

Log M-203

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: November 26, 1982

Forwarded to:

Honorable Harold E. Shear
Maritime Administrator
U.S. Department of Transportation
400 Seventh Street, S.W.
Washington, D.C. 20590

SAFETY RECOMMENDATION(S)

M-82-50 through -56

About 1310, e.s.t., on December 22, 1981, a fire erupted in the engineroom of the training ship BAY STATE while it was moored alongside the dock at the Massachusetts Maritime Academy. The fire caused heavy damage to the vessel's engineroom and crew accommodation spaces. One person was killed and six persons were injured. Damage to the BAY STATE was estimated at \$5 million. 1/

The investigation revealed that the fuel oil strainer had a history of being difficult to operate. It had become an acceptable practice to use a wrench or tool for leverage, a hammer, and even a kick by someone's foot on occasion to apply greater than normal force to shift the strainer. The chief engineer, being aided by temporary employees and confronted with many serious problems, might overlook the fact that a duplex strainer was difficult to operate even if it had been brought to his attention.

Since the BAY STATE was not originally designed as a training ship, some amount of alteration might be necessary to provide a safer environment to train students, but there is no evidence such changes were considered. Conceivably, there might be fragile fittings, particularly in the engineroom, which were acceptable when the ship was being operated by a small, professional crew, but which would be hazardous when 27 to 100 cadets are in the space. The brass vent fittings on the fuel oil duplex strainer appear to be examples of such fittings. The vent fittings and the strainer may have been operated by former crews without any problem before the ship was deactivated in 1971; however, these fairly vulnerable vent fittings can become hazards in a training ship environment. The hazard presented by these fittings which were of brass rather than steel, and which discharged upward rather than downward into a drip pan, was demonstrated on March 30, 1981, when the vent fittings on the forward chamber was accidentally kicked and broken off by a cadet attempting to shift the strainer. The oil spill which resulted and the fire which occurred a few days later presented a preview of the December 22, 1981, accident.

The Safety Board believes that the fuel oil strainer should be replaced, vent fittings using steel pipe should be fitted, and a spray shield should be installed above the strainer. The vent connection should discharge downward and, if possible, be fitted to the side of the strainer, rather than into the top of the covers.

1/ For more detailed information read Marine Accident Report—"Fire Onboard the Training Ship Bay State at the Massachusetts Maritime Academy, Buzzards Bay, Bourne, Massachusetts, December 22, 1982" (NTSB-MAR-82-7).

The primary means to combat an engineroom fire on the BAY STATE is by releasing CO₂ into the space; however, release of the CO₂ would be contingent upon getting everyone out of the engineroom. In view of the limited exits from the engineroom of the BAY STATE, some of which might become unavailable, as in this accident, it is highly probable that getting everyone out and accounting for all persons could be a time-consuming process. The great number of personnel in the engineroom underway, ranging from 29 to 75, or 100 on occasion, is a cause for grave concern. The time for an evacuation of this magnitude would in many cases delay the use of CO₂ until it was too late to save the engineroom, and possibly even the ship.

The Safety Board believes that a fixed Halon 1301 fire extinguishing system should be installed in the interest of safety of engineroom personnel in the BAY STATE. Halon 1301 is a colorless, odorless gas which is effective as a firefighting agent, in a similar manner to CO₂, and it is currently accepted by the Coast Guard for fixed shipboard fire extinguishing systems. Like CO₂ it may be used to flood a space, such as an engineroom, to extinguish a fire and it is more effective than CO₂, especially on an oil or electrical fire. Although it is similar to CO₂ in application and storage, its extinguishing action is produced by an entirely different process. Halon 1301 chemically interrupts the process which produces combustion, while CO₂ acts to reduce or displace the oxygen and smother the fire. Unlike CO₂, which is lethal to personnel, Halon 1301 can be used to combat a fire while personnel are still in the space with relative safety, using concentrations of up to 7 percent. This concentration is adequate for most engineroom fires. The Safety Board further believes that the Maritime Administration should study its other training ships to ascertain if similar personnel congestion exists in these enginerooms which would warrant installation of fixed halon systems.

