SP-20
Log M-263

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: January 16, 1985

Forwarded to:

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

SAFETY RECOMMENDATION(S)

M-85-1 through -5

About 0006 P.s.t. on March 19, 1984, the fully loaded 618-foot-long United States tankship SS MOBILOIL experienced a steering gear malfunction and grounded in the Columbia River on the right ascending bank about 1 mile upstream from Saint Helens, Oregon. There were no injuries to the 36 persons aboard, but five cargo tanks and the forepeak tank were ruptured, and more than 170,000 gallons of oil polluted the river and its shores. The cleanup cost of the oil spill was estimated to be $3 million, and the cost of the repair to the ship was estimated to be $5 million. 1/

At the time of the accident, the port and starboard main steering gear pumps were both operating in the followup control mode. The steering system failure probably was caused by the movement of the clevis pin out of the link which connects the crosshead of the starboard main steering pump to the differential control linkage. The pin movement probably resulted from the hunting and interrupted motion of the steering gear pumps in simultaneous operation and from heavy vibration in the ship's stern when the clearance between the keel and the river bottom averaged only about 10 feet.

Operational tests conducted after the accident indicated that dual pump operation for this type of steering gear may be less reliable for navigation in restricted waters. Single pump and motor operation permitted smooth pump stroke excursions, while dual pump operation caused excessive hunting and interrupted motion of both strokes, which causes greater wear on the machinery parts as well as increasing the possibility of an unsecured clevis pin working free.

1/ For more detailed information read Marine Accident Report--"Grounding of the United States Tankship SS MOBILOIL in the Columbia River, near Saint Helens, Oregon, March 19, 1984" (NTSB/MAR-84/09).

According to the International Maritime Organization (IMO) Protocol of 1978 Regulations on Steering, Regulation 19-1, simultaneous operation of steering gear power units is required where navigation demands special caution. This same concept underlay 33 CFR 164.39(p), which never was implemented; recently, however, the Coast Guard has incorporated the requirement into a final regulation, 33 CFR 164.11(t). The MOBILOIL was operating both steering gear pumps simultaneously while it was in the maneuvering condition as it proceeded up the Columbia River. When the clevis pin became dislocated, the redundancy of the power units contributed nothing to save the ship from grounding. Had only one power unit been on and had the link connection failed even though no alarm had sounded, the bridge watch might have acted differently by first alerting the engineers who could have within 30 seconds started the deenergized power unit and regained steering. The investigation of the steering gear failure on the AMSTELVOORN 2/ also demonstrated that redundancy alone in a steering gear system is not enough to prevent accidents unless trained personnel are readily available and that hazards are created in simultaneous operation of both steering gear pumps. Therefore, the Safety Board urges the Coast Guard to reevaluate, using a failure and risk analysis, the effect of the regulation which requires all vessels 1,600 gross tons or more to have at least two steering gear power units in operation upon entering U.S. waters.

The need for thorough inspection of these cotter pins was made apparent by this accident. When the MOBILOIL was in the shipyard for overhaul in June 1983, the American Bureau of Shipping (ABS) surveyor noticed just before the shipyard's final post-repair test that the four aft clevis pins had no cotter pins to secure them. The test was run without the cotter pins installed, and no one caught the error. Even after cotter pins were installed, no one checked them for size, for how they were fitted, or to insure that all four had been installed. It was only after the failure on March 19, 1984, that the three remaining cotter pins were discovered to be undersized and with the split ends not completely bent to 180 degrees. No cotter pin or pieces of a cotter pin which may have come from the dislocated clevis pin were found, leaving doubt that the cotter pin was ever installed.

A senior Coast Guard inspector witnessed the post-repair test in the shipyard of the steering gear of the MOBILOIL and indicated his satisfaction that it met all Coast Guard regulations. His concern was to insure that the steering gear met Coast Guard regulations, and other than witnessing the test, he did not inspect the equipment to see if it was put back together correctly or if parts were missing. The pumps operated satisfactorily, and he was not aware that during the test four cotter pins were missing from the four aft clevis pins in the linkage mechanism for the hydraulic pumps.

On March 23 or 24, 1984, the senior Coast Guard inspector visited the MOBILOIL aground, examined the four aft clevis pins, and found that three had 1/16-inch-diameter cotter pins, and that the fourth clevis pin, next to the starboard pump crosshead, was secured with "lock wire." The inspector stated that the cotter pins did not seem to be undersized.

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

The "Protocol of 1978 Relating to Safety of Life at Sea 1984 (SOLAS '74) of the Tanker Safety and Pollution Prevention (TSPP) Conference of 1948" emphasized the importance of checks and tests of steering gear by including in the Safety of Navigation chapter a regulation that within 12 hours before departure the ship's crew should make a visual inspection of the steering gear and its connecting linkage. The ABS and the Coast Guard presently have general instructions to the surveyors and inspectors in the field on steering gear inspections. However, the Safety Board has recommended that the ABS should expressly require in the instructions on inspection of steering gear a check that cotter pins or other similar fastenings are of the proper size and are installed properly. The Coast Guard has drafted a new chapter to its Marine Safety Manual concerning inspection of steering gear systems. Had the Coast Guard inspector been familiar with this information, he might have made a more thorough inspection. The Coast Guard should expedite publishing these revised instructions.

