



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: May 24, 2012

In reply refer to: M-12-1 through -3
M-10-5 and -6 (reiterated)
M-05-6 (reclassified)

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Background

On Saturday, May 8, 2010, at 0918 eastern daylight time, the 310-foot-long passenger ferry *Andrew J. Barberi*, owned and operated by the New York City Department of Transportation (NYC DOT) Ferry Division, allided with the terminal structure at slip No. 5 at the St. George terminal, Staten Island, New York. Eighteen crewmembers, 2 New York City police officers, 2 concessionaires, and 244 passengers were on board. As a result of the allision, 3 passengers sustained serious injuries; 47 passengers, crew, and others reported minor injuries. The damage to the vessel and the terminal structure totaled \$182,238.¹

The National Transportation Safety Board (NTSB) determines that the probable cause of the accident was a solenoid failure, which caused a loss of propulsion control of one of the vessel's two cycloidal propellers. Contributing to the accident was the propulsion system's lack of a propeller pitch deviation alarm, which was not required by regulation, but which would have alerted the pilothouse crew to the loss of propulsion control and permitted prompt action.

Undetected Loss of Propulsion Control and Lack of Propeller Pitch Deviation Alarms on Vessels with Controllable Pitch or Cycloidal Propulsion

The actions by the pilothouse crewmembers leading up to the accident, as captured by the closed-circuit television (CCTV) in the pilothouse, suggested that the crewmembers were unaware of the loss of propulsion control until seconds before the accident. The assistant captain began reducing the vessel's speed after the *Andrew J. Barberi* passed the KV buoy about 1,000 yards out from the ferry terminal. For about the next minute and a half, he input routine, incremental

¹ Allision of Passenger Ferry Andrew J. Barberi With St. George Terminal, Staten Island, New York, May 8, 2010. Marine Accident Report NTSB/MAR-12/01 (Washington, D.C.: National Transportation Safety Board, 2012).

reductions in ahead thrust to the vessel's two propulsion units. Because he achieved a portion of the speed reduction that he commanded—the Staten Island-end² propulsion unit, directly beneath him, responded normally—the incomplete response of the New York-end propulsion unit went undetected until the crew visually noted the vessel's excessive approach speed about half a minute before the allision. The assistant captain then input a full astern command; however, the New York-end propulsion unit remained stuck in ahead thrust. The NTSB therefore concludes that the pilothouse crewmembers were unaware of the loss of propulsion control until seconds before the accident, and, as a result, they were unable to take effective action to avoid the allision. The NTSB further concludes that had the *Andrew J. Barberi* had an audible and visual alarm to alert the pilothouse crewmembers to the loss of propulsion control, they may have been able to avoid the allision by implementing emergency response procedures prescribed in the NYC DOT Ferry Division's safety management system.

Propeller pitch deviation alarms audibly and visually alert operators in the shortest possible time should the propeller not respond to a command. However, at the time of the accident, the *Andrew J. Barberi* did not have this type of alarm, nor did Coast Guard regulations require it. After the accident, the NYC DOT Ferry Division decided to modernize the propulsion control system on its Barberi-class vessels, including voluntarily installing pitch deviation alarms.

Regulations at 46 CFR 113.43-3 require steering deviation alarms on inspected vessels greater than 1,600 gross tons with a propeller/rudder configuration to alert operators when the actual rudder position differs by more than 5 degrees from the command given. However, despite the fact that 46 CFR Part 62 identifies propulsion as a “vital system”³ on a vessel, regulation does not currently require propeller pitch deviation alarms on vessels with controllable pitch or cycloidal propulsion. The NTSB also considers both steering and propulsion to be vital systems on a vessel, and, as such, should have an alarm that brings the operator’s attention to the indicator in the event of critical failures. The same level of safety (that standards and requirements for steering deviation alarms provide) should also apply to propulsion deviations. And in the case of cycloidal propulsion, like on the *Andrew J. Barberi*, because the system combines both steering and propulsion, failures could result in loss of both steering and propulsion control.

Current technology allows vessels to be fitted with propeller pitch deviation alarms either during initial vessel construction or, on most vessels, retroactively—as the NYC DOT Ferry Division elected to do with its Barberi-class ferries. The negative consequences of undetected loss of propulsion control are elevated for passenger vessels, because they carry more people on board, often transit in confined waterways, and generally dock frequently. A requirement that U.S.-flag passenger vessels with controllable pitch propulsion be fitted with such alarms would increase the likelihood of early detection of improper propulsion response to operator command,

² The *Andrew J. Barberi* has identical pilothouses and propulsion units at each end. Its “New York-end” docks in Manhattan; the “Staten Island-end” docks in Staten Island. The solenoid failure that caused the accident occurred in the New York-end.