As has been demonstrated in this accident, the failure of the boiler and destruction of electrical wiring prevented use of the steam fire pump and both electric fire pumps. During the fire, there was no means to maintain fire main pressure for any prolonged period; hence, there was no effective means to combat the fire once it spread beyond the engineroom. Accordingly, the Safety Board believes that the diesel fire pumps on the BAY STATE should be repaired or replaced by other diesel driven fire pumps.

The two main exits from the engineroom, opening into fore and aft passageways on the second deck, are served by only one ladder between the operating level and the third deck level. This ladder, located on the portside, is also the primary route to the auxiliary generator room and the stairwell inside. If a platform were installed linking the third deck level platform on the starboard side (leading to the crew mess) and the platform on the port side (connecting to the auxiliary diesel generator room), personnel would be able to use the starboard ladder, as well as the port ladder to reach the second deck exits. Installation of this additional platform would also enable personnel in either the crew mess or the auxiliary diesel generator room to move quickly from one side of the ship to the other, which might be required in an emergency, without traversing the circuitous route of descending one ladder, crossing the engineroom, and ascending the ladder on the other side. Should the second deck exits become blocked, as in this accident, it would be possible for personnel to shift from the portside to the starboard side at the third deck level to take advantage of stairwells in the crew messhall as well as in the auxiliary generator room.

On the lower level of the engineroom, the cadets had to proceed forward to get around the main engine in order to reach the shaft alley door; this circuitous route passed near the boilers. An escape route to the shaft alley door from the port ladder to the lower level is possible by installing a walking platform and a ladder arrangement over the propeller shaft. Such a route might have enabled the first class cadet to lead the cadets directly to the shaft alley before the lower level became filled with heavy smoke.

The chief engineer's recommendation that two new exits be installed, one through the after engineroom bulkhead from the machine shop and the other through the forward engineroom bulkhead on the lower level, forward of the port boiler, seems reasonable. The two exits would greatly facilitate a rapid evacuation of the engineroom in case of an emergency. In view of the limited access to and from the engineroom, the Safety Board believes that at least two more openings should be provided for access to and from the engineroom of the BAY STATE. The Massachusetts Maritime Academy and the Maritime Administration should conduct a joint study to determine the actual number of openings needed. This joint study should address the questions of linking the third deck ladder platforms together and the possibility of installing an escape route over the propeller shaft from the port ladder to the shaft alley door.

The Safety Board believes that the Maritime Administration also should conduct a study of its other training ships to ascertain if there is a need for additional exits from the enginerooms of those training ships.

As a result of its investigation, the National Transportation Safety Board recommend that the U.S. Maritime Administration:

Install a fixed halon fire protection system in the engineroom of the training ship BAY STATE. (Class II, Priority Action) (M-82-50)

Study the manning conditions and configuration of enginerooms on other training ships owned by the Maritime Administration to determine if installation of halon fire protection systems in these enginerooms is warranted. (Class II, Priority Action) (M-82-51)

Repair or replace the diesel fire pumps on the BAY STATE. (Class II, Priority Action) (M-82-52)

Conduct a study in conjunction with the Massachusetts Maritime Academy to determine what improvements, such as additional exits or modifications of ladders and walkways, are feasible and necessary to facilitate safe, effective evacuation of personnel from the engineroom of the BAY STATE in case of fire or other emergency. (Class II, Priority Action) (M-82-53)

Make such improvements as are found to be feasible and necessary to facilitate safe, effective evacuation of the number of personnel that may be in the engineroom of the BAY STATE at any time during regular watchstanding and training sessions. (Class II, Priority Action) (M-82-54)

Study the manning conditions and configuration of enginerooms on other training ships owned by the Maritime Administration to determine if improvements to facilitate evacuation of personnel from enginerooms of other training ships are warranted. (Class II, Priority Action) (M-82-55)

Pending possible relocation of the high pressure fuel oil strainer in the engineroom of the BAY STATE to a location where escaping fuel would be removed from sources of ignition, install a new duplex strainer equipped with a spray shield and steel vent fittings. (Class II, Priority Action) (M-82-56)

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


By: Jim Burnett
Chairman