

Fire aboard Roll-on/Roll-off Passenger Vessel *Caribbean Fantasy*
Atlantic Ocean, 2 Miles Northwest of San Juan, Puerto Rico
August 17, 2016



Marine Accident Report

NTSB/MAR-18/01
PB2018-101068



**National
Transportation
Safety Board**

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490 L'Enfant Plaza, SW
Washington, DC 20594

National Transportation Safety Board. 2018. *Fire aboard Roll-on/Roll-off Passenger Vessel Caribbean Fantasy, Atlantic Ocean, 2 Miles Northwest of San Juan, Puerto Rico, August 17, 2016. Marine Accident Report NTSB/MAR-18/01. Washington, DC.*

Abstract: This report discusses the August 17, 2016, fire aboard the roll-on/roll-off passenger vessel *Caribbean Fantasy*. The fire began in the main engine room when fuel spraying from a leaking flange came in contact with a hot surface on the port main propulsion engine. The fire could not be contained, so the master ordered the ship to be abandoned. US Coast Guard and other first responder vessels and aircraft, along with good Samaritan vessels, helped transport passengers and crew to the port of San Juan, Puerto Rico. Several injuries, none life-threatening, occurred during firefighting and abandonment efforts. The burning vessel drifted in the wind and grounded on the sandy bottom just outside the port. Three days later, the vessel was towed into the harbor, where shore-based firefighters extinguished the last of the fire. The accident resulted in an estimated \$20 million in damage to the *Caribbean Fantasy*, which was eventually scrapped in lieu of repairs.

The report identifies the following safety issues: machinery maintenance practices, fuel and lube oil quick-closing valves, fire protection, crew training on and familiarity with emergency systems and procedures, implementation of the company's safety management system, and oversight by the flag state and the flag state's recognized organization.

As a result of this investigation, the National Transportation Safety Board makes new safety recommendations to the US Coast Guard, Baja Ferries S.A. de C.V., RINA Services S.p.A, the International Association of Classification Societies (IACS), and the Panama Maritime Authority.

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Acronyms and Abbreviations

AB	able-bodied seaman
AIS	automatic identification system
APT	annual performance test
ATON	aids to navigation
BV	Bureau Veritas
CBP	Customs and Border Protection
CEO	chief executive officer
CFR	<i>Code of Federal Regulations</i>
CO ₂	carbon dioxide
COTP	captain of the port
CPR	cardiopulmonary resuscitation
CSNCOE	Cruise Ship National Center of Expertise
DPA	designated person ashore
ECR	engine control room
EEBD	emergency escape breathing device
EOC	emergency operations center
EMS	emergency medical services
FURA	Fuerzas Unidas de Rápida Acción (United Forces of Rapid Action)
GMDSS	global maritime distress and safety system
GPS	global positioning system
GRP	glass-fiber-reinforced plastic
hp	horsepower
IACS	International Association of Classification Societies
ICAO	International Civil Aviation Organization
ICOC	initial certificate of compliance

ILO	International Labour Organization
IMO	International Maritime Organization
ISM Code	International Safety Management Code
JIS	Japanese Industrial Standards
kW	kilowatt
MES	marine evacuation system
MGO	marine gas oil
MHZ	main horizontal zone
MLC	Maritime Labour Convention
MRO	mass rescue operation
MSC	Marine Safety Center
MSD	marine sanitation device
MVZ	main vertical zone
NTSB	National Transportation Safety Board
OEM	original equipment manufacturer
OSC	on-scene coordinator
PA system	public address system
PET	polyethylene terephthalate
PFD	personal flotation device
PREMA	Puerto Rico Emergency Management Agency
PSC	port state control
PSCO	port state control officer
PVSS	passenger vessel safety specialist
QCV	quick-closing valve
RCU	release control unit
Ro/Ro	roll-on/roll-off

RO	recognized organization
SAR	search and rescue
SCBA	self-contained breathing apparatus
SMS	safety management system
SOLAS	International Convention for the Safety of Life at Sea
STCW Code	Seafarers' Training, Certification and Watchkeeping Code
VAC	volts AC
VDR	voyage data recorder
VHF	very high frequency

Executive Summary

About 0725 on August 17, 2016, a fire broke out in the main engine room of the roll-on/roll-off (Ro/Ro) passenger vessel *Caribbean Fantasy* when fuel spraying from a leaking flange came in contact with a hot surface on the port main propulsion engine. The fire could not be contained, so the master ordered the ship to be abandoned. US Coast Guard and other first responder vessels and aircraft, along with good Samaritan vessels, helped transport all 511 passengers and crew to the port of San Juan, Puerto Rico. Several injuries, none life-threatening, occurred during firefighting and abandonment efforts. The burning vessel drifted in the wind and grounded on the sandy bottom outside the port. Three days later, the vessel was towed into the harbor, where shore-based firefighters extinguished the last of the fire. The accident resulted in an estimated \$20 million in damage to the *Caribbean Fantasy*, which was eventually scrapped in lieu of repairs.

The National Transportation Safety Board determines that the probable cause of the fire aboard the roll-on/roll-off passenger vessel *Caribbean Fantasy* was Baja Ferries' poor safety culture and ineffective implementation of their safety management system on board the vessel, where poor maintenance practices led to an uncontained fuel spray from a blank flange at the end of the port main engine fuel supply line onto the hot exhaust manifold of the engine. Contributing to the rapid spread of the fire were fuel and lube oil quick-closing valves that were intentionally blocked open, fixed firefighting systems that were ineffective, and a structural fire boundary that failed. Contributing to the fire and the prolonged abandonment effort was the failure of the Panama Maritime Authority and the recognized organization, RINA Services, to ensure Baja Ferries' safety management system was functional.

Safety issues identified in this accident include the following:

- machinery maintenance practices
- fuel and lube oil quick-closing valves
- fire protection
- crew training on and familiarity with emergency systems and procedures
- implementation of the company's safety management system
- oversight by the flag state and the flag state's recognized organization

As a result of this investigation, the National Transportation Safety Board makes new recommendations to the US Coast Guard, Baja Ferries S.A. de C.V., RINA Services S.p.A, the International Association of Classification Societies (IACS), and the Panama Maritime Authority.

1 The Accident

1.1 The *Caribbean Fantasy*

The Panama-flagged *Caribbean Fantasy* was a 614-foot-long roll-on/roll-off (Ro/Ro) passenger vessel that provided ferry service between Santo Domingo, Dominican Republic, and San Juan and Mayaguez, Puerto Rico. The vessel had three decks—designated garages A, B, and C from bottom to top—for carrying vehicles, as well as passenger accommodation spaces located above the garages. The *Caribbean Fantasy* was certificated to carry 1,030 passengers and had lifesaving appliances (lifeboats and liferafts) for 1,150.



Figure 1. Ro/Ro passenger vessel *Caribbean Fantasy*. (Photo by Baja Ferries)

1.2 Pre-Accident Events

From March 26 to July 3, 2016, the *Caribbean Fantasy* completed a shipyard period in Menzel Bourguiba, Tunisia.¹ Along with other repairs, extensive maintenance was performed on the vessel's main propulsion engines, and all lifeboat release hooks were replaced in compliance with revised regulations under the International Convention for the Safety of Life at Sea (SOLAS).² The hooks, which were installed on each of the vessel's three lifeboats, attached the boats to the falls (wire ropes) on the gravity davits. The hooks for each boat were designed to be released via a mechanism inside the boat once it was lowered to the water. At the completion of the shipyard period, the *Caribbean Fantasy* departed the facility without conducting sea trials or testing of major systems to ensure proper operation.

After leaving the shipyard, the *Caribbean Fantasy* transited to Gibraltar (British Overseas Territory), arriving on the evening of July 5. While in Gibraltar, the vessel experienced two full blackouts, including loss of propulsion and loss of primary electrical power. The blackouts occurred when the chief engineer stopped all three online diesel generators in response to fire

¹ Menzel Bourguiba is in the governate of Bizerte on the northeast coast of Tunisia. The capital of the governate is the city of Bizerte. Various documents generated while the *Caribbean Fantasy* was in the shipyard list "Bizerte" as the location of the vessel.

² The SOLAS Convention is generally regarded as the most important of all international treaties concerning the safety of merchant ships. The main objective of the convention is to specify minimum standards for the construction, equipment, and operation of ships, compatible with their safety. Flag states are responsible for ensuring that ships under their flag comply with its requirements. The first version of the SOLAS Convention was adopted in 1914 in response to the *Titanic* disaster. The current version in force is the 1974 Convention, as amended on numerous occasions. Source: International Maritime Organization (IMO), International Convention for the Safety of Life at Sea (SOLAS), 1974, [http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-\(SOLAS\),-1974.aspx](http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Safety-of-Life-at-Sea-(SOLAS),-1974.aspx).

alarms and smoke in the auxiliary engine room, the location of the generators. Upon investigation, the engineers discovered that cooling water was leaking into the generators' crankcases due to a failure of O-rings. After the first blackout, the Gibraltar Maritime Administration initiated a port state control inspection of the *Caribbean Fantasy*. On July 8, 2016, the port state control officer issued three major deficiencies and detained the vessel in port, the *Caribbean Fantasy's* third detention in 3 years. Detention is one of the most serious actions that port state control authorities may take to ensure that a foreign vessel's operational condition or crew meets applicable international conventions and will not present a danger to the vessel, its crew, the port, or cause harm to the marine environment. Detentions are rare. Between 2014 and 2016, the US Coast Guard conducted nearly 28,000 SOLAS safety inspections yet detained only 448 vessels, a detention rate of 1.6 percent.³ Multiple detentions of the same vessel are rarer still. (See section 1.13 for more information on port state control actions involving the *Caribbean Fantasy*.)

