



National Transportation Safety Board

Washington, D.C. 20594
Safety Recommendation

Date: September 6, 1991
In reply refer to: M-91-24

Mr. R. A. Belik
Chairman
Council of the International Association of
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On May 26, 1990, the Bahamian-registered cruise ship REGENT STAR was nearing the end of its voyage from Montego Bay, Jamaica, to Philadelphia, Pennsylvania, where its passengers were to disembark. The vessel had 469 crew and 882 passengers (1,351 total) on board. About 2248, a Delaware State marine pilot boarded the REGENT STAR off Cape Henlopen at the entrance of Delaware Bay to guide the vessel to its berth in Philadelphia. The master informed the pilot that the vessel was propelled by two controllable-pitch propellers and steered by a single rudder and that the bridge watch had control of main engine speed and propeller pitch. When the pilot boarded the vessel, visibility was approximately 6 to 8 nmi, wind was from the northeast at 20 to 25 mph, and tide at the Delaware Bay entrance was flooding.

About 2250, the cruise ship began inbound passage of Delaware Bay and River, proceeding at 16 knots toward the shipping channel and, ultimately, Philadelphia. The pilot noted that wind force on the cruise ship's superstructure created a list of several degrees to port. To maintain an ordered heading, the helmsman used about 10 degrees of port rudder to counter the ship's tendency to head into the wind.

Less than 2 hours later, at 0040 on May 27, the cruise ship suddenly experienced a total loss of electrical power. According to the staff captain, when the electrical power failed, power failure alarms for the gyrocompass, sprinkler system, fire alarms, and the smoke detectors sounded on the navigation bridge. Then the main engines, all lights, radars, and the steering gear stopped operating. Because the rudder was hydraulically held, steering inputs from the helm were no longer effective. Propulsion ceased. The navigation watch could do little except drop anchor. The master, who had returned to the bridge shortly after the power loss, sent the chief officer forward to the bow to standby to release the anchor on command. Meanwhile, the pilot used his hand-held VHF radio (VHF channel 13--bridge-to-bridge channel) to alert any river traffic of the REGENT STAR's situation.

The REGENT STAR was on a course of about 335⁰ True and the ship's starboard side was about 65 yards from the shallow boundaries of the shipping channel when the power loss occurred. The pilot observed that even though the rudder was held at 10 degrees of port, the vessel was swinging to starboard and heading into the wind toward channel marker No. 32, an ice-resistant structure mounted on steel pilings. The pilot advised the master not to let go of the anchor yet, because, "If we let the ship run, she may get enough current set to miss the structure or just hit it a glancing blow. If we drop the anchor at this speed, we will increase the turn and I think we will either hit it broadside, putting a hole in the ship, or get our anchor tangled in it and pull it down."

From the navigation bridge, the master and pilot watched as the marker passed from sight under the cruise ship's starboard bow, scraping the vessel for about 300 feet along the starboard side. As soon as the ship cleared the marker, the master ordered the anchor dropped to halt the vessel's forward momentum, but the cruise ship had already touched bottom. At 0046, just 6 minutes after the power loss, the REGENT STAR was firmly aground on the soft bottom of Delaware Bay. The cruise ship suffered only minor damage (\$20,000) from running aground. The hull was not penetrated nor was the bay polluted. No persons were injured or killed.

In the main engine room just before the power loss, the maneuvering watch engineer, the chief engineer, and the chief electrician were among the crew members in the enclosed engineering control room where the ship's main switchboard was located. Generated electrical power flowed through a single electrical busbar to the main switchboard through which the ship-service electrical power was distributed. Four of the vessel's five ship-service diesel generators were operating, providing electrical power via the main switchboard throughout the cruise ship.

The chief electrician heard a chattering noise and saw sparking coming from behind the center door of the No. 2 ship service generator's switchboard panel (each vertical panel has three doors). At the direction of the chief engineer, the chief electrician attempted, but failed on his first try, to disconnect the No. 2 generator circuit breaker. Then the chief electrician loosened the panel door screws to allow the panel to swing open and expose the circuit breaker. He observed electrical arcing at the circuit breaker, fire on the power cables, and thick black smoke from burning insulation. The fire appeared to be spreading along the cables to other sections of the main switchboard. On the second attempt, the electrician was able to disconnect the No. 2 generator.

