National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: March 29, 2007

In reply refer to: M-07-1
M-02-6 and -8 (Superseded)

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Commandant
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Washington, D.C. 20593-0001

About 1615 on June 12, 2006, the U.S. Coast Guard–inspected commuter ferry *Massachusetts* was en route from Rowe's Wharf in Boston Harbor to Hingham, Massachusetts, carrying 65 passengers and 4 crewmembers, when a fire broke out in the engineroom. The master maneuvered the vessel into shallow water south of the Long Island Bridge, anchored, and waited for firefighters. Before a fireboat from the Boston Fire Department's marine unit arrived, all the passengers safely transferred to the *Laura*, another commuter vessel in the vicinity. The fireboat extinguished the fire. The accident resulted in no serious injuries or fatalities. Damage, estimated at $800,000, was confined mostly to the engineroom.[1]

The National Transportation Safety Board determined that the probable cause of the fire on board the *Massachusetts* was the ignition of diesel fuel by contact with a hot engine surface, which occurred because a fuel line attached to a fuel injector was not properly connected during engine maintenance by a contract mechanic. Contributing to the extent of the damage was the absence of a fixed fire detection and suppression system, which precluded the crew from receiving timely notification of the fire and which allowed the blaze to spread throughout the engineroom.

Federal regulations at 46 *Code of Federal Regulations* (CFR) 118.115 stipulate that the requirements at 46 CFR 118.400 for fixed fire extinguishing and detection systems do not apply to an "existing vessel"—a vessel constructed, converted, or issued its first certificate of inspection on or before March 10, 1996.[2] The exceptions are if the vessel's hull, machinery space bulkhead, or deck is composed of wood or fiberglass; if its interior is sheathed with fiberglass; or if its engineroom contains gasoline-powered machinery. Because the

[1] For further information, see National Transportation Safety Board, *Fire On Board U.S. Small Passenger Vessel* Massachusetts, *Boston Harbor, Massachusetts, June 12, 2006*, Marine Accident Brief NTSB/MAB-07-01 (Washington, DC: NTSB, 2007). The report is available on the Safety Board's website at www.ntsb.gov.

[2] Existing vessels must meet the fire protection regulations applicable on March 10, 1996, which require fixed fire protection in enginerooms only if they contain gasoline-powered machinery or other fuel having a flash point of 110° F or lower.

Massachusetts was built of aluminum in 1988, it was not required to have a fixed fire protection system in its engineroom.

As is the case with most small passenger vessels, the engineroom of the *Massachusetts* was unmanned, meaning that no one was in the engine space to continuously monitor for fire safety. Yet the engineroom poses the greatest risk of fire on a vessel because it is the location of most fire ignition sources, including hot surfaces, fuel and lubricating oils, and electrical equipment.[3] Moreover, as the service life of a vessel increases, the potential for failure or breakdown in system components increases. Engine hoses deteriorate, electrical parts fail, and the overall condition of the engineroom declines.

The Safety Board has investigated previous engineroom fires on U.S. small passenger vessels.[4] In November 2000, a fire broke out on board the *Port Imperial Manhattan*, a commuter ferry operated by NY Waterway, while the vessel was en route from Manhattan to Weehawken, New Jersey, with eight passengers and three crewmembers on board.[5] Like the *Massachusetts*, the *Port Imperial Manhattan*, built of aluminum in 1987, was exempt from the Federal requirement for fixed fire extinguishing and detection systems. Crewmembers attempted unsuccessfully to extinguish the fire with portable extinguishers and the fire burned out of control, causing the ferry to lose power and forcing the crew and passengers to abandon the interior spaces. All those on board were rescued by another NY Waterway passenger vessel, and the burning vessel was towed to Manhattan, where the New York City Fire Department extinguished the fire. One passenger was treated for smoke inhalation. No deaths resulted from the accident. The estimated cost of repairing the vessel was $1.2 million.

The Safety Board's investigation of the *Port Imperial Manhattan* accident determined that the fire was probably in the first, or incipient, stage for some time before entering the free-burning phase.[6] Because the vessel had no fire detection system in the engineroom, the crewmembers were unaware of the fire until it was fully involved in the engineroom. The Safety Board concluded that the lack of fire detection systems in the enginerooms of existing small passenger vessels in commuter and ferry service presented an unacceptable risk to passengers and crewmembers. The Safety Board also concluded that if the *Port Imperial Manhattan* had been equipped with a fixed fire suppression system, crewmembers who had been properly trained could have kept the fire confined to the engineroom and extinguished it.