A shore-based team of technicians repaired the no. 1 and no. 2 generators (the no. 3 generator was put out of commission), other deficiencies were addressed, and the *Caribbean Fantasy* was released by the Gibraltar Maritime Administration on July 14. A week later, on July 21, the *Caribbean Fantasy* stopped at a shipyard in Cádiz, Spain, to complete repairs to the bearings on the vessel's port main propulsion engine. The *Caribbean Fantasy* departed Cádiz on July 27 and crossed the Atlantic Ocean, arriving in Santo Domingo on August 5.

Fifty-nine hotel crew who had been off the vessel during the shipyard period in Tunisia joined the vessel on August 5 and 6. The master and a second engineer also joined the vessel at that time. While in Santo Domingo, the crew prepared for a US Coast Guard port state control inspection. The vessel then sailed for San Juan on August 8, where it arrived the following morning. The port state control inspection was completed on August 9 with a satisfactory result. Upon completion, the *Caribbean Fantasy* resumed regular service between the Dominican Republic and Puerto Rico.

1.3 Accident Events

1.3.1 Fuel Leak and Fire

One week later, the *Caribbean Fantasy* departed Santo Domingo for an overnight passage to San Juan. This was to be the third voyage to San Juan since the vessel returned to service. There were 124 crewmembers, 387 passengers, and 7 dogs on board.⁴ The vessel was also carrying 58 containers and 36 cars as cargo. The crossing between the Dominican Republic and Puerto Rico was uneventful. Crewmembers reported nothing unusual with the vessel or its machinery.

In the morning on August 17, the *Caribbean Fantasy* approached the pilot station at the entrance to the port of San Juan for a scheduled boarding of the harbor pilot at 0730. The ship's master arrived on the bridge at 0644 and received an update on the upcoming arrival from the second officer who was on watch. Shortly thereafter, the staff captain and the safety officer arrived on the bridge. At 0715, the ship's autopilot was disengaged, and the helmsman took the wheel while the vessel was on a heading of 100 degrees at a speed of 17.4 knots.

³ Coast Guard, *Port State Control in the United States 2016 Annual Report*, Washington DC: Department of Homeland Security, 2017.

⁴ Originally, there were 388 passengers on board, but one was disembarked from the ship for medical reasons just as the vessel was getting under way from Santo Domingo.

Below in the main engine room, a third engineer, a motorman, and a wiper were on watch and preparing for the arrival in San Juan.⁵ Just before 0700, the chief engineer entered the main engine room, conducted a routine round of the space, and recorded the fuel levels of the main engine service tanks in advance of the arrival. The main engines and generators were using marine gas oil (MGO), a low-sulfur version of diesel fuel, having transitioned from heavy fuel oil (HFO) 7 hours earlier.⁶

About 0720, the motorman and the wiper noticed the smell of fuel in the main engine room. Upon investigation, the motorman saw MGO leaking from the aft end of the port main engine. He immediately notified the chief engineer, who was at the forward end of the main engine room. The chief engineer, motorman, and wiper investigated further and found fuel discharging from an end flange on the port main engine fuel supply line, located on the aft outboard side of the engine. The chief engineer proceeded to the engine control room (ECR) and, at 0723, called the bridge to inform the master of the leak. The chief engineer told the master that repairing the leak required shutting down the fuel system and isolating the fuel supply line, which would also shut down the port main engine propulsion. After receiving the call from the chief engineer, the master told the bridge watch, "Reduce the speed." At that moment, the ship was altering course to starboard toward the pilot station at a speed of 17.3 knots.

With the permission of the master, the chief engineer took control of the main propulsion in the ECR. He reduced the load on the main engines by decreasing the pitch angle of the controllable-pitch propellers in preparation for stopping one or both engines. He then left the ECR and returned with the motorman to the location of the fuel leak. There they discovered an increased amount of fuel spraying from the fuel end flange in the direction of the engine's exhaust manifold casing and turbocharger. Reducing the load on the engines had decreased fuel consumption and thereby increased the fuel supply line pressure, which in turn had increased the fuel spray.

The chief engineer told investigators that he was about a meter away from the flange when the fuel spray ignited. A large plume of fire, heat, and smoke forced the chief engineer, motorman, and wiper to exit the area. The chief engineer and motorman returned to the ECR. The wiper attempted to go to the ECR, but the smoke and heat prevented him from doing so. Instead, he exited the space into the auxiliary engine room. He then proceeded aft and climbed a stairway to garage B on deck 3.

Although the "engine room fire contingency plan" in the *Caribbean Fantasy's* safety management system (SMS) included the step "[machinery space] evacuated and personnel mustered," no procedure or location was provided for the muster of evacuated personnel. Other documents reviewed by investigators, such as the *emergency plan and station bill*, likewise contained no procedures for a muster.⁷ Thus, after exiting the engine room, the wiper remained in garage B.

⁵ A *motorman* is an unlicensed member of the engine department whose principal duties are to maintain and operate machinery as directed by the engineering officers. A motorman possesses at least one year of experience in the engine room. A *wiper* is an entry-level member of the engine department whose principal duties are to ensure the cleanliness of engineering spaces and assist more senior members of the department as directed.

⁶ Marine engines and fuel systems are designed to use varying grades of fuel. The type of fuel being used most often depends on the regulations for the waters in which the vessel is operating. MGO burns cleaner than HFO and complies with the requirements of the US Caribbean Emission Control Area.

⁷ The *emergency plan and station bill* provided emergency duties and survival craft assignments for the crew. See section 1.4.3 for more information about the *Caribbean Fantasy's* emergency plan and station bill.

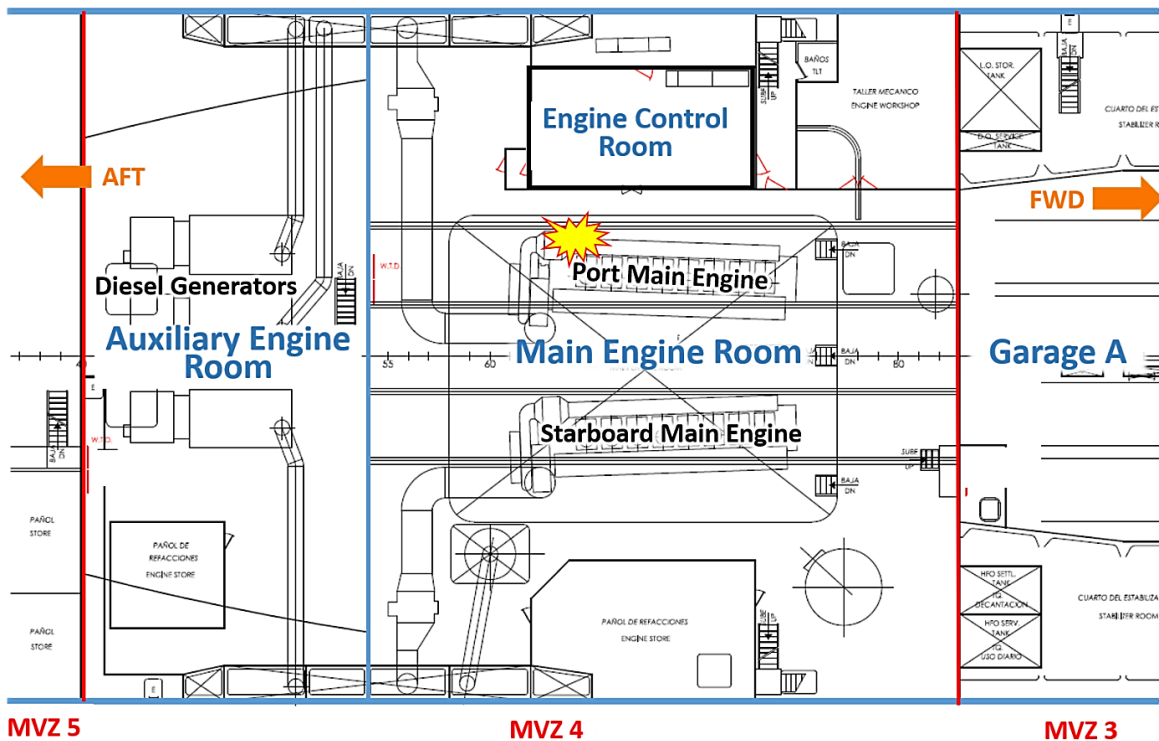


Figure 2. Excerpt from general arrangement drawing for deck 2 engineering spaces in *Caribbean Fantasy*. Boundaries for main vertical zones are noted in red. Garage B was located directly above the spaces shown in the drawing.

Meanwhile, the third engineer on watch in the ECR heard an explosion, looked out the window into the main engine room, and saw the fire. He called the bridge to notify the watch team of the fire and depressed the fuel supply and boost pump stop buttons on the control console. The third engineer then pulled both propulsion levers to zero pitch from the console in the ECR. Soon thereafter, the chief engineer entered the ECR.

From the ECR, the chief engineer manually activated the HPN Nebula high-pressure water-mist fixed firefighting system over the port and starboard main engines by depressing the push buttons for zones no. 1 (starboard machinery) and no. 2 (portside machinery), as labeled on the control panel.⁸ The chief engineer told investigators that he knew the system was activated because a green indicator light for the service pump illuminated on the control panel. This light signified that the high-pressure pump motor controller was energized, but there was no means in the ECR to verify system pressure or that the pump was running. Heavy black smoke prevented the chief engineer from visually verifying that the system was operating as designed.