The MOBILOIL met the present alarm requirements for a power failure to the steering gear, but in this accident there was no loss of power so the alarm did not sound. Rather, a mechanical connection in the linkage from the differential to the starboard pump separated when the clevis pin near the pump vibrated out of position. There is no requirement for an alarm for this type of failure, which could sound in the same locations as the power failure alarm, and alert the persons on watch to the failure and to carry out the necessary casualty control. The bridge watch on the MOBILOIL was aware of a steering problem but was not alerted immediately that the steering gear had failed mechanically because they heard no alarm. The engineers learned of the steering gear failure through a telephone call from the bridge after the ship had gone aground.

This accident emphasizes the need for a visual/audio steering gear pump control failure alarm for all pumps to alert both the bridge and engineering watchstanders of a failure. The steering failure alarm required by 46 CFR 113.43 would partly satisfy this need, because it is activated when the actual position of the rudder differs by more than 5 degrees from the rudder position ordered by the followup control system. When the MOBILOIL's starboard steering pump was jammed at 25 degrees right, the helmsman at first came as much as 25 degrees left on the steering wheel to compensate; this was more than enough discrepancy to have actuated the steering failure alarm after 23 seconds, had it been installed. In this case the helmsman on the MOBILOIL knew quickly that he was experiencing a steering failure, and this device would not have been necessary to inform him of this. However, the Safety Board believes that all existing vessels of 1,600 gross tons or more should have a steering gear pump control failure alarm. A steering failure alarm, if installed, would have alerted persons on watch of a steering failure but not which steering gear pump had the casualty. The steering gear pump control failure alarm would have directed the engineers quickly to the failed equipment even in the single steering gear pump mode of operation.

Coast Guard regulations require newly constructed tankships to have complete steering control, including control of associated power units, in the wheelhouse. If the MOBILOIL had had this control, as well as a steering gear pump control failure alarm, a quick turn of a switch to stop the disabled starboard pump motor could have been made to restore steering. The Safety Board believes that all self-propelled vessels of 1,600 gross tons or more that do not have such complete control of steering in the wheelhouse should be required to have the steering gear space manned when the vessel is in the maneuvering condition.

According to Coast Guard steering casualty data, steering gear casualties are not uncommon. Over a period of 9 years, about 119 material failures of steering gears have been recorded on vessels of over 1,000 gross tons. The Coast Guard records contain a report of a similar steering gear failure which caused the 730-foot-long freighter MIDDLETOWN to ground. The Safety Board believes that neither the number of serious accidents which have occurred nor their consequences have been insignificant, and the Board continues to believe that steering compartments on oceangoing vessels should be manned by a trained person when the vessel's steering systems do not meet the IMO and Coast Guard steering gear standards for new vessels and the vessel is navigating in rivers, channels, and harbors of the United States in which there is limited maneuvering room. Had a qualified engineer on the MOBILOIL been on watch in the steering gear room, his action to stop the faulty pump might have regained steering control in time to prevent the vessel from going hard aground. Manning the steering gear room during the passage of the MOBILOIL up the Columbia River would have required only an additional 9 man-hours of watchstanding.

The anchors had previously been prepared for letting go. Only a pawl on each chain had to be lifted and the brakes on each anchor windlass released to drop the two anchors. Although there were men up and about on deck and a lookout on the bridge wing, no one was actually standing by on the foc'sle before the ship grounded to release the anchors. The lookout on the bridge wing only managed to reach the main deck before the ship grounded after he was ordered to drop the anchors. He still had to go forward about 200 feet and up a ladder to the foc'sle before reaching the anchor windlass. The men on deck were not called. Had there been an anchor detail set, the anchors could have been dropped quickly after the pilot gave the order, which may have reduced the vessel's speed in time to lessen the hull damage and oil pollution. However, dropping the anchors with the ship's engine full ahead and before substantial way was lost (even against the river current) would have been dangerous, had the anchors held and the anchor chains parted with the anchor detail on the foc'sle.

Therefore, as a result of this investigation, the National Transportation Safety Board recommends that the U.S. Coast Guard:

> Reevaluate, using a failure and risk analysis, 33 CFR 164.11(t) which requires vessels of 1,600 gross tons or more when operating in the navigable waters of the United States to have at least two steering gear power units in simultaneous operation. (Class II, Priority Action) (M-85-1)
>
> Expedite publishing revised instructions on inspection of steering gear in the Marine Safety Manual. (Class II, Priority Action) (M-85-2)
>
> Require all self-propelled vessels of 1,600 gross tons or more to have an audio/visual alarm in the wheelhouse, the engineroom, and the steering gear room to indicate a steering gear pump failure caused by an interruption in the control linkage of the operating steering gear pump or of a particular pump if more than one is in operation. (Class II, Priority Action) (M-85-3)

Require that self-propelled vessels of 1,600 gross tons or more which do not meet the International Maritime Organization and Coast Guard steering gear standards for new vessels and which navigate in rivers, channels, and harbors of the United States in which there is limited maneuvering room man the steering gear compartment with a person trained and qualified to switch the steering gear to all alternate modes of control and operation. (Class II, Priority Action) (M-85-4)

Amend 33 CFR Part 164 to require that ship's personnel assigned to the anchor detail be stationed at the anchor windlass controls when navigating in rivers, channels, and harbors of the United States in which there is limited maneuvering room. (Class II, Priority Action) (M-85-5)

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

By: Jim Burnett
Chairman