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[3] In its supplemental notice of proposed rulemaking to revise the small passenger vessel regulations, the Coast Guard cited its study of 20 years of casualty statistics for small passenger vessels, which found: "The origin of most fires is in the engineroom and is independent of construction material" (*Federal Register*, vol. 59, no. 9 [January 13, 1994], pp. 2045-46).

[4] This discussion considers only engineroom fires that have occurred since 1996, when the Coast Guard's revised fire protection requirements for vessels regulated under subchapter K (46 CFR Part 118) and subchapter T (46 CFR Part 181) went into effect.

[5] National Transportation Safety Board, *Fire on Board the Small Passenger Vessel* Port Imperial Manhattan, *Hudson River, New York, November 17, 2000,* Marine Accident Report NTSB/MAR-02/02 (Washington, DC: NTSB, 2002).

[6] The incipient stage of a fire begins at the moment of ignition. At that stage, the flames are localized, the fire is fuel-regulated (regulated by the configuration, mass, and geometry of the fuel), the oxygen content is within normal range, and normal ambient temperatures still exist (National Fire Protection Association, *Fire Ignition and Development,* Catalog No. V-54 [Quincy, Massachusetts: NFPA, 1998]).

The Safety Board pointed out that the outcome of another fire on board a commuter ferry had demonstrated the value of a fixed fire suppression system. On September 28, 2001, a fire broke out in the engineroom of the *Seastreak New York*, which was in commuter service between Highlands, New Jersey, and Manhattan.[7] The engineroom of the *Seastreak New York* was fitted with a carbon dioxide (CO_2) fire suppression system.[8] When crewmembers discovered the fire, they activated the suppression system without having to enter the engineroom and extinguished the fire before it damaged the vessel extensively. No injuries resulted from the fire, and damages amounted to an estimated $81,000. The Board's report stated, "The difference between the outcomes of these two fires was that the *Seastreak New York* was equipped with a fire suppression system to protect its engineroom and the *Port Imperial Manhattan* was not."

On July 3, 2002, as a result of its investigation of the *Port Imperial Manhattan* fire, the Safety Board issued the following safety recommendations to the Coast Guard:

> M-02-6
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> Require that all small passenger vessels in commuter and ferry service, regardless of their date of build, be fitted with a fire detection system in the enginerooms.
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> M-02-8
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> Require that all small passenger vessels in commuter and ferry service, regardless of their date of build, be fitted with a fixed fire suppression system in their enginerooms.

On November 21, 2003, in a letter updating its position on open safety recommendations that had been issued by the Safety Board, the Coast Guard stated that it did not concur with Safety Recommendations M-02-6 or M-02-8 and requested that the recommendations be closed. With regard to Safety Recommendation M-02-6, the Coast Guard noted that after a "careful and comprehensive review" during the rulemaking process culminating in 1996, it had concluded that

> while there was sufficient reason to require retrofitting on small passenger vessels with fiberglass reinforced plastic and wooden hulls, the substantial cost was not justified on small passenger vessels with steel and aluminum hulls.

The Coast Guard stated further that extending the requirements for fire detection systems to vessels engaged in commuter and ferry service was not justified because those vessels "accounted for only 8.4% of the fire casualties suffered by small passenger vessels from 1992 through 2000."

With regard to Safety Recommendation M-02-8, the Coast Guard stated that it considered its action complete:

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[7] National Transportation Safety Board, *Fire on Board the Small Passenger Vessel* Seastreak New York, *Sandy Hook, New Jersey, September 28, 2001*, Marine Accident Report NTSB/MAR-02/04 (Washington, DC: NTSB, 2002).

[8] The *Seastreak New York* was built in 2001, after the new small passenger vessel regulations went into effect, and was therefore required to have a fixed fire suppression system in its engineroom.

> During the rulemaking, retrofitting of all existing small passenger vessels with fixed extinguishing systems was considered. This included response programs, including risk-based preparedness planning with maximum stakeholder involvement. Additionally, contingency planning guidance . . . includes contingency planning for passenger vessel incidents as one of the three top contingency planning priorities.

On April 7, 2005, the Safety Board responded to the Coast Guard that it continued to believe in the validity of its recommendations and classified Safety Recommendations M-02-6 and M-02-8 as "Open—Unacceptable Response." With regard to Safety Recommendation M-02-6, the Board stated, "Because new, small passenger vessels are required to have fire detection systems to protect their enginerooms but older existing vessels in the same service are not, two standards of safety exist. More importantly, the vessels with higher risk are permitted to adhere to a lower standard." Concerning Safety Recommendation M-02-8, the Board cited the difference between the outcomes of the *Port Imperial Manhattan* and *Seastreak New York* fires noted earlier, and stated that "because [small passenger] vessels are not required to have fire suppression systems in their enginerooms, the passengers on board are at increased risk."

