

NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.

ISSUED: August 4, 1977

Forwarded to:

Admiral Owen W. Siler  
Commandant  
U.S. Coast Guard  
Washington, D.C. 20590

SAFETY RECOMMENDATION(S)

M-77-8 through 14

On February 24, 1977, the bulk sulfur carrier SS MARINE FLORIDIAN, in ballast, was downbound from Hopewell, Virginia, in the James River en route to Newport News for fueling. About 2 miles downriver, the MARINE FLORIDIAN veered to the left (north) of the channel and the lifted center span of the Benjamin Harrison Bridge and collided with the northern truss of that bridge.

A section of the northern approach causeway and two highway motor vehicles fell into the river on the portside of the vessel. The northern end of the northern truss span, which was displaced from its supporting pier by the ship, collapsed downward and came to rest on the main deck of the ship until March 6, 1977, when that span and the northern main tower of the bridge further collapsed onto the ship and into the river. The bridge was damaged extensively and will require substantial rebuilding. The MARINE FLORIDIAN suffered considerable damage to the deckhouse and other damage to deck-level structures and equipment.

Fortunately, the persons in the vehicles escaped back from the span, and no one was injured on the ship. Likewise, there were no injuries when the bridge further collapsed onto the ship.

As you know, a U.S. Coast Guard Marine Board of Investigation of this accident is now in process and a member of our staff is participating in it. Although that investigation has not been completed, evidence indicates that the MARINE FLORIDIAN experienced a loss of rudder control; the precise reason for that loss has not yet been determined. However, the steering casualty alarm in the engineroom did not activate when power apparently was lost to the port steering motor, and a manual transfer switch in the port electric power circuit had a mechanical fault of possible critical, but not yet determined, consequence.

This casualty and others, and the potentially catastrophic consequences of steering failures, indicate a need to further upgrade rudder control and alarm systems. Steering gear tests, operating procedures, and inspections should be improved to assure more reliable vessel control. Also, a study made by the General Electric Company for your Office of Research and Development made recommendations in regard to the need to attain exceptional reliability of steering systems and other systems critical to the ship control in merchant vessels. 1/

The Safety Board has knowledge that the Coast Guard recently emphasized and intensified the inspection procedures for steering gear systems by issuing of Commandant Notice 16711, dated January 11, 1977. Those procedures should help to assure that the installed equipment is maintained adequately. Also, you have recently adopted rulemaking to require that steering gear failures be reported to the Coast Guard, as proposed by our recommendation M-76-3, so that the reliability of those systems can be determined and the deficiencies, if any, can be identified and corrected.

We are also aware of the currently proposed rules to amend 33 CFR Part 157 to require improved emergency steering system standards for all oil tankers of 20,000 deadweight tons or more, and your intent to propose certain amendments to 46 CFR Subchapter J and to extend those rules to other tank vessels and to other types of vessels. We will submit our detailed comments regarding those proposed rules at the appropriate time in another document.

Although we agree that those proposals should be extended to other vessels such as the MARINE FLORIDIAN, we also believe that there is a need to take further actions and to include all oceangoing vessels of 1,600 gross tons or more.

46 CFR 111.80-70(f) requires a steering gear motor pilot light and a feeder circuit breaker audible alarm at the propulsion control station but not in the wheelhouse, where interruption of electrical power to the steering motor should be known at the earliest time for ship control purposes. Also, the installation of a pilot light for each steering gear power motor in other locations, such as the wheelhouse, is permitted. Without an alarm system in the wheelhouse, and in the absence of a report of an alarm or casualty from the engine room, persons on the bridge may not become aware of rudder control problems until someone discovers that the ship's head or the rudder angle indicator is not responding to orders from the helm, or the alarm, proposed in 33 CFR 157.20, sounds 30 seconds later. In the absence of turning orders to

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1/ USCG Report No. CG-D-153-75, July 1975, "Reliability Analysis of Vessel Steering System (Dual Electro-Hydraulic Type)."

the helm to initiate that chain of events, a ship could be without electrical power to a steering motor for a significant time unbeknownst to those on the bridge. Therefore, we believe that a visual and audible alarm system is needed in the wheelhouse to indicate instantaneously an interruption of electrical power to steering gear motors. Thus, in case of electrical interruption, it would not be necessary to wait for time-consuming telephone calls or other types of communications from the engineroom, or for the proposed rudder-failure alarm to function. A 30-second delay could be critical in avoiding an accident.