A deck cadet standing a training watch on the bridge answered the call from the third engineer at 0725.⁹ The cadet then announced to the bridge team, “Fire in the engine room.” Immediately thereafter, numerous audible alarms sounded on the bridge. Although the vessel’s emergency plan and station bill assigned the staff captain to the bridge in an emergency, the master asked the staff captain to go below to check on the situation. Both the staff captain and the safety officer departed the bridge.

⁸ See section 1.7.6 for more information about the HPN Nebula system.

⁹ A *cadet* is an officer in training. Most often, cadets are students at maritime academies who are detailed to operational vessels for a period of time to gain experience at sea as part of their learning curriculum.

The *Caribbean Fantasy* was 2 miles from the entrance of San Juan harbor, with the pilot boat approaching to embark the pilot. The second officer informed the pilot boat by radio of the engine casualty and that the vessel would require two tugboats. The pilot did not board the vessel, but the boat remained on scene relaying information to other vessels and ashore.

At 0727, the master gave the order to announce “Mr. Skylight” over the ship’s public address (PA) system. The codeword “Mr. Skylight” alerted the crew to the fire and activated the ship’s firefighting and response teams. (Passenger ships commonly use coded announcements to avoid panicking or concerning the passengers while allowing specific crewmembers to be activated to respond to a situation.) The announcement included the instruction “staging area garage A.” To the crew responding, this meant that all fire and response teams would stage themselves in garage A (deck 2) to await further instructions from the ship’s safety officer. Garage A was the lowest of all the vehicle decks, forward of the main engine room and separated by a main vertical zone (MVZ) bulkhead.

Shortly thereafter, the master ordered the helmsman to steer hard to port from a heading of 120 degrees to turn the ship away from the harbor entrance. This action was intended to keep the vessel from running aground in the shoal water surrounding the port’s shipping channel. The *Caribbean Fantasy*’s speed was 10 knots but slowing due to the loss of propulsion. At 0729, the master was informed by phone that the engine room was being evacuated. In response, he ordered the ECR to activate “hi-fog,” referring to the water-mist fixed firefighting system.¹⁰ Right after the call, the master informed the San Juan pilot station via very high frequency (VHF) radio of the fire in the engine room and that he was preparing for an evacuation of the passengers.

While the master was on the radio, the second officer (on watch) used the ship’s internal radio to inform the safety officer that they needed to know when all persons were evacuated from the engine room in preparation for using the CO₂ fixed firefighting system.

During this time, the smoke, heat, and flames continued to increase in the main engine room. In the ECR, the chief engineer, third engineer, and motorman were unable to account for the wiper who had exited the engine room via the auxiliary engine room. Consequently, the third engineer attempted to re-enter the main engine room to look for the wiper. Upon entry, he called out to the wiper, but the smoke was too thick to see anything, and he was driven back out of the space. He returned to the ECR. The chief engineer then took an emergency escape breathing device (EEBD) and attempted to find the wiper. He re-entered the main engine room but was also driven back by the heat.

¹⁰ HI-FOG is the name of a specific brand of water-mist fixed fire-protection system, patented and produced by the Marioff Corporation, that is used on ships in both machinery and accommodation spaces (source: www.marioff.com, accessed June 2017). The crew of the *Caribbean Fantasy* referred to their water-mist system as “hi-fog,” although the Marioff system did not exist on board. The water-mist system on the *Caribbean Fantasy* was the HPN Nebula system. See section 1.7.6 for more information on the HPN Nebula system.

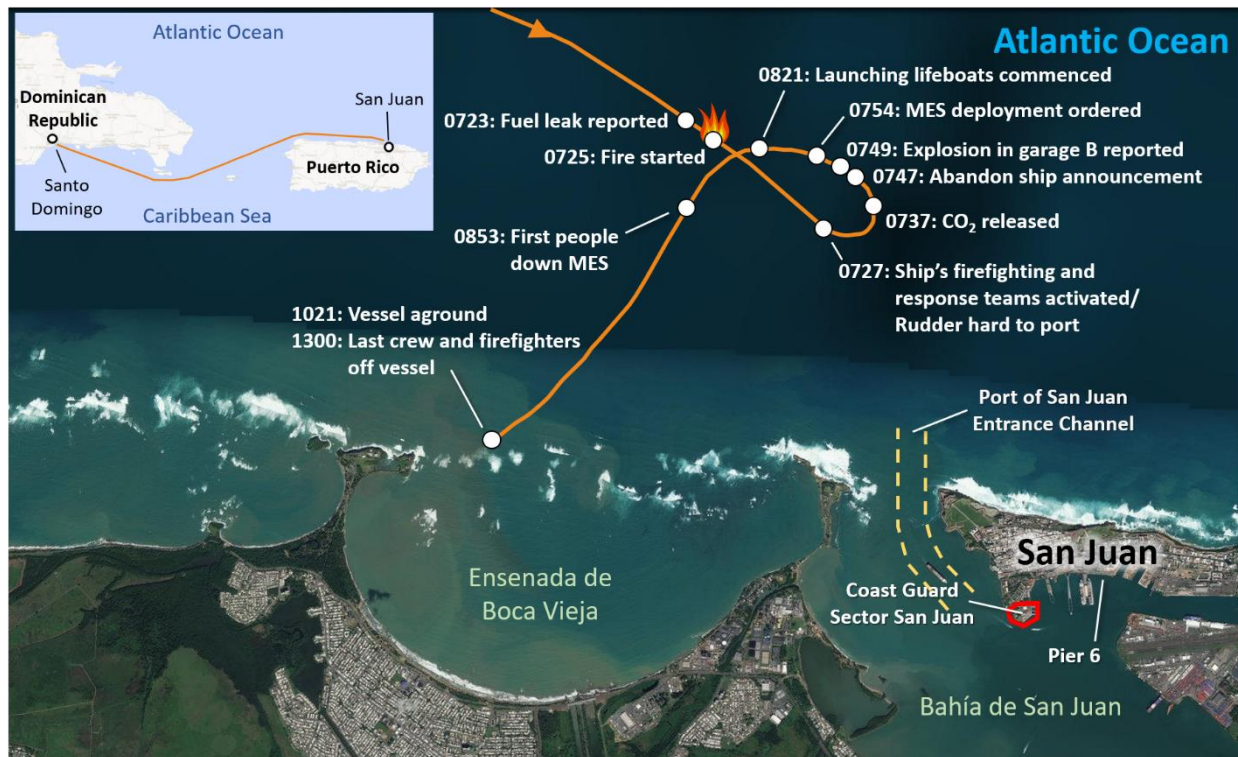


Figure 3. Automatic identification system (AIS) track of the *Caribbean Fantasy* and timeline of events.¹¹ (Background by Google Earth)

About the same time, the staff captain arrived in the main engine room as directed by the master. He was there for only a few seconds before retreating to the ECR. The staff captain recalled to investigators that, looking through the ECR window to the main engine room, the fire was “very violent,” and the flames were touching the overhead. The staff captain said that he informed the master by radio that there was a “big fire” in the engine room and he recommended that CO₂ be released. However, the chief engineer recommended not to release CO₂ because he was still unable to account for the wiper. The staff captain departed the ECR and went to the CO₂ station in garage B aft on the port side to await further instructions.

Members of the fire response teams, which were organized into a quick-response team, two firefighting squads, and a boundary cooling team, began to arrive at the staging area in garage A, where they met the safety officer. The safety officer, as the designated on-scene commander, directed fire squad no. 1 to open watertight door no. 3, which separated the garage from the main engine room. Upon opening the door, a significant amount of smoke began to enter garage A. Consequently, the safety officer ordered the fire squad to close the door and pull back. Recognizing that it was not possible to fight the fire from garage A, she ordered the fire response teams to move to garage B directly above. When they arrived at garage B, it was also beginning to fill with smoke, so the safety officer established garage C forward as the staging area for the fire teams. From garage C, the safety officer directed fire squad no. 2 to conduct boundary cooling

¹¹ AIS is a maritime navigation safety communications system. At 2- to 12-second intervals on a moving vessel, the AIS automatically transmits vessel information, including the vessel’s name, type, position, course, speed, navigational status, and other safety-related information, to appropriately equipped shore stations, other vessels, and aircraft. The rate at which the AIS information is updated depends on vessel speed and whether the vessel is changing course. AIS also automatically receives information from similarly equipped vessels.

one deck below in garage B. However, according to fire squad members who were interviewed after the accident, their fire hoses were never charged.

The safety officer attempted to radio the chief engineer to confirm that the engine room was evacuated but could not get a response. Concerned about this, she donned a self-contained breathing apparatus (SCBA) and, together with fire squad no. 1, proceeded aft toward a portside stairway that led to the engine room. She told investigators that they were not able to make it to the engine room because of the smoke and heat.

The chief engineer, motorman, and third engineer evacuated the ECR by way of the portside stairway adjacent to and forward of the ECR. The third engineer stated that he was the last person to evacuate the ECR and that he was overcome by the smoke and heat. At the top of the stairway, on a platform that led out to garage B, the chief engineer went to the emergency shutdown panel and opened its pneumatic valve. This action should have shut the eight ventilation dampers and the eight fuel and lube oil quick-closing valves (QCVs). The ventilation dampers, when closed, were designed to prevent the spread of smoke, reduce the supply of oxygen to the fire, and prevent the CO₂ firefighting agent (when released) from escaping the space. The QCVs, when closed, were designed to seal the main engine space and cut off the fuel and lube oil tanks. After activating the pneumatic valve, the chief engineer continued up the stairs and escaped to garage C.