The chief engineer stated that he was concerned that the entire main switchboard was in danger of heat damage. To prevent the fire from spreading and damaging other parts of the main switchboard, at 0040 the chief engineer opened the main switchboard circuit breakers for each of the operating generators, cutting off ship-service electrical power to the electrical busbar and to the entire vessel. Pumps providing fuel oil, lubricating oil, and cooling water to the diesel main engines and the diesel generators stopped, in turn stopping the main engines and generators. The chief engineer said he was reasonably sure that cutting the power supply did not

pose a danger of collision because he had been on the navigation bridge just 5 minutes before the electrical problem occurred and noticed that the REGENT STAR was in the middle of the shipping channel and that no other vessels, piers, or bridges were in the vicinity.

Concurrent with actions by personnel in the control room to determine the cause of the power loss and to contain the fire, the second engineer and the second electrician reported to their emergency duty assignment in the emergency diesel generator room and started the emergency diesel. The chief engineer had instructed the emergency team not to connect the emergency generator output to the emergency switchboard until ordered. The emergency team started the emergency generator as instructed and called the engine control room to report, but no one answered. All personnel in the engine control room had evacuated because of the fire. The chief engineer stated that he heard the telephone ringing as he was leaving the control room.

The REGENT STAR was equipped with an emergency battery system designed to provide 30 minutes of electrical power for emergency lighting immediately upon the loss of main electrical power. In the case of this power loss, emergency lighting did not come on because the switch connecting the emergency batteries to the emergency lighting circuit was not an automatic switch, but a manual switch, which was in the open (off) position.

About 20 minutes after the power loss, the second electrician, using a flashlight for illumination, went behind the emergency switchboard in the emergency generator room, located the unlabeled battery switch, and closed it. Emergency lighting came on in the main passageways, stairwells, engineering and navigation control stations, lifeboat stations, and at exits.

Even with emergency lighting, thick smoke in the control room reduced visibility to nearly zero. After donning oxygen breathing apparatus stowed in the main engine room, personnel re-entered the smoke-filled control room and extinguished the fire using portable CO₂ units at 0108, about 30 minutes after the fire was discovered.

Electrical arcing in the No. 2 generator circuit breaker had created a temperature so high that the circuit breaker's heavy copper electrical components and the fittings in contact with the breaker were melting and dripping behind the switchboard. The chief engineer's concern centered on the "dead ship" switchboard panel located next to the No. 2 generator panel on the main switchboard. The "dead ship" panel, connected by circuitry and breakers to the emergency switchboard, could not be easily isolated from the main switchboard. The chief engineer feared that melting copper had dripped on and closed the main switchboard's open switches and that putting the emergency generator on-the-line would further damage the main switchboard through the "dead ship" panel. The chief engineer directed his crew to isolate the No. 2 generator panel from the main switchboard, restart the remaining diesel generators, and then remove the failed circuit breaker.

About 0155, 1 hour and 15 minutes after the chief engineer had shut down the vessel's main electrical power, crew members restarted the ship-service generators and restored electrical power. Two days later, following the

debarkation of all passengers by ferry, the vessel was refloated and proceeded under its own power to Penn's Landing in Philadelphia.

The REGENT STAR cruise ship was built in 1957 under the name STATENDAM to the requirements of both Lloyd's Register of Shipping Rules and Regulations for the Classification of Ships and the International Maritime Organization's (IMO's) International Convention for the Safety Of Life At Sea, 1948, (SOLAS '48), which was the international safety standard in effect at the time. In 1982, the vessel was sold and renamed RHAPSODY. In 1986, when the cruise ship was sold again and renamed REGENT STAR, the new (and current) owners financed a major alteration of the vessel at a shipyard in Piraeus, Greece, in an effort to reduce the vessel's operating costs.

