



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: May 14, 2001

In reply refer to: M-01-4 through -6

Mr. Robert H. Dickinson
President and COO
Carnival Cruise Lines
3655 NW 87th Avenue
Miami, Florida 33178

The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in this letter. The Safety Board is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

These recommendations address the following safety issues: adequacy of fire protection systems, adequacy of engineering systems design, and adequacy of passenger and crew safety. The recommendations are derived from the Safety Board's investigation of the fire on board the Liberian Passenger Ship *Ecstasy* near Miami, Florida, on July 20, 1998, and are consistent with the evidence we found and the analysis we performed.¹ As a result of this investigation, the Safety Board has issued twelve safety recommendations, three of which are addressed to Carnival Cruise Lines. Information supporting the recommendations is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendations.

The fire on board the *Ecstasy* started in the main laundry and migrated through the ventilation system to the aft mooring deck where mooring lines ignited, creating intense heat and large amounts of smoke that damaged several deck areas in the aft two main vertical zones of the ship. The affected areas included the stern thruster room, an air conditioning room, an electrical equipment room, and the steering gear room. In addition, some passenger staterooms and crew cabins on decks No. 2, 4, 5, and 6 sustained heat and smoke damage. The *Ecstasy* subsequently lost propulsive power and most steering and had to be towed back to Miami. During the emergency, all passengers evacuated safely from the affected areas; however, two crewmen became trapped on deck No. 2, and firefighting teams had to rescue them. Nine passengers were treated for injuries resulting from pre-existing conditions or smoke inhalation, and 14 crewmembers sustained minor injuries from firefighting activities and/or smoke inhalation.

¹ For further information, read: National Transportation Safety Board, *Fire On Board the Liberian Passenger Ship Ecstasy, Miami, Florida, July 20, 1998*, Marine Accident Report NTSB/MAR-01/01 (Washington, DC: NTSB, 2001).

From its examination and tests of damaged ship areas on the *Ecstasy* and from interviews with witnesses, the Safety Board determined that the probable cause of fire aboard the *Ecstasy* was the unauthorized welding by crewmembers in the main laundry that ignited a large accumulation of lint in the ventilation system and the failure of Carnival Cruise Lines to maintain the laundry exhaust ducts in a fire-safe condition. Contributing to the extensive fire damage on the ship was the lack of an automatic fire suppression system on the aft mooring deck and the lack of an automatic means of mitigating the spread of smoke and fire through the ventilation ducts.

The *Ecstasy's* main laundry ventilation ducts, which served as a conduit for the fire, had fail-safe fire dampers, which closed in the event that the ventilation system lost power. If conditions warranted that the dampers be closed while the ventilation system was operating, someone present in the laundry area or someone on the bridge had to shut the dampers. In this accident, if the fire in the overhead had triggered the closure of the laundry fire dampers, the shutdown would have occurred several minutes before the bridge personnel secured the ventilation system, which would have resulted in appreciably less heat, smoke, and flame escaping from the main laundry and spreading to the mooring deck.

A passive means for actuating the closure of fire dampers in certain areas is required by various interpretations of the *International Convention for the Safety of Life at Sea (SOLAS)*, including U.S. Coast Guard regulations.² The most commonly required passive closure mechanism is a weight- or spring-activated fusible link that melts at a given temperature, allowing the fire damper to close. A fusible link can be designed to actuate at various temperatures, depending on the metal used in the mechanism. It potentially offers a more fail-proof method of closure and, consequently, a greater margin of fire safety because an external power source is not needed to drive the damper.

While automatic fire dampers with passive actuating mechanisms are one way to effectively stem the spread of smoke and fire through ventilation systems in high-risk areas, such dampers are not the only method of mitigating the danger. The Board considers the individual cruise ship companies best qualified to analyze their vessels' design arrangements and devise measures for dealing with the problem. The Safety Board believes that Carnival Cruise Lines should, for the ships in its fleet, engineer, design, and implement system modifications to mitigate the spread of smoke and fire from the laundry rooms through the ventilation ducts to other areas of the vessel.

The *Ecstasy* had been built to Lloyds Register of Shipping (LR) regulations, which stipulate the need to provide independent and isolated power supplies to essential components of the vessels engineering systems, such as propulsion. The *Ecstasy's* propulsion system had many redundant features and isolated components designed to provide reliability. However, the auxiliary voltage to the high-speed breakers for the starboard and the port propulsion systems was routed through the same distribution panel, which was in an electrical equipment room on the deck above the mooring station. The auxiliary voltage was essential to the operation of both propulsion systems. When the distribution panel sustained heat damage, both systems failed.