Once in garage C, the chief engineer was able to obtain an SCBA from fire squad no. 1. With that, he tried to re-enter the engine room, by way of the same stairway, to confirm that everyone was out of the space, including the wiper. But he was not able to make it down the stairs because of the smoke and heat intensity. While on the stairway, he opened the refilling valve for the air reservoir for the QCVs and ventilation shutdowns as an assurance that there would be adequate air supply for everything to close. He then exited to garage B.

The wiper was found in garage B several minutes later. After sighting the wiper, the chief engineer reported to the bridge that all persons were out of the engine room. For about 2 minutes, communications continued between the bridge, the safety officer, and the staff captain regarding confirmation of the engine room evacuation and the closing of fire dampers.

At 0734, the master informed the passenger reception desk about the fire in the engine room. He requested that the hotel crew start to gather all passengers to bring them to their muster stations, and he told the crew that he would make an announcement. Two minutes later, a VHF broadcast was made from the *Caribbean Fantasy* informing all ships in the local area that the vessel was not under command.¹² At that time, the vessel was drifting at a speed of 1.5 knots and was 1.5 miles north of the entrance to San Juan harbor.

Upon confirming that the engine room was evacuated and all persons in the space were accounted for, the master gave the order to release CO₂. The staff captain complied by operating the two valves needed to activate the system. At 0737, the staff captain informed the bridge by radio that CO₂ had been released. The staff captain remained at the CO₂ station and was joined by the chief engineer shortly thereafter. The staff captain verified that he heard the CO₂ bottles discharge, and he and the chief engineer noted frost on the valves and piping (a common indicator of movement of gas through discharge lines). They then departed the CO₂ station.

¹² *Not under command* is defined in the International Regulations for Preventing Collisions at Sea, 1972 (72 COLREGS), as “a vessel which through some exceptional circumstance is unable to maneuver as required by the regulations and is therefore unable to keep out of the way of another vessel.”



Figure 4. CO₂ system activation station postaccident. Both actuation valves are in the open position.

Both the safety officer and staff captain communicated to the bridge that there was a high concentration of smoke building in both garages B and C. At 0738, the safety officer announced to the command center that she had relocated the staging area to garage C forward due to the smoke and directed the fire squads and boundary cooling team to that location.

At 0740, the bridge command center requested that boundary cooling be conducted in garage B directly above the engine room. The staff captain replied that there was “too much smoke in garage B and C” and requested to open the forward main ramp/door to clear the smoke out. The master denied this request as he did not want to add wind and air to the car deck. None of the boundary cooling team members had SCBAs or fire-protective equipment, and thus they were unable to access the area in garage B above the engine room.

Concerned about the smoke in the garages, the master directed the activation of the drencher system for garage B at 0742. The staff captain went to the drencher room on deck 5, where he met the first engineer. The staff captain told investigators that he activated the system by opening the valves for all of garages A and B. The first engineer, who was assigned to activate the system by the emergency plan and station bill, also told investigators that he opened the valves, including the valves for garage C.

At 0745, one long signal was automatically sounded on the ship's general alarm by the fire detection system.¹³ Investigators could not determine if this alarm was broadcast throughout the ship or only to specific spaces.

For the next 5 minutes, multiple radio calls to the bridge from various personnel and teams throughout the ship were unanswered or not acknowledged. The second officer who was off watch radioed the bridge to report heavy smoke on deck 5 aft, the safety officer relayed information that there was smoke in garage B and that there was oil coming from the port side bunker station on that same deck, and the medical team checked in. The calls were recorded on the *Caribbean Fantasy's* voyage data recorder (VDR), but there was no response from the bridge to any of the calls.¹⁴

At the time the radio calls went unanswered, the master, second officer (on watch), and cadet were occupied with communications with the Coast Guard and announcements to the passengers. The master ordered a PA system announcement to inform the passengers of the fire and to direct them to follow the instructions of the crew. At 0746, the announcement was made in English by the deck cadet, using a prewritten script, to all areas of the vessel. Immediately following this announcement, the second officer (on watch) made an announcement in Spanish. The announcement followed a different prewritten script that stated the fire was not under control and, "it has been decide [*sic*] to abandon the vessel." It further directed all crew to their survival craft embarkation stations. When the master was interviewed by investigators after the accident, he stated that he ordered only the announcement that was made in English and not the announcement in Spanish. He further stated that, because he did not speak Spanish, he would not have understood the second announcement.

Upon hearing the announcement from the bridge to abandon the vessel, the fire teams evacuated the staging area and proceeded to their respective survival craft embarkation stations. No active firefighting or boundary cooling was attempted by the crew during the accident.

1.3.2 Abandonment and On-Scene Rescue Operations

Coast Guard Sector San Juan had been monitoring VHF radio traffic and, after hearing the *Caribbean Fantasy's* announcement that it was not under command, contacted the vessel at 0742. The second officer (on watch) replied that there was a fire in the engine room, that CO₂ had been released, and that the vessel was not under command just north of the entrance to San Juan harbor. About 3 minutes later, the second officer told the Coast Guard that the crew was going to make an "announcement for evacuation; we need assistance immediately." In response, Sector San Juan dispatched Coast Guard small boats to proceed to the scene. Having heard the radio traffic, multiple towing vessels and other good Samaritan vessels also began moving from the harbor out to the *Caribbean Fantasy's* location.

¹³ The ship's fire detection system was wired to the ship's general alarm system. When alarms from the fire detection system went unacknowledged or unsilenced for more than 2 minutes, the general alarm system was activated. During the accident, there were six instances (0745, 0810, 0845, 0854, 0919 and 1015) of one prolonged signal of the general alarm with no evidence that the signal was intentionally sounded by the crew. The only intentional sounding of the alarm was at 0758 by the deck cadet.

¹⁴ VDRs maintain continuous, sequential records of data relating to a ship's equipment and its command and control and capture bridge audio from certain areas in the pilothouse and on the bridge wings. SOLAS regulation requires all passenger ships and all cargo ships of 3,000 or more gross tons (International Tonnage Convention), built on or after July 1, 2002, to carry VDRs.

About this time, the chief of Sector San Juan's Response Department was on the bridge of the Coast Guard fast response cutter *Joseph Tezanos* (WPC 1118) in port in San Juan. The *Joseph Tezanos* was a new cutter that had recently arrived in its homeport. It was not yet fully commissioned on the day of the accident, and the crew was preparing for a final readiness inspection intended to prove that both the vessel and its crew were fit for service. There was a need for a cutter on scene at the *Caribbean Fantasy* accident site to coordinate and communicate with all the assets responding, but the nearest commissioned cutter was under way and unable to respond in a timely manner. Therefore, the Response Department chief asked the commanding officer of the *Joseph Tezanos* if he and the crew were ready for this tasking. The response was affirmative.

At 0747, the Coast Guard radioed the *Caribbean Fantasy* and asked how many people were on board. The response from the ship was that there were "five one two" passengers and crew on board. (There were, in fact, 511 people on board after a passenger had disembarked the night before.) The Coast Guard then asked if the *Caribbean Fantasy* had any personal flotation devices (PFDs) and liferafts on board and, if so, what color the PFDs and rafts were. The bridge crew replied that the ship did have them. The number of lifeboats on board was also communicated to the Coast Guard, who again requested the color of the liferafts. Communications continued between the *Caribbean Fantasy* bridge and the Coast Guard as they sorted out confusion regarding the number and capacities of lifeboats and liferafts on board. The Coast Guard asked if the liferafts were filled. The second officer (on watch) responded that the master had not yet ordered abandon ship and that the passengers were at their evacuation stations.

At 0749, the safety officer, speaking through an SCBA, reported to the bridge that there was a "big explosion" in garage B. The master requested to know if the drencher was working. The staff captain, who was still moving about the ship, replied that he had started the pump but could not verify that it was working. The safety officer then reported that there was "nothing coming in garage B." About 3 minutes later, the chief engineer radioed the master and stated that the drencher system was working.

At 0754, the master ordered the *Caribbean Fantasy* crew to deploy the ship's marine evacuation systems (MESs). As designed, an MES and associated liferaft containers are deployed in an emergency, with passengers and crew sliding down the MES's 83.7-foot-long (25.5-meter-long) inflatable slide to an inflated platform floating on the water. All liferaft containers are connected together by retrieving lines and the first container is connected to the MES floating platform by a retrieving line. The liferaft containers are launched one at a time from the ship, and the rafts do not automatically inflate upon entering the water. Instead, crewmembers assigned to the platform are expected to pull the first liferaft container to the platform using the retrieving line and inflate the raft at the platform. The second liferaft is then launched, pulled to the platform, and inflated. Passengers then board the two liferafts until at capacity, after which the liferafts are cut away and crewmembers pull the next two liferaft containers to the floating platform. Boarding continues until the evacuation is complete.¹⁵ The system is designed for all assigned people to be transferred from the ship to inflated liferafts within 30 minutes.

¹⁵ VIKING LIFE-SAVING EQUIPMENT A/S, *Manual, VIKING Marine Evacuation System, M/V Caribbean Fantasy*, 1999.