³ According to 46 CFR 62.10-1, vital systems are “essential to the safety of the vessel, its passengers and crew.” In addition to steering and propulsion, vital systems include—but are not limited to—fire detection and suppression, flooding safety systems, and emergency electrical generators.

thereby allowing time to take effective corrective action. By having the audible and visual alarm in place, the operator is actively alerted to the situation, as opposed to having to monitor his control station gauges and detect the problem, which in a stressful scenario may be less likely to occur.

The NTSB therefore recommends that the Coast Guard require new-construction U.S.-flag passenger vessels with controllable pitch propulsion, including cycloidal propulsion, to be equipped with alarms that audibly and visually alert the operator to deviations between the operator's propulsion and steering commands and the actual propeller response. The NTSB further recommends that the Coast Guard, where technically feasible, require existing U.S.-flag passenger vessels with controllable pitch propulsion, including cycloidal propulsion, to be retrofitted with alarms that audibly and visually alert the operator to deviations between the operator's propulsion and steering commands and the actual propeller response.

Operational Safety Provided by Safety Management Systems

Following the 2003 allision involving the *Andrew J. Barberi*, the NTSB issued several safety recommendations, including M-05-2, which asked the NYC DOT to implement a safety management system (SMS) on its ferries. The Ferry Division did so, and the positive effects of that action were evident in the 2010 accident. The crew and shoreside personnel carried out their duties effectively: The pilothouse crew warned passengers over the public address system and sounded the danger signal. The deckhands began directing passengers away from the Staten Island-end. The shoreside operator of the transition bridge remained at his position and, in accordance with his training, ensured that he aligned the bridge with the vessel's main deck. Had he not done so, and had the bridge protruded a few feet higher toward the oncoming vessel, the bridge could have severely injured any passengers who might have been waiting on the main deck to disembark the vessel, and who might have been unable to retreat. All of the Ferry Division personnel that NTSB investigators interviewed after the accident—from deckhands to company managers—displayed familiarity with the SMS procedures. Each of them knew how to apply the procedures to carry out their duties in this particular accident. Their action on behalf of the passengers' welfare demonstrated a commitment to safety and adherence to prescribed SMS procedures. Given the differences between crew actions in this accident and those in the 2003 *Andrew J. Barberi* accident, the NTSB concludes that the NYC DOT Ferry Division's SMS provided specific emergency procedures, which the crew and shoreside personnel performed in a timely and effective manner, and this benefited the passengers.

Also following the 2003 accident, the NTSB issued Safety Recommendation M-05-6 to the Coast Guard:

Seek legislative authority to require all U.S.-flag ferry operators to implement safety management systems, and once obtained, require all U.S.-flag ferry operators to do so. (M-05-6)

The NTSB is pleased that the Coast Guard obtained authority through the enactment of Public Law 111-281 to require SMS not only on ferries, but on all passenger vessels based on the number of passengers who could be killed or injured. The NTSB concludes that implementing SMS on all U.S.-flag passenger vessels would further enhance operators' ability to achieve the

higher standards of safety than the Coast Guard requires of U.S. oceangoing vessels in international service. The NTSB therefore recommends that the Coast Guard require all operators of U.S.-flag passenger vessels to implement SMS, taking into account the characteristics, methods of operation, and nature of service of these vessels, and, with respect to ferries, the sizes of the ferry systems within which the vessels operate. The NTSB classifies Safety Recommendation M-05-6 “Closed—Superseded.”

Lack of Voyage Data Recorders on U.S.-Flag Ferries

For security reasons, video surveillance cameras are increasingly installed on board vessels in sensitive areas such as the navigation bridge. However, as on the *Andrew J. Barberi*, these cameras are meant to capture only general information, not specific operating data or pilothouse audio. The CCTV footage captured on board the *Andrew J. Barberi* was important in this investigation and considerably aided the work of investigators. However, the CCTV footage was nevertheless incomplete and did not provide certain crucial information, such as the moment when the New York-end propulsion unit failed to properly respond (which a voyage data recorder [VDR] would have provided). Moreover, NTSB investigators had to estimate the speed at which the vessel allided, whereas a VDR would have recorded the speed as determined by onboard equipment. Recordings of bridge conversations and radio transmissions are often very useful in marine accident investigations, but they were also not available in this accident. The NTSB therefore concludes that although the *Andrew J. Barberi*'s pilothouse CCTV captured certain accident-related information, it could not capture, record, and safeguard important detailed data from vessel navigation and control systems, as a VDR would have.

Following its investigation of the *Morro Bay/Block Island* collision,⁴ the NTSB issued Safety Recommendations M-10-5 and -6 to the Coast Guard:

Require installation of VDRs that meet the international performance standard on new ferry vessels. (M-10-5)

Require installation of VDRs on ferry vessels built before the enactment of VDR carriage requirements that will record, at a minimum, the same video, audio, and parametric data specified in the International Maritime Organization's performance standard for S-VDRs. (M-10-6)

The Coast Guard did not act on these recommendations, and the NTSB therefore classified Safety Recommendations M-10-5 and -6 “Open—Unacceptable Response” in July 2011.