² *Navigation and Vessel Inspection Circular No. 09-97.*

Hazardous situations that may result from a ship losing propulsive power include vessel grounding, inability to avoid severe weather conditions, and passenger evacuation at sea. Thus, it is essential that all propulsion system components be redundant and isolated. Following the *Ecstasy* accident, Carnival Cruise Lines advised the Safety Board that it had modified the vessel's electrical system by adding a backup circuit breaker and wiring to provide an alternate source of electrical power for the high-speed breakers.

Carnival Cruise Lines owns seven other Fantasy Class ships that may have similar propulsion system arrangements as the *Ecstasy*. In correspondence to Safety Board investigators, the cruise ship company did not indicate whether it had examined or intended to examine its other vessels to identify design problems in their propulsion systems. The Safety Board, therefore, believes that Carnival Cruise Lines should examine the propulsion systems on the ships in its fleet and, if necessary to provide redundancy, modify the arrangement of the auxiliary voltage circuitry to the high-speed breakers where a single source supplies both port and starboard propulsion systems.

Although no one was seriously hurt in the *Ecstasy* accident, the Safety Board identified several improvements that Carnival Cruise Lines could make in the content of safety information disseminated to passengers, based on interviews and a postaccident survey³ of passengers.

Carnival Cruise Lines conducted an emergency drill for the *Ecstasy's* passengers before the vessel sailed. Of the 126 passengers who responded to the Safety Board's postaccident survey, most indicated that the drill adequately prepared them for the actual emergency. Fifty-three of those surveyed identified various problems or situations that were not addressed in the drill. For example, passengers indicated that the drill did not include specific information about fire emergencies, such as what to do if they encountered smoke or fire. A number of respondents who mustered on an outer deck said that they had to move to a different station because of smoke, and the drill did not provide information about what to do if a muster station was not available.

Safety Board investigators reviewed the drill script used by the *Ecstasy's* cruise director as a reference for necessary subjects to cover in the drill. The script makes no mention of actions that passengers should take if they see smoke or if their muster station is not available.

Based on the survey responses from *Ecstasy* passengers, the company needs to provide passengers with this additional safety information. The Safety Board notes that, in addition to the practice drill, Carnival Cruise Lines uses a variety of other methods to provide passengers with emergency information. The company broadcasts general cruise information, including emergency procedures, on television monitors at the embarkation point where passengers line up to board the ship. In the staterooms, Carnival Cruise Lines posts evacuation procedures on placards and broadcasts emergency procedures on a television channel devoted to cruise information. The company has television monitors at the bars in passenger lounges to disseminate announcements and other information.

³ The Safety Board mailed questionnaires to 300 *Ecstasy* passengers asking about the muster drill and whether they encountered any problems during the actual emergency.

The Safety Board, therefore, believes that Carnival Cruise Lines should revise the safety information disseminated to passengers to include actions to take if they encounter smoke or fire and/or if their muster station is not available.

In summary, the National Transportation Safety Board makes the following recommendations to Carnival Cruise Lines:

For the ships in your fleet, engineer, design, and implement system modifications to mitigate the spread of fire and smoke from the laundry rooms through ventilation ducts to other areas of the vessel. (M-01-4)

Examine the propulsion systems on the ships in your fleet and, if necessary to ensure redundancy, modify the arrangement of the auxiliary voltage circuitry to the high-speed breakers where a single source supplies both port and starboard propulsion systems. (M-01-5)

Revise the safety information disseminated to passengers to include actions to take if they encounter smoke or fire and/or if their muster station is not available. (M-01-6)

The Safety Board also issued safety recommendations to the U.S. Coast Guard, American Classic Voyages, Carnival Corporation, Inc., Crystal Cruises, Disney Cruise Line, Norwegian Cruise Line, Orient Lines, P&O Princess Cruises International, Ltd., Radisson Seven Seas Cruises, Regal Cruises, Renaissance Cruises, Inc., Royal Olympic Cruises, Royal Caribbean Cruises, Ltd., and Silversea Cruises, Ltd., ABB, Inc., and the International Association of Classification Societies. In your response to the recommendations in this letter, please refer to M-01-4 through -6. If you need additional information, you may call (202) 314-6607.

Acting Chairman CARMODY and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

Original Signed

By: Carol J. Carmody
Acting Chairman