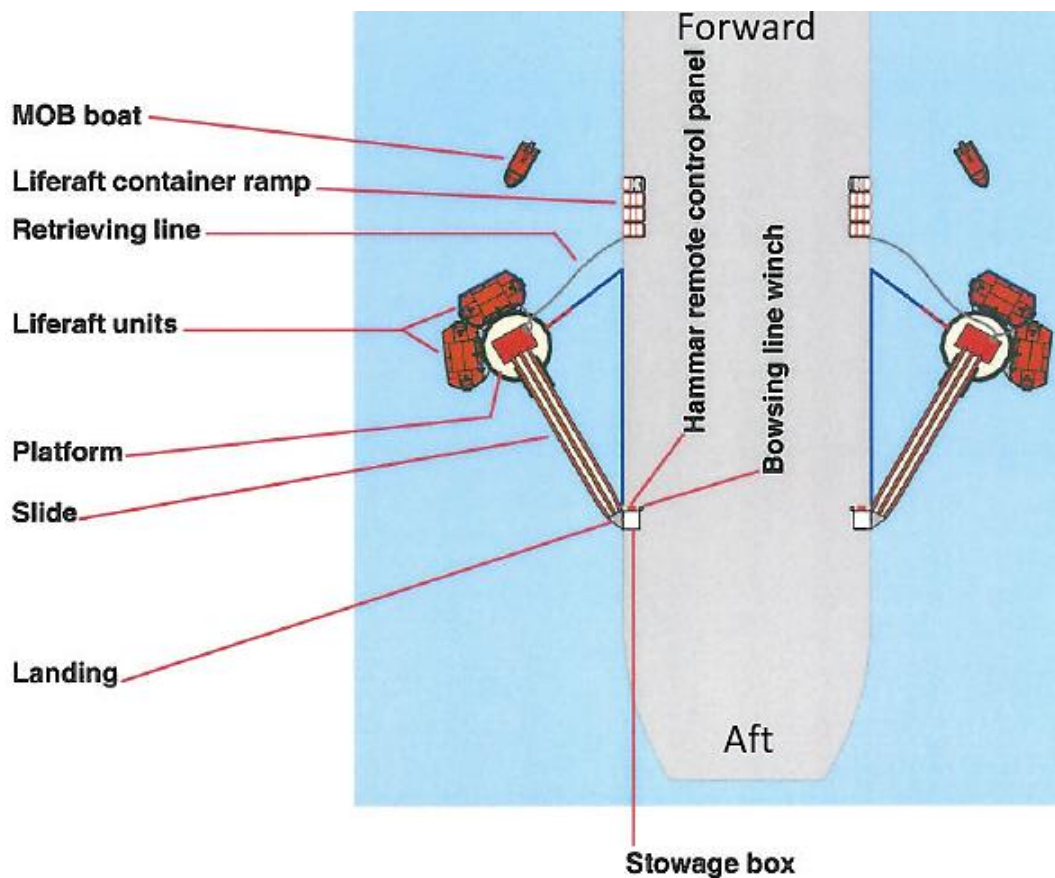


Figure 5. Overhead drawing of the port and starboard MESSs, with names of the main system components. Note: although the illustration shows two fast rescue boats (labeled as “MOB boat”), the *Caribbean Fantasy* was equipped with only one. (Source: *Manual, VIKING Marine Evacuation System, M/V Caribbean Fantasy, 1999*)

At 0756, Coast Guard Sector San Juan issued an urgent Pan-Pan message to all vessels on VHF radio channel 16 about the *Caribbean Fantasy* engine room fire.¹⁶ The message requested that mariners assist if possible and make reports to Sector San Juan.

On board the *Caribbean Fantasy*, at 0756, the bridge was informed by phone that all passengers and crew had been evacuated from the ship’s internal spaces. However, about a minute later, the safety officer radioed the bridge and requested that one long signal be sounded on the ship’s alarm system because there were still people on deck 5. This signal, according to the ship’s emergency plan and station bill, was the “prepare for abandon ship signal” and directed all persons on board to go to their survival craft embarkation stations where, upon verbal command from the master, the abandonment of the ship would take place. The second officer (on watch) directed the deck cadet to sound the signal, which was recorded by the *Caribbean Fantasy*’s VDR at 0758. The first Coast Guard small boat (CG 45751) arrived on scene about a minute after the signal was sounded.

About the same time, the bridge was attempting to reach both the port and starboard MESS operators by radio to give them instructions to prepare each for deployment. These multiple calls went unanswered. Therefore, the second officer (on watch) radioed the third officer and directed

¹⁶ *Pan-Pan* is a VHF radio transmission indicating that there is an urgent situation but no immediate danger to a person’s life or to the vessel. The vessel or station transmitting the message begins by saying “Pan-pan, Pan-pan, Pan-pan” and follows with the urgent message.

him to go and prepare the portside MES. When later interviewed by investigators, the safety officer and staff captain stated that they also went to the MES stations to help with launching preparation.

The *Caribbean Fantasy* had one fast rescue boat stowed on the port side of the ship that was designated for use in emergencies, such as a man overboard or an oil spill. According to the operating instructions for the MES, the fast rescue boat was tasked with keeping the launching area clear of any obstructions, hauling liferaft containers to the floating platform, and hauling inflated and fully embarked liferafts away from the platform. However, there were no instructions found in the *Caribbean Fantasy*'s emergency plan and station bill for use of the fast rescue boat during abandonment. Instead, there were instructions for lifeboat no. 3 to be positioned in the vicinity of the MES to assist in marshalling liferafts. At 0802, the second officer (on watch) announced that the portside MES was on the water and asked the master if the crew should launch the fast rescue boat to provide assistance to the rafts and the MES platform. The master declined and stated that they would ask the Coast Guard to assist. When investigators asked the master why he did not order the fast rescue boat lowered, the master stated that the reason was the presence of Coast Guard response vessels and that he needed to keep the crew that normally operated the fast rescue boat on board to continue helping with the emergency. The master radioed the Coast Guard small boat to request assistance with gathering the liferafts and bringing them to the MES on the port side. The boat crew responded that they would stand by on the port side of the ship. The master then ordered the launch of all 12 liferafts from the portside rack. About the same time, a second Coast Guard small boat (CG 33139) reported that it was on scene.

In the midst of radio communications with the Coast Guard small boat, the master announced, "Stop the drencher." The drencher had been in operation for about 20 minutes. When investigators later asked the master why he ordered the drencher to be stopped, he recalled that the vessel was starting to list to port. He said he was concerned about the amount of water on the car decks and its effect on the ship's stability. The wind at the time was on the starboard beam of the ship, which induced a heel to port. As a result, the water from the drencher pooled on the port side of the garages.

At 0803, the ship was about 2 miles north-northwest of the entrance to San Juan harbor on a northerly heading and drifting to the west-southwest at about 1 knot. The master stated that his original intention was to use the portside MES for the evacuation. Given the ship's heading, which put the wind and seas on the starboard side, the lee (calmest sea conditions) was on the port side. However, the staff captain reported that smoke was blowing onto the portside MES station, which he considered to be a risk if persons were to evacuate to that side. Additionally, there was a problem with the MES: the slide angle was too steep ("near vertical," according to the staff captain) for passengers and crew to slide down.

Based on the staff captain's report, at 0804, the second officer (on watch) asked the safety officer to prepare the starboard-side MES. Accordingly, the safety officer ordered all MES preparation teams to that MES. The bridge also ordered the liferaft preparation teams to release the rafts on the port and starboard side. When interviewed, the staff captain told investigators that he activated the remote releases for the liferafts on the port side of the ship before proceeding to the starboard side. However, only 1 of the 12 liferafts dropped from the port rack to the water. Another crewmember told investigators that he was the one who had released one of the portside raft cannisters into the water.

About this time, more Coast Guard small boats were deployed from Sector San Juan to the scene (CG 33114 and CG 33137).

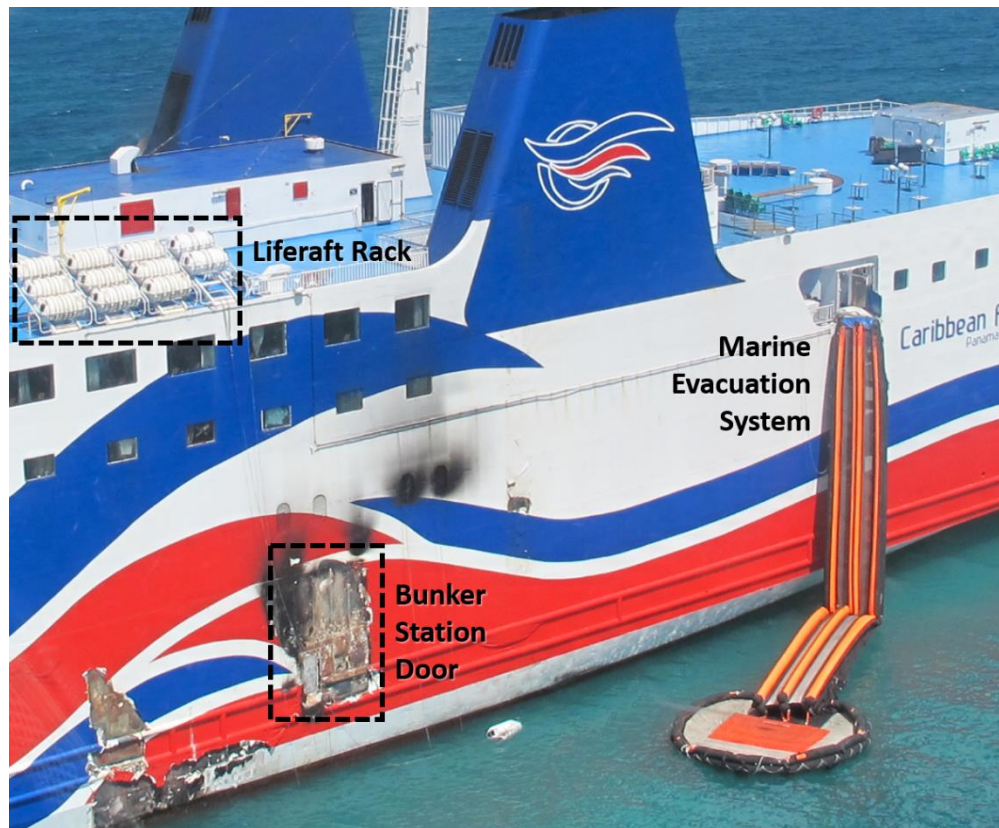


Figure 6. Port side of *Caribbean Fantasy* on the day after the accident. Note the angle of the MES and the single liferaft container floating in the water.