During that alteration, the vessel was converted from a steam ship to a motor ship. Workers removed the main and auxiliary boilers, all associated boiler equipment, the four steam turbine main propulsion engines and reduction gears, the four ship-service steam turbine generators, and the main electric switchboard. Shipyard personnel installed four diesel main propulsion engines, five ship service diesel-driven generators, a main switchboard, and the associated pumps, valves, piping, wiring, alarms and controls for a diesel engineering plant. Workers also installed two new controllable-pitch propellers and shafting. A new emergency diesel-driven generator was also installed, but the original emergency switchboard was retained.

When a vessel undergoes a major alteration, the ship's classification society and the regulatory authority for the administration (flag state) where the vessel is registered negotiate the upgrade of the ship's existing safety systems. In the case of the REGENT STAR, Lloyd's Register of Shipping was both the classification organization and the regulatory authority for the Commonwealth of the Bahamas in IMO matters. Lloyd's approved the engineering upgrade of the cruise ship's main propulsion and electrical generating plant but did not require an upgrade of associated safety equipment.

At the time of the major alteration, the REGENT STAR did not have automatic circuitry from the emergency batteries to the emergency lighting as required by SOLAS '48. Moreover, between the ship's original construction and its upgrade in 1986, the IMO had issued SOLAS '74 and amendments, which contain significant changes in safety provisions that the REGENT STAR also lacked. For example, SOLAS '74 requires passenger ships to have a divided main busbar so that crew members can disconnect the busbar section that suffers a failure and continue to power the cruise ship's vital systems through the uninterrupted busbar section. SOLAS '48 did not require a divided main busbar.

To ensure that the emergency electrical power supply to the steering system is independent of the main switchboard, SOLAS '74 requires that emergency electric power to the steering gear be routed through circuitry and breakers installed in the emergency switchboard directly to the steering gear or from a dedicated independent power source in the steering gear compartment rather than in the main switchboard. SOLAS '48 did not have this requirement.

SOLAS '74 requires passenger vessels to have emergency sources of power that automatically provide electrical power to designated emergency systems upon loss of main electrical power. The REGENT STAR had a "dead ship" panel that was designed to distribute a portion of the emergency generator electric power to a bilge pump, a fire pump, a sprinkler pump, and the steering gear. However, the REGENT STAR's "dead ship" panel was part of the ship's main switchboard, a configuration allowed under SOLAS '48 but not under SOLAS '74.

SOLAS '74, Chapter II-1, Part A, Regulation 1, Paragraph 3, states:

"All ships which undergo repairs, alterations, modifications and outfitting related thereto shall continue to comply with at least the requirements previously applicable to these ships. Such ships if constructed before 1 July 1986 shall, as a rule, comply with the requirements for ships constructed on or after that date to at least the same extent as they did before undergoing such repairs, alteration, modifications or outfitting. Repairs, alterations and modifications of a major character and outfitting related thereto shall meet the requirements for ships constructed on or after 1 July 1986 in so far as the Administration deems reasonable and practicable." [emphasis added]

In a letter dated June 7, 1990, from the Captain of the Port (COTP) of Philadelphia, U.S. Coast Guard (USCG), to the owners and operators of the REGENT STAR, the USCG cited the following SOLAS '74 regulations as being applicable to the REGENT STAR.

"The switchboard, propulsion plant, generators, and related auxiliaries on the REGENT STAR were new installations in 1987 as part of the conversion of the propulsion and electrical power generation systems from steam to diesel. Those modifications were of a major character and the installation should have been in accordance with the requirements of reference (a) [SOLAS '74] as applicable to ships constructed on or after 1 July, 1986; see Regulation II-1/1.3. During the investigation of the 27 May 1990 grounding of the REGENT STAR in Delaware Bay, Coast Guard inspectors noted that the main switchboard is not subdivided as required by Regulation II-1/41.4. The inspector also noted that an automatic alternative source of power for the steering gear is not provided as required by Regulations II-1/29.14 and 42.2.5. In the latter case, the source of power remains as the ship service main switchboard, even though that switchboard was renewed in 1987."