The Safety Board is aware that the Coast Guard is reluctant to extend its fire protection regulations to all small passenger vessels built before March 1996 because of the cost of retrofitting. The Board does not consider that the costs of retrofitting are prohibitive, particularly for the larger vessels that carry more passengers. According to a manufacturer's representative, the cost of installing a fire protection system in the engineroom ranges from $2,000 to $50,000, depending on the type of system and who installs it. The Board is aware that repairing the damage to the *Massachusetts* cost the vessel's owners $800,000, and that the estimated cost to repair the *Port Imperial Manhattan* was even more, $1.2 million. By contrast, estimated damages to the *Seastreak New York*, which was equipped with a CO_2 fire suppression system in its engineroom, were $81,000. More recently, an engineroom fire on board the small passenger vessel *Express Shuttle II*, which was equipped with a CO_2 fire suppression system that the crew failed to activate, resulted in the total constructive loss of the vessel, valued at $800,000.[9]

The Safety Board does not regard the date of build, conversion, or certification to be an appropriate determinant of whether a vessel should be required to have an installed fire detection and suppression system. The primary reason for requiring such systems should be the risk factors involved. The engineroom is the location of the greatest fire risk on a vessel. Although no lives have been lost in any engineroom fires on small passenger vessels to date, the potential for loss of life in such an accident cannot be ignored.

According to Coast Guard data, nearly 6,000 small passenger vessels, including both subchapter T (5,500) and subchapter K (437) vessels, were subject to Coast Guard inspection as of June 2006. One-third (1,770) of the subchapter T vessels and 76 percent (332) of the subchapter K vessels were built before 1996 and have noncombustible hulls (aluminum, steel, etc.), which exempts them from the current requirements for fixed fire detection and suppression

[9] For further information about the accident, see National Transportation Safety Board, *Fire on Board U.S. Small Passenger Vessel* Express Shuttle II, *Pithlachascotee River Near Port Richey, Florida, October 17, 2004*, Marine Accident Report NTSB/MAR-06/02 (Washington, DC: NTSB, 2006).

systems. Thus, as of June 2006, over 2,000 U.S. small passenger vessels were not required to have fixed fire protection systems in their enginerooms.

In the *Massachusetts* fire, no lives were lost and no one suffered serious injuries. The master and crew saw to it that the passengers donned lifejackets and transferred safely to the commuter ferry *Laura*, which had come alongside to rescue them within 10 minutes of the fire's being noticed. Environmental conditions were ideal, with good visibility and calm water, and the similar configurations of the two ferries made it easy for passengers to transfer from one to the other. However, such ideal conditions cannot be counted on in a fire emergency, and in adverse weather or when no other vessel is close by, the safest option may be to remain with the vessel. Thus, early warning of a fire on board a vessel is of paramount importance to protect against injuries or loss of life. As it was, one of the deckhands was the first to notice black smoke coming from the stern of the *Massachusetts*, and the fire had been in progress for several minutes before the high water temperature alarm for the port inboard engine alerted the pilothouse to a problem in the engineroom.

The *Massachusetts* crew had limited firefighting equipment on board. Because the *Laura* happened to be close by, passengers had to remain on the burning vessel only a short time before being rescued. However, if passengers and crew had had to remain longer on board, their lives might have been endangered. In its supplemental notice of proposed rulemaking to revise the small passenger regulations, the Coast Guard acknowledged that

> threats to human life can develop early in a fire, before involvement of the hull and structure, due to the accumulation of smoke and toxic gases. This rapidly developing hazard is similar for all vessels regardless of the construction material.[10]

An engineroom fire detection system would have provided early and definitive warning of the fire on board the *Massachusetts*. And because early detection is critical to extinguishing a fire, a warning about the fire at its early stages might have given crewmembers time to initiate a response before it spread out of control.

Further, if the *Massachusetts* had been equipped with a fixed fire suppression system in the engineroom, the system could have extinguished the fire before it spread, thus limiting the damage to the vessel and the threat to the people on board. The *Massachusetts* fire, as well as the previous fires on the *Port Imperial Manhattan* and *Seastreak New York*, demonstrates that fires are a risk to small passenger vessels, regardless of hull material or date of build. In the Safety Board's opinion, fire detection and suppression systems are essential safety components that should be on board all passenger vessels that carry a large number of passengers.

In its supplemental notice of proposed rulemaking to revise the small passenger vessel regulations, the Coast Guard discussed the "graduated system" by which requirements generally become more stringent as a vessel exceeds certain thresholds or "breakpoints."[11] The

[10] *Federal Register*, vol. 59, no. 9 (January 13, 1994), p. 2046.