At 0808, the master ordered the embarkation of lifeboat no. 2. According to crewmembers interviewed, once lifeboat no. 2 was lowered to the embarkation deck, there was a gap between the lifeboat and the ship's side because the ship was listing about 4 degrees. This gap was too wide to embark passengers, so the crew hoisted the boat back up and adjusted the forward and aft bowing/tricing gear to the correct length and tension of the gear. (Bowling/tricing gear is designed to pull in and hold the boat against the side of the ship at the embarkation deck for conditions of ship movement or list.) While this was taking place, the master directed crew and passengers at the embarkation station for lifeboat no. 2 to go to the embarkation station for lifeboat no. 1 and board that lifeboat. When lifeboat no. 2 was lowered back to the embarkation deck, the gap was closed.

Once the problem with the gap was resolved, the master was informed that the boat's commander (the third officer) and first engineer were missing. (Both had moved to lifeboat no. 1 as directed by the master while the gap at the lifeboat no. 2 embarkation station was corrected.) In response, the master directed the chief engineer via the ship's internal radio to have someone from the engine crew go to lifeboat no. 2; he did not receive a reply. The second officer (on watch) then called the third officer, who was now on the starboard side, and directed him back to lifeboat no. 2.

Recognizing at 0812 that liferafts had not yet been released on the starboard side, the cadet requested by radio for the MES preparation and launching team to release the liferafts from the starboard side.

The master then ordered the crew to prepare lifeboat no. 3. Upon hearing the order, the second officer (on watch) asked who should command lifeboat no. 3, because he was the assigned commander. In response, the master ordered the second officer (off watch) to take lifeboat no. 3. The second officer (on watch) stated over the radio that he would then take lifeboat no. 1.

At 0818, the staff captain at the starboard-side MES station reported to the bridge that the “line is broken,” referring to the MES’s bowsing line. The bowsing line was a rope that ran from the MES platform to a winch on the ship. It was designed to adjust tension on the slide and platform, thereby enabling the system to be in the best position for use.

Although directed to command lifeboat no. 3, the second officer (off watch) boarded and took command of lifeboat no. 1, the boat he was originally assigned to. At 0819, the bridge was informed that lifeboat no. 1 was ready to be lowered with 100 people on board. The master gave the order to do so.

At 0823, the master asked the safety officer by radio if the fire was under control. He received a response that the garages were still full of smoke. Upon receiving the report, the master called Coast Guard Sector San Juan and stated “I’m sending all the passenger[s] on the evacuation now by the lifeboats. I cannot control the fire.”

Two minutes later, the commander of lifeboat no. 1, which was now in the water, reported that he was unable to release the hooks that connected the boat to the davit falls (wire ropes). The master replied, “The release works; you don’t know how it works, but it works.” The lifeboat no. 1 commander was then given instructions over the radio to break the clear plastic cover on the hooks’ release mechanisms, which was an override procedure for the hooks’ hydrostatic interlock systems.

About 0829, the crew in lifeboat no. 1 was still attempting to open the release hooks when an unidentified person either jumped or fell in the water. Video taken from a passenger’s mobile phone captured a second person jumping in the water from the lifeboat. The master requested assistance in rescuing the people, and both were rescued by a nearby Coast Guard small boat.



Figure 7. Lifeboat no. 1 in the water and unable to open the release hooks, about 0825. (Photo provided to Coast Guard by a *Caribbean Fantasy* passenger)

The lifeboat no. 1 crew eventually freed the boat from the hooks by removing each lifting eye from the closed hook by hand. The crew then attempted to clear the boat away from the ship, but, according to the first engineer who was on board, the engine started but did not have any thrust. The lifeboat was also taking on water, so one of the arriving tugboats, the *Diane Moran*, transferred the passengers and crew to the deck of the tugboat. The empty lifeboat no. 1 was later towed into San Juan harbor by the Coast Guard.

At 0837, the master gave orders to lower lifeboat no. 2. According to the commander of the boat, once lifeboat no. 2 was in the water, he was unable to open the hooks using the release handle, so the crew had to manually remove each lifting eye from the closed hook by hand. When clear of the blocks and the ship, lifeboat no. 2 was escorted under its own power by a Coast Guard small boat into the port of San Juan. The commander estimated he had 105 passengers on board, together with 4 crew.

Passengers and crew lined up on deck 7 aft of lifeboat no. 3 as it was prepared for embarkation. However, embarkation of the boat was delayed because there was no commander for the boat. Consequently, the master ordered the second officer (on watch) to go to lifeboat no. 3. From then on, only the master and the cadet remained on the bridge.

At 0847, the master ordered lifeboat no. 3 to be lowered when ready. About 6 minutes later, when the boat was in the water, the boat commander reported that the crew was unable to open the release hooks. In response, the master ordered the commander to try to release the hooks manually. At 0854, the commander informed the master he could not manually release the hooks, and, after all attempts to release the hooks failed, the commander reported that the boat was getting damaged from waves pushing it against the *Caribbean Fantasy*'s side.

While lifeboat no. 3 continued to lay against the side of the ship, the master turned his attention to the starboard MES, ordering all 11 starboard-side liferafts inflated. He then ordered the staff captain to assign a crewmember to go down the slide and work on gathering the rafts around the platform. The staff captain responded that the slide was not opening as it should and, if anyone was sent down, an accident could result. The master told the staff captain that from his view on the starboard bridge wing the slide looked fine and that the staff captain should send a crewmember down.

About this time, more response vessels began arriving on scene, including a boat from Customs and Border Protection (CBP), two police boats, a fire department boat, five tugboats, a Marine Spill Response Corporation boat, a second pilot boat, and several good Samaritan vessels. In addition to the Coast Guard small boats, a 55-foot-long aids to navigation (ATON) boat, *CG 55115*, proceeded to the accident site.¹⁷ Two Coast Guard MH-65 helicopters and a Fuerzas Unidas de Rápida Acción (United Forces of Rapid Action—FURA) Bell 429 helicopter also responded to the scene.

¹⁷ *ATON boats* are industrial platforms used by the Coast Guard to maintain the buoys, day boards, ranges, and other fixed aids along US waterways. Source: Coast Guard, *Coast Guard Compass*, "Coast Guard Boats," August 19, 2017, <http://coastguard.dodlive.mil/2017/08/coast-guard-boats/>.

Meanwhile, the *Joseph Tezanos* had received approval and tasking from Coast Guard Sector San Juan to respond to the accident and for the commanding officer to assume duties as on-scene coordinator (OSC) for the search and rescue (SAR) operation.¹⁸ The cutter arrived on scene at 0850, according to the vessel's log. Although the crew also logged that the commanding officer assumed duties as OSC, neither the cutter nor Sector San Juan formally conveyed this to the *Caribbean Fantasy's* master or other vessels in the area. The commanding officer later stated that he believed that the vessels and aircraft on site understood that the *Joseph Tezanos* was coordinating the rescue efforts.

The *Joseph Tezanos* commanding officer assigned dedicated personnel to handle radio traffic on the internal Coast Guard frequency, various VHF radio channels, and a radio channel for aircraft. He also established a 15-minute communications schedule with the Sector San Juan command center using a Coast Guard cell phone, and he assigned an individual to record the event using the vessel's surveillance camera system. The command center also monitored all radio communications between the OSC and SAR assets.

Using VHF channel 16, the *Joseph Tezanos* crew communicated with the master and other crewmembers of the *Caribbean Fantasy* in English while communicating with some of the other response vessels in Spanish. The cutter commanding officer told investigators that he had suitable communications with the Coast Guard vessels, tugboats, and pilot boats on scene. However, communications with the San Juan fire department boat and the San Juan police department boat were intermittent.



Figure 8. US Coast Guard fast response cutter *Joseph Tezanos* (WPC 1118) on the day of the accident. (Photo by Coast Guard)

¹⁸ The OSC is a person designated to coordinate SAR operations in a specified area. The OSC should be the most capable person available, taking into consideration SAR training, communications capabilities, and the length of time that the unit the OSC is aboard can stay in the search area. Source: IMO, *International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual*, Resolution A.894(2), November 29, 1999.

Aboard the *Caribbean Fantasy*, the starboard-side MES had been deployed, but no passengers had yet descended to the platform and embarked the liferafts. The master once again ordered the staff captain, who was near the starboard-side MES landing (the location where people would board the slide), to send a crewmember to the floating platform to pull in liferafts. This was necessary before any passengers started down the slide.

A crewmember went down the slide and, once he was on the platform, attempted to pull the liferafts alongside. When integrated with the MES, the liferafts should have remained in their containers when they were released to the water. The rafts that had dropped from the starboard side had inflated, however, and it was difficult to pull the rafts to the platform by hand in the winds and seas. Consequently, the master made multiple requests for the Coast Guard to position the rafts at the platform using their boats. The deck cadet also requested that all vessels near the *Caribbean Fantasy* pick up any liferafts and bring them to the platform for the embarkation of passengers.