Older vessels such as the MARINE FLORIDIAN are permitted to continue in service with certain electrical standards that are now obsolete but were used at the time they were built and which involve systems vital to ship control functions. This is particularly so in the case of steering systems, and we believe that the electrical installations for the steering gear on all oceangoing vessels should be brought up to current standards to improve the reliability of those systems.

Your Navigation and Vessel Inspection Circular No. 12-65 explains the application of 46 CFR 30.01-10 and 46 CFR 90.05-5(a) to safety improvements to be made on existing vessels undergoing major alterations and provides for the consideration of upgrading to current standards for specified older systems. Steering systems are not specifically mentioned for consideration and that system on the MARINE FLORIDIAN was not updated when that vessel was rebuilt in 1969. We believe that all ship control systems should be included in that list and that the upgrading should not only be considered but also should be required in all cases of substantial alterations made with the definite intent to extend the useful life of existing vessels.

Meanwhile, manual transfer switches in the steering motor electrical circuits should be inspected thoroughly for existing or potential mechanical defects which may have developed through long use under severe vibrations.

Therefore, The National Transportation Safety Board recommends that the U.S. Coast Guard:

Amend 46 CFR 111.80-70(f) (1) and (2) to require the installation of a pilot light and an audible alarm to indicate power interruption to steering gear motors in the wheelhouse independent of, and in addition to, those currently required to so indicate at the propulsion control station. (M-77-8) (Class II, Priority Followup)

Amend 46 CFR 111.01 and 111.90 to make the provisions of 46 CFR 111.80-70(c) (2) and 111.80-70(e) applicable to vessels equipped with electric-powered steering gear and contracted for prior to November 19, 1952, which would require the removal of motor-running protective devices; the installation of protective devices responsive to motor current, temperature, or both; and the installation of interlocks to prevent both steering systems from being connected to the same feeder circuit simultaneously. (M-77-9)  
(Class II, Priority Followup)

Amend 46 CFR 35.20-10, 78.17-15, and 97.15-3 and 33 CFR 164.25 to require additional specific steering gear tests, including the switching from one steering gear control system to the other, from hydraulic control to electrical control and back; from one source of electric power for the steering motors to the other and back; and the activation of alarm systems by simulation of power interruption to each of the steering motors. (M-77-10) (Class II, Priority Followup)

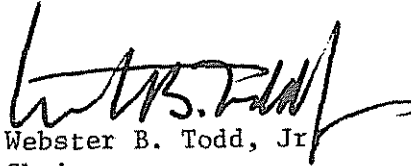
Amend regulations to require the upgrading to meet current standards of all systems vital not only to onboard safety but also to vessel control whenever an oceangoing vessel is modernized, lengthened, rebuilt, or converted to another service. (M-77-11) (Class II, Priority Followup)

Undertake further rulemaking to amend 33 CFR 164.15 to require, when steering gear rooms are required to be manned, that the persons assigned are competent and trained to switch the steering gear to all alternate modes and control systems, and to require that the person manning the steering engine room is in communication with the wheelhouse. (M-77-12) (Class II, Priority Followup)

Make a special one-time inspection of manual transfer switch installations, such as that found in the MARINE FLORIDIAN, on a representative number of vessels; and, based on the findings, change steering gear inspection procedures to assure that mechanical faults in the electrical system are identified and corrected during future periodic inspections. (M-77-13)  
(Class II, Priority Followup)

Determine, in vessels which have electric and hydraulic components installed so that both steering motors can be operated simultaneously, whether such operation would provide a safe and viable dual capacity without risk of causing a failure to some component of the steering gear. If such operation is found to be safe, require the operation of both motors by vessels so equipped while they are underway in restricted or congested waters to insure that steering is not lost even though one motor fails to function. (M-77-14) (Class II, Priority Followup)

TODD, Chairmam, BAILEY, Vice Chairman, McADAMS, HOGUE, and HALEY, Members, concurred in the above recommendations.

  
By: Webster B. Todd, Jr.  
Chairman