[11] As the Coast Guard stated in its notice of proposed rulemaking for the revised passenger vessel regulations, "Breakpoints were developed to determine when a vessel is subject to particular regulations. Most breakpoints were originally mandated by Congress, established to comply with the intent of law, or result from an international

breakpoints, which vary according to such factors as passenger capacity, vessel length, presence of overnight accommodations, and route, can be viewed as measures of the risk involved in operating a small passenger vessel. In its supplemental notice, the Coast Guard supported the idea that "the number of passengers carried should be the primary factor in determining safety requirements." The Safety Board agrees that passenger capacity should receive foremost consideration in determining suitable measures of addressing risk for small passenger vessels.

The Coast Guard has established safety requirements for small passenger vessels certificated to carry over 49 passengers (comprising about 1,550 of the approximately 5,500 subchapter T vessels inspected by the Coast Guard and all vessels regulated under subchapter K) that are stricter than the requirements for passenger vessels that carry fewer than 49 passengers. Included are the requirements for fire pumps (46 CFR 181.300[a][ii]), bilge pumps (46 CFR 182.520), collision bulkheads (46 CFR 179.210[b][I]), and watertight bulkheads for subdivision (46 CFR 179.212). These requirements exist regardless of date of build or hull material. Setting 49 passengers as the breakpoint for requiring existing small passenger vessels to install fixed fire suppression and detection systems would thus be consistent with the intent of current regulations for other safety measures.

Safety Recommendations M-02-6 and M-02-8 to the Coast Guard regarding fixed fire detection and suppression systems applied only to vessels in commuter and ferry service. Five years have passed since those safety recommendations were issued, and the *Massachusetts* accident has focused the Safety Board's attention on the most important aspect of the original recommendations: the at-risk population. In the Board's opinion, all small passenger vessels certificated to carry more than 49 passengers, including existing as well as new vessels, should be equipped with fixed fire detection and suppression systems in their enginerooms.[12] Further, vessels that were grandfathered in 1996 are now 10 years older than when they were exempted from the requirements at 46 CFR 118.400 and 181.400 and therefore may be at greater risk of a casualty such as a fire.[13] The National Transportation Safety Board therefore recommends that the Coast Guard take the following action:

> Require that all small passenger vessels certificated to carry more than 49 passengers, regardless of date of build or hull material, be fitted with an approved fire detection system and a fixed fire suppression system in their enginerooms. (M-07-1) (Supersedes Safety Recommendations M-02-6 and M-02-8.)

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convention. Examples of breakpoints presently existing in Subchapter T include 26 feet, 65 feet, 49 passengers, and 150 passengers" (*Federal Register*, vol. 54, no. 18 [January 30, 1989], p. 4418). The supplemental notice of proposed rulemaking noted that the "new proposed breakpoints are also in keeping with the Coast Guard's desire to minimize the complexity of the regulations . . . (*Federal Register*, vol. 59, no. 9 [January 13, 1994]), p. 1996).

[12] Coast Guard data indicate that 667 of the inspected subchapter T vessels are certificated to carry more than 49 passengers and were built before 1996 and have noncombustible hulls. As noted above, 332 subchapter K vessels fall into the same category of build date and hull type. That gives a total of 999 small passenger vessels that are certificated to carry more than 49 passengers but are not required to have fixed fire protection systems in their enginerooms.

[13] In the preamble to its supplemental notice of proposed rulemaking to revise the small passenger vessel regulations, the Coast Guard stated: "Statistics show the risk of a casualty is generally greater for an older vessel" (*Federal Register*, vol. 59, no. 9 [January 13, 1994], p. 2000).

In light of the new recommendation issued above, the National Transportation Safety Board classifies the following previously issued recommendations to the Coast Guard as "Closed—Unacceptable Action/Superseded":

> Require that all small passenger vessels in commuter and ferry service, regardless of their date of build, be fitted with a fire detection system in the enginerooms. (M-02-6)

> Require that all small passenger vessels in commuter and ferry service, regardless of their date of build, be fitted with a fixed fire suppression system in their enginerooms. (M-02-8)

The Safety Board would appreciate a response from you within 90 days, addressing actions you have taken or intend to take to implement its recommendation. In your response, please refer to Safety Recommendation M-07-1. For additional information, you may call (202) 314-6174.

Chairman ROSENKER, Vice Chairman SUMWALT, and Members HERSMAN, HIGGINS, and CHEALANDER concurred in this recommendation.

[*Original Signed*]

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Chairman