According to Coast Guard records, the first report of people going down the starboard-side slide was at 0853. However, at 0906, the master observed that there were not enough rafts at the MES platform. He ordered the staff captain to hold off on sending any passengers down and to send only crew down to help pull the liferafts to the platform.

By 0912, liferafts had been pulled alongside the MES platform, but the large openings in the raft canopies that allowed for mass boarding were facing away from the platform. With the smaller opening facing the platform, the loading process was slowed. The master contacted the Coast Guard by radio and requested assistance with the raft alignment. After some confusion due to the master's accent and use of unfamiliar terminology, the OSC responded that assistance would be provided to help turn the liferafts.



Figure 9. Liferaft at the starboard-side MES platform with the main access opening facing away from the platform, about 0923. (Photo by Coast Guard)

About 2 minutes later, the master ordered the staff captain to send the maximum number of people to the liferafts via the starboard MES. He then radioed the Coast Guard and requested emergency assistance to lifeboat no. 3, stating that there were “close to 100 pax” (passengers) inside the boat and that the release hooks could not be opened. As a result, the lifeboat was hitting the ship's side and taking on water. The OSC responded that a 33-foot-long small boat was being sent to lifeboat no. 3.

About 0916, the crew hoisted lifeboat no. 3 back out of the water. During the hoist, the winch tripped off line, leaving the boat suspended about 6 feet above the water. (The prime mover for the winch was designed to lift the lifeboat with a crew of six only and not a fully loaded lifeboat.¹⁹) With the boat hanging at the ship's side and unable to be lowered, none of the Coast Guard small boats were able to be effectively positioned to remove people from the lifeboat. The master, who was monitoring this from the starboard-side bridge wing, requested assistance from the Coast Guard ATON boat, which had a higher freeboard (nearly 6 feet). The OSC responded by directing the ATON boat to lifeboat no. 3. About 1000, the ATON boat began extracting people from the lifeboat, a process that was slowed by the height of the lifeboat and the motion of the vessels in the seas. The lifeboat commander told investigators that as the passengers were transferred to the Coast Guard vessel, he had to convince some passengers who were beginning to panic not to jump into the water. The transfer of all passengers and crew from lifeboat no. 3 took about an hour and a half to complete.



Figure 10. *Caribbean Fantasy*, about 1015, during the final stage of abandonment, with its starboard anchor down. (Photo by Coast Guard)

Evacuation of the remaining passengers by MES continued as vessels in the area brought liferafts to the platform. At 0923, the master reported to the Coast Guard that one of the liferafts that was filled with people was let go from the platform and was drifting away from the ship toward the shore line. The OSC responded by sending a small boat to recover the raft.

¹⁹ Schat-Harding, *Installation, Operation and Maintenance Manual, VIP Davits/W-winch*, ed. 971117, page 6.

From then on, each liferaft was filled at the platform one at a time. When a liferaft was full, it was towed away from the ship by a Coast Guard small boat. Once a raft was clear of the platform, the passengers and crew were transferred to another vessel. The passengers and crew were then taken to the port of San Juan. At San Juan's pier 6, the receiving area designated by the Coast Guard mass rescue operation (MRO) plan, the passengers were accounted for, triaged, and processed by CBP.

Fifteen minutes after its arrival on scene, the FURA helicopter had begun ferrying shore-based firefighters, Puerto Rico police rescue personnel, and Puerto Rico Emergency Management Agency (PREMA) personnel out to the *Caribbean Fantasy* and deploying them on board. By about 0925, a total of 14 persons were landed on board with SCBAs and personal protective equipment. The master later informed investigators that he did not authorize, nor was he aware of, the landing of shore-based firefighters and first responders on board. Coast Guard Sector San Juan command center personnel were also unaware of the three shore-based fire teams on board. According to the Coast Guard captain of the port (COTP), he learned of this only after speaking to the fire chief when they were at the San Juan pier 6 receiving site.

Once on board, the shore-based teams staged themselves near the emergency diesel generator room on the starboard side of the ship on deck 7 forward. According to one of the firefighters, on at least two occasions the firefighters made attempts to gain access to the engine room. The chief engineer was asked to accompany the firefighters because he was most familiar with the location of the fire and how to get around the ship. On the first access attempt, a firefighter reported seeing fire on the way down to the engine room. Given the poor visibility, the exact location where the fire was sighted could not be confirmed. During the second access attempt, the firefighter explained that they were able to make it down about two decks via a stairway near the galley on deck 5 but were then forced back because of the smoke and heat.

At 0948, the OSC asked the master how many persons remained on board. He replied that he did not have a complete count, but about 70 people remained, including crewmembers. He requested assistance in getting the two nearby liferafts to the platform and stated that, once delivered, he could have everybody off in 5 minutes.

The master also requested that a vessel pull the MES platform forward (toward the *Caribbean Fantasy* bow) to make a better angle for the slide, noting that there were injuries because of the existing steep angle. About 1009, a Coast Guard small boat attached a line from its bow to the MES platform. Operating in astern propulsion, the small boat pulled the platform forward as requested by the master. About 2 minutes later, upon seeing an improvement in the angle of the slide, the master ordered the staff captain to send the remaining passengers and crew down.



Figure 11. Bow of Coast Guard small boat, about 1012, as it began to pull the starboard-side MES platform forward, with another small boat holding a liferaft to the platform. Two evacuees with lifejackets are on the slide, while many others are looking over the ship's side from the deck above the MES embarkation landing. (Photo by Coast Guard)

The *Caribbean Fantasy* was still adrift and setting in a southwesterly direction. Recognizing that the vessel was nearing shoal water, the tugboat *Diane Moran* made up to a mooring line from the ship in an attempt to hold the vessel. However, the captain of the *Diane Moran* expressed concern about towing the ship ahead and the effect it would have on the angle of the MES slides and platform; if he pulled the ship ahead, the MES platforms would move aft. At 1012, he recommended to the OSC that the *Caribbean Fantasy* drop anchor. The OSC relayed this recommendation to the master, who in turn ordered the starboard anchor dropped and held to six shackles in the water.²⁰ The ship continued to drift, however, and its stern grounded on a sandy bottom about 1021.

About the same time as the anchor was dropped, a Coast Guard MH-65 helicopter, which had been flying a pattern around the ship on guard for persons in the water, was directed by Sector San Juan to evacuate as many people as possible from the ship via hoist operations. The helicopter came into a hover over the designated hoist area on the *Caribbean Fantasy* and lowered a rescue swimmer to the deck. The rescue swimmer then directed the evacuation of predominantly elderly and disabled passengers to the helicopter via basket hoist. When the helicopter was at full capacity with four passengers, it departed with the rescue swimmer to take the passengers to Isla Grande airport, about 4 miles away. Another Coast Guard helicopter then arrived to continue hoist operations. A total of eight persons and one dog were retrieved by Coast Guard helicopters. Four dogs were also taken off the ship by the FURA helicopter. (The remaining two dogs were unaccounted for and were later found deceased on board the ship.)

At 1023, the master made three attempts to hail the “Coast Guard commander” on VHF channel 16. After each call, the Coast Guard cutter crew responded, “cutter *Joseph Tezanos*.” After the third response from the cutter, the master then asked, “are you the Coast Guard commander?” The response was “Yes, we are the Coast Guard cutter located off the starboard side of your ship.”

²⁰ One *shackle* is 90 feet (27.4 meters).

This was the first time that the master understood that the *Joseph Tezanos* commanding officer was the OSC. The master later told investigators that he recalled hearing “*Joseph Tezanos*” over the radio before this exchange but thought the communications were referring to someone’s name and not the OSC’s vessel.

The fire continued to burn on the *Caribbean Fantasy* throughout the abandonment of the ship. The intense heat generated by the fire caused paint on both sides of the ship to blister and eventually burn off, falling into the water. On the starboard side of the ship, this included paint above the waterline, forward of the MES, and adjacent to the engine casings extending from the engine room to the stacks. Although close to the MES, none of the pieces of paint that fell came into contact with the slide, platform, or any of the liferafts.

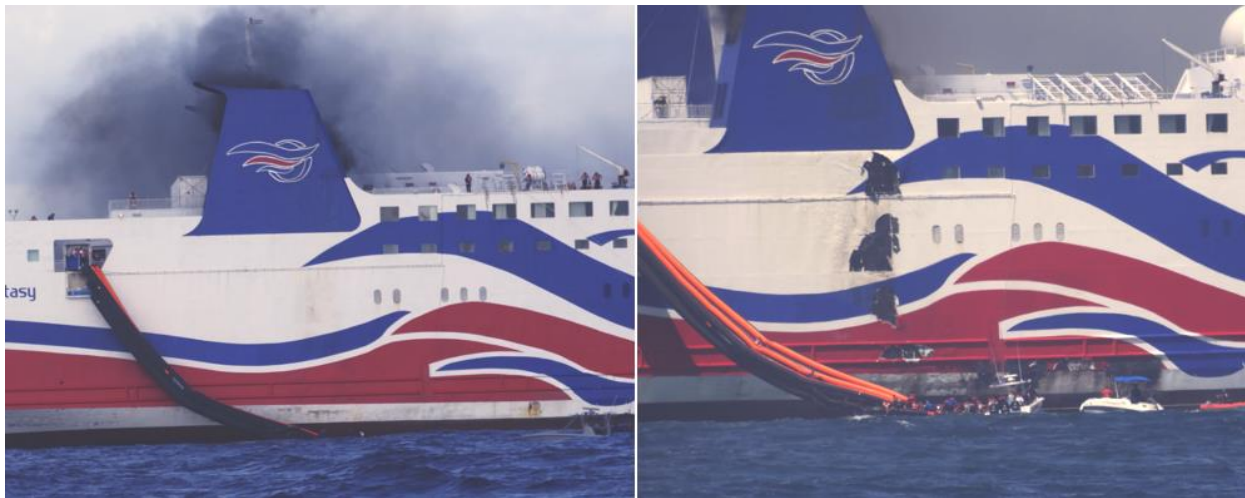


Figure 12. On the left, at 0853, paint is starting to blister at the waterline. On the right, at 1049, large pieces of paint are missing from the ship’s side starting at the waterline and extending to the stack. (Photos by Coast Guard)

About 1030, the master informed the OSC that the last of the passengers had abandoned the ship. He then coordinated with the safety officer and staff captain to release the crew from their stations. This included the crewmembers manning the starboard-side MES. The remaining persons arriving at the MES platform were picked up directly by Coast Guard, CBP, and good Samaritan vessels and brought to pier 6. Video taken from the *Joseph Tezanos* showed the last person coming down the slide at 1104. At 1119, the master informed the OSC that there were 6 people remaining on board. (The transfer of people from lifeboat no. 3 was ongoing, with the last person transferred to the ATON boat about 1130.)

