirement for oceangoing vessels in designated restricted waters such as New York harbor to have the emergency steering station manned. This should also apply to foreign vessels. (M-76-2)

The U.S. Coast Guard responded that Safety Recommendation M-76-2 was included in a Notice of Proposed Rule Making (NPRM), dated May 6, 1976. As a result of comments received by the Coast Guard, the recommendation was dropped from the final rulemaking of January 31, 1977. On February 3, 1979, the Safety Board reiterated Safety Recommendation M-76-2 as a result of its investigation of the steering failure on the M/V POLA DE LENA. In a letter dated February 11, 1981, the Coast Guard responded that it continues to not concur with this recommendation because "the number of serious incidents which result from steering gear failures which could have been prevented or mitigated by manning the emergency steering station is insignificant." The Safety Board continues to believe, however, that steering compartments should be manned by a competent and trained person when the ship is navigating in narrow rivers, channels, and harbors of the United States and further recommended in Safety Recommendation M-77-12 that a person assigned to the steering gear room should be trained and qualified

2/ For more detailed information, read Marine Accident Report--"Fire Onboard the Cypriot Bulk Carrier PROTECTOR ALPHA, Columbia River, Near Kalama, Washington, February 14, 1982" (NTSB-MAR-83-1).

3/ Marine Accident Report--"S.S. C.V. SEA WITCH--S.S. ESSO BRUSSELS (Belgium); Collision and Fire, New York Harbor, on June 2, 1973, with Loss of Life" (USCG/NTSB-MAR-75-6).

in the operation of the steering gear. Had the AMSTELVOORN's third engineer, or another qualified person, been on station in the steering gear room, his action to press the solenoid button, which released the stuck spool piece of the control valve, could have been taken earlier and might have restored rudder control in time to avoid the collision with the pier. Because of the Coast Guard's revocation of the designated restricted water regulation, the Safety Board has issued with this letter, Safety Recommendation M-83-82 dealing with the topic in a broader and more comprehensive way and has placed Safety Recommendations M-76-2 and M-77-12 in a "Closed-Superseded" status.

As a result of its investigation of this accident, the Safety Board reiterates Safety Recommendations M-80-42 and M-83-3 to the U.S. Coast Guard. In addition, the National Transportation Safety Board recommends that the U.S. Coast Guard:

Establish a requirement that self-propelled vessels of 1,600 gross tons or greater navigating in narrow rivers, channels, and harbors of the United States have the steering gear compartment manned by a competent person trained to switch the steering gear to all alternate modes of control and operation. (Class II, Priority Action) (M-83-82)

Require that all vessels over 1,600 gross tons navigating in U.S. waters have written emergency steering procedures and that they conduct and enter in the ship's log regularly scheduled drills involving the loss of steering gear control. (Class II, Priority Action) (M-83-83)

The National Transportation Safety Board also requests that the U.S. Coast Guard uses its good offices to contact the Polish Administration to inform it of the following recommendations separately made by the Safety Board to the Hydroster/Ship Machinery Works of Gdansk, Poland:

Contact ship owners/operators of all vessels that are outfitted with the Hydroster model MS-800-TE-1 steering gear and inform them of the hazards involved with simultaneous operation of both main steering pumps using current operating instructions. (Class II, Priority Action) (M-83-86)

Provide revised operating instructions for simultaneous pump operation of both pumps on the Hydroster model MD-800-TE-1 steering gear to all vessels that are outfitted with this type of steering gear. (Class II, Priority Action) (M-83-87)

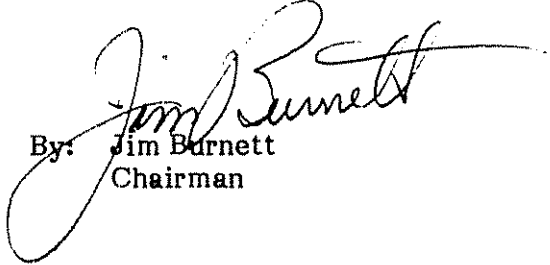
Review the steering gear system design of the Hydroster model MS-800-TE-1 and design an effective alarm which will activate when the system fails due to hydraulic lock. (Class II, Priority Action) (M-83-88)

and similarly contact the Netherlands Administration to inform it of the following recommendations separately made by the Safety Board to Nedlloyd Bulk Shipping Company of Rotterdam, Holland:

Take all necessary action to correct conditions of excessive vibrations, mechanical failure of pipelines and flange fittings, and hydraulic system leaks to improve the reliability of the Hydroster model ME-800-TE-1 steering gear system in all modes of system operation. (Class II, Priority Action) (M-83-84)

Establish written steering emergency procedures for use onboard all Nedlloyd fleet vessels of 1,600 gross tons or greater and conduct regularly scheduled emergency drills for the loss of steering gear control. (Class II, Priority Action) (M-83-85)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and McADAMS, BURSLEY, and ENGEN, Members, concurred in these recommendations.

  
By: Jim Burnett  
Chairman