Installing VDRs on older ferry vessels such as the *Andrew J. Barberi* can be technically challenging because it may not be feasible to capture the specified data on these vessels. The International Maritime Organization anticipated this technical difficulty and developed an alternative standard (simplified voyage data recorders, or S-VDRs) for older vessels. This standard allowed for exemptions from the requirement to record certain data if it could be shown that it would not be feasible to do so.

⁴ *Collision Between U.S. Passenger Ferry M/V Block Island and U.S. Coast Guard Cutter Morro Bay, Block Island Sound, Rhode Island, July 2, 2008*. Marine Accident Report NTSB/MAR-11/01 (Washington, D.C.: National Transportation Safety Board, 2010).

With regard to new-construction ferries, installing VDRs at the initial design stage poses little technical difficulty.

In addition, VDRs can help vessel operators enhance their SMS—continual improvement is an important aspect of SMS. In addition to providing accident investigation benefits, VDRs can be valuable tools in a company's SMS, because they record many vessel, systems, and operational parameters. Operators can review crew and vessel performance through data obtained during actual operations. For example, the NYC DOT's dedicated simulator, coupled with data obtained from a VDR, could be used to study incidents, create new procedures, and train vessel operators. Therefore, the NTSB reiterates Safety Recommendation M-10-5 to the Coast Guard to require installation of VDRs that meet the international performance standard on new ferry vessels. The NTSB also reiterates Safety Recommendation M-10-6 to the Coast Guard to require installation of VDRs on ferry vessels built before the enactment of VDR carriage requirements that will record, at a minimum, the same video, audio, and parametric data specified in the International Maritime Organization's performance standard for S-VDRs.

As a result of this accident investigation, the National Transportation Safety Board makes the following safety recommendations to the U.S. Coast Guard:

Require new-construction U.S.-flag passenger vessels with controllable pitch propulsion, including cycloidal propulsion, to be equipped with alarms that audibly and visually alert the operator to deviations between the operator's propulsion and steering commands and the actual propeller response. (M-12-1)

Where technically feasible, require existing U.S.-flag passenger vessels with controllable pitch propulsion, including cycloidal propulsion, to be retrofitted with alarms that audibly and visually alert the operator to deviations between the operator's propulsion and steering commands and the actual propeller response. (M-12-2)

Require all operators of U.S.-flag passenger vessels to implement safety management systems, taking into account the characteristics, methods of operation, and nature of service of these vessels, and, with respect to ferries, the sizes of the ferry systems within which the vessels operate. (M-12-3)

Also as a result of this accident investigation, the National Transportation Safety Board reiterates two recommendations previously issued to the U.S. Coast Guard, as follows:

Require installation of voyage data recorders that meet the international performance standard on new ferry vessels. (M-10-5)

Require installation of voyage data recorders on ferry vessels built before the enactment of voyage data recorder carriage requirements that will record, at a minimum, the same video, audio, and parametric data specified in the International Maritime Organization's performance standard for simplified voyage data recorders. (M-10-6)

Also as a result of this accident investigation, the National Transportation Safety Board reclassifies a recommendation previously issued to the U.S. Coast Guard, as follows:

Seek legislative authority to require all U.S.-flag ferry operators to implement safety management systems, and once obtained, require all U.S.-flag ferry operators to do so. (M-05-6)

Safety Recommendation M-05-6 (previously classified “Open—Acceptable Response”) is classified “Closed—Superseded” by M-12-3.

The NTSB would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendations. In response to the recommendations in this letter, please refer to Safety Recommendations M-12-1 through -3, M-10-5 and -6, and M-05-6. We encourage you to submit updates electronically at the following e-mail address: correspondence@ntsb.gov. If a response includes attachments that exceed 5 megabytes, please e-mail us at the same address for instructions. To avoid confusion, please do not submit both an electronic copy and a hard copy of the same response.

Chairman HERSMAN, Vice Chairman HART, and Members SUMWALT, ROSEKIND, and WEENER concurred in these recommendations.

[Original Signed]

By: Deborah A.P. Hersman
Chairman

Safety Recommendation Reiteration List

SR Number	Reiteration Number	Report Number	Report Date	Accident Description	Accident City	Accident State	Accident Date
M-12-003	1	MAR-18-02	12/20/2018	Fire on Board US Small Passenger Vessel Island Lady Pithlachasco tee River near Port Richey, Florida	Port Richey	Florida	1/14/2018
M-12-003	2	MAR-20-03	11/10/2020	Fire Aboard Small Passenger Vessel Conception	Platts Harbor, Channel Islands National Park, Santa Cruz Islands, 21.5 Miles South-Southwest of Santa Barbara, California	California	9/2/2019
M-12-003	3	MIR-24-37	12/31/2024	Fire aboard Passenger Vessel Spirit of Boston	Commonwealth Pier, Boston Harbor	Massachusetts	3/24/2023