"These deficiencies pose a threat to U.S. passengers, other vessels, and the environment. The current Control Verification of Foreign Vessel Certificate (CG-4504) authorizing embarkation of passengers in the United States ports expires 23 June 1990."

"I [COTP] will not issue a new Certificate to allow operations in United States ports beyond 23 June, until the deficiencies noted

above are corrected."

The owners corrected the deficiencies cited by the USCG and also installed an automatic start switch for the emergency generator and an automatic switch for the emergency battery circuit before June 23, 1990.

Each year vintage foreign flag passenger vessels, such as the REGENT STAR, operating out of U.S. ports, enter the Caribbean/Gulf of Mexico and U.S. West Coast (Alaska/Pacific Mexico) cruise markets. Under an exemption provision known as "grandfathering," current IMO conventions allow vessel owners and operators to maintain the safety standards that were in effect when the vessel was built. Even if vintage ships undergo major modifications or alterations, the grandfathering exemption still applies to areas of the ship not being altered. Even vessel areas being modified must be upgraded to current safety standards only insofar as the flag Administration deems reasonable and practicable.

Of the approximately 100 foreign flag passenger vessels currently operating out of U.S. ports, 4 percent were built to a 61-year old safety standard (SOLAS '29), 21 percent were built to a 42-year old safety standard (SOLAS '48), and 34 percent were built to a 30-year old safety standard (SOLAS '60), for a total of 59 percent constructed to safety standards 30 years old or older.

The remaining 41 percent of the foreign flag cruise ships operating out of U.S. ports were built to a 17-year old safety standard (SOLAS '74). Only half of them meet the latest safety standards of SOLAS '74 as amended in 1981 and 1983.

Grandfather clauses give potential buyers and current owners of older vessels an economic incentive not to incorporate safety improvements, thus prolonging the existence of ships having inadequate safety provisions. In addition, current international standards defining the extent of required safety improvements when a ship is modified are subject to differing interpretations. Furthermore, when the owner of a vessel constructed to 1960 or earlier SOLAS safety standards elects to start passenger operations from U.S. ports, the extent of implementation of updated safety provisions, resulting from a major modification or alteration of the vessel, cannot be readily determined.

The National Transportation Safety Board believes that Lloyd's Register of Shipping misinterpreted the intent of the SOLAS requirements concerning major modifications and alterations. Lloyd's should have required the upgrading of all the main and emergency electrical components and the safety systems associated with the 1986 major engineering modification of the REGENT STAR. As a result of the Safety Board's findings in the course of investigating the REGENT STAR accident, the Board recommends that the International Association of Classification Societies:

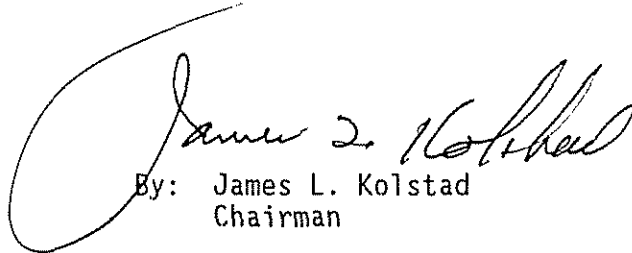
Revise the Societies' procedures concerning major modifications and alterations to oceangoing vessels over 1,000 gross tons and set uniform compliance standards for the required upgrading of

associated safety systems. (Class II, Priority Action) (M-91-24)

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "...to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any action taken as a result of its safety recommendations. Therefore, we would appreciate a response from you regarding action taken or contemplated with respect to the recommendation in this letter. Please refer to Safety Recommendation M-91-24 in your reply.

Also, the Safety Board issued Safety Recommendation M-91-23 to the U.S. Coast Guard and Safety Recommendation M-91-25 to World Pioneer, S.A., the owner of the REGENT STAR.

Chairman KOLSTAD, Vice Chairman COUGHLIN, and Members LAUBER, HART and HAMMERSCHMIDT concurred in this recommendation.



By: James L. Kolstad
Chairman