The emergency plan called for pursers and assistant pursers assigned to each muster station to conduct a “roll call” of passengers and crew. However, the hotel director told investigators that the roll call of passengers did not take place because passengers were ordered to embark survival craft shortly after receiving the order to proceed to their muster stations. Although there was no full accounting of passengers and crew, the master stated that he was confident no one remained on board because the crew had conducted several sweeps of the accommodation and public spaces.

Once the starboard MES was no longer manned, the platform and slide drifted away from the ship, which allowed a tugboat and firefighting vessel to spray the ship’s side to cool the burning areas.

Only five crewmembers remained on board the *Caribbean Fantasy*: the master, the staff captain, the safety officer, the chief engineer, and the chief electrician. The OSC requested that all remaining persons leave the ship, but the master responded that shore-based firefighters were still on board and that they had requested that the chief engineer and chief electrician remain behind to help with firefighting efforts. The master stated that it was his wish to remain on board with the shore-based firefighters and his crew accompanying them. At 1150, the master replied to the OSC that he would try to reach the firefighters to direct them to leave the ship, but they were down in the engine room.

The master was able to contact the chief engineer and firefighters, and he ordered them to the helicopter deck. Once there, he reported to the OSC that he had all remaining crew and that they were ready to depart the vessel. About 1224, the FURA helicopter landed on deck and picked up the remaining five crew, leaving the shore-based firefighters behind. After transporting the crew to the airport, the helicopter returned to the *Caribbean Fantasy* to pick up the shore-based firefighters, making two separate trips. All persons were off the ship just before 1300.

At 1320, the OSC established a 1,000-foot security zone around the *Caribbean Fantasy* to prevent unauthorized vessels or aircraft from approaching the vessel. At 1422, the Coast Guard cutter *Richard Dixon* arrived on scene and its commanding officer assumed the role of OSC from the *Joseph Tezanos*' commanding officer. The commanding officer of the *Joseph Tezanos* stated to investigators that he had never participated in an MRO exercise, nor had he experienced a SAR case of this nature previously. The Coast Guard crewmember on the *Joseph Tezanos* that was assigned VHF radio channel 16 also indicated that he had no formal training related to the MRO or the lifesaving systems such as the MES on board the *Caribbean Fantasy*.

The *Caribbean Fantasy* remained aground outside the port of San Juan for 3 days, and the fire continued. On August 20, the vessel was towed into the port, where the fire was extinguished by marine salvage and firefighting crews.

1.3.3 Shoreside Rescue Operations

In fiscal year 2002, the US Congress authorized the Coast Guard to create permanent positions in the agency to develop and maintain an MRO program. The program, now called the Passenger Vessel Safety Program, requires the Coast Guard to plan and prepare for MRO events and includes periodic exercises incorporating the agency's many federal, state, and local emergency response partners. Each of the Coast Guard districts has an individual passenger vessel safety specialist (PVSS) assigned to execute the elements of the program. Although a sector is subordinate to a district, Coast Guard Sector San Juan has its own PVSS assigned due to the significant number of large passenger vessels that operate in that command's area of responsibility, which includes a large portion of the eastern Caribbean and the US Virgin Islands. Sector San Juan's PVSS maintained and regularly exercised the elements of the unit's MRO plan, and the plan was last revised in January 2016.

When the PVSS was informed of the fire on board the *Caribbean Fantasy*, he proceeded to the Sector San Juan command center to assist. Upon arrival, he spoke with the commanding officer, the chief of the Preventions Department, and other senior command representatives about the landing site for the passengers and crew to be taken ashore. Earlier in the year, San Juan's PVSS had held an MRO planning meeting with emergency response personnel in the San Juan area, and the attendees at that meeting had agreed that Pier 6 in the port of San Juan was the preferred landing spot for survivors during an actual MRO. Pier 6 was chosen because it was lower

than most of the other nearby locations and had a floating dock that was accessible by small rescue vessels with low freeboard. After discussing the landing site with Sector San Juan leadership, the PVSS proceeded from the command center to Pier 6, which was approximately 1 mile from the unit, assumed the role as landing site manager, and began to coordinate with other emergency responders to clear access routes and assist with the setup of staging areas to accommodate the survivors.

Other organizations responding shoreside included the CBP; FURA; and the City of San Juan's emergency operations center (EOC), emergency medical services (EMS), police, and fire department. The various organizations established an incident command post and reception facility on Pier 6 to manage the response. A triage station was also set up on the pier to assess each passenger's medical condition. When passengers began arriving ashore, EMS transport units took individuals needing medical treatment beyond first aid to one of nine medical facilities in the area.



Figure 13. Passengers and crew from *Caribbean Fantasy* lifeboat no. 2 disembarking at Pier 6, port of San Juan, about 1015. (Photo by Coast Guard)

1.4 Background

1.4.1 The Vessel

Caribbean Fantasy was built by Mitsubishi Heavy Industries in Kobe, Japan, and completed in 1989. Originally named the *Victory*, the vessel sailed with the Higashi Nippon Ferry services in Japan from 1989 to 1998 and with the Grandi Navi Veloci services in Italy from 1998 to 2008. The vessel was purchased in early 2008 by Baja Ferries S.A. de C.V., renamed the *Chihuahua Star*, and put into service in the Gulf of California under the flag of Mexico.

In the spring of 2011, the company began the process of shifting the operations of the vessel from Mexico to scheduled runs between the ports of San Juan and Mayaguez, Puerto Rico, and Santo Domingo, Dominican Republic, under a time charter agreement with America Cruise Ferries, Inc. On October 21, 2011, the company officially changed the name of the vessel to

Caribbean Fantasy and changed the flag to Panama. Although marketed as a cruise ferry, the company had no affiliation or membership with any cruise industry trade groups.

The ship's propulsion system consisted of two 14,400 hp (10,738 kW) medium-speed diesel engines driving two controllable-pitch propellers. The *Caribbean Fantasy* had three diesel electric generators that powered the vessel's various equipment and electrical systems.

The *Caribbean Fantasy* was subdivided into five main vertical zones (MVZs) that provided both watertight integrity and thermal containment. The thermal containment divisions were rated at "A-60" class, which indicated that they were designed to limit the transmission of heat, flames, and smoke to an adjacent or overhead area for a period of 60 minutes. The ship also had two main horizontal zones (MHZs) subdividing the garage decks, with A-60 insulation in between. Six watertight doors provided access between the MVZs.

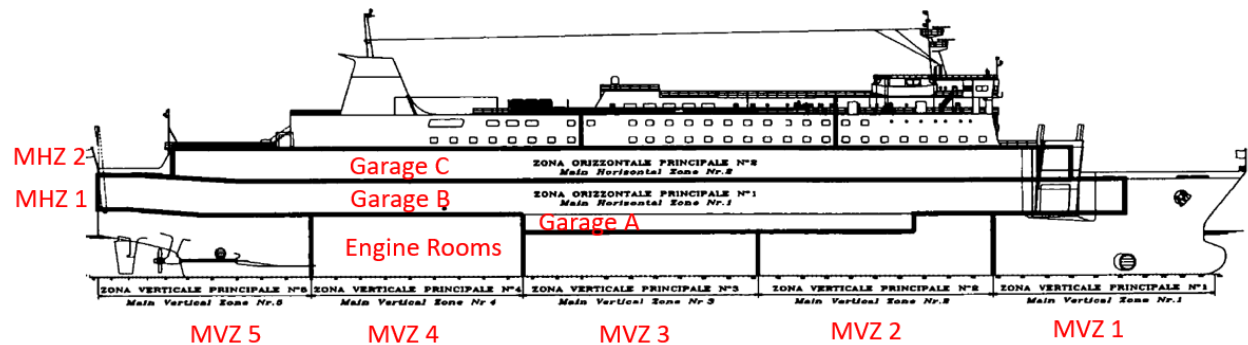


Figure 14. Profile of *Caribbean Fantasy* showing garages and fire zones.

1.4.2 Shipboard Organization

Deck Department. The *Caribbean Fantasy*'s deck department organization followed cruise industry practices. The ship's master was overall in command, with the staff captain as second in command. The staff captain was responsible for the deck department and all deck operations, including safety. The staff captain did not occupy a watchkeeping position and was typically on the bridge for arrivals, departures, emergencies, or at any time as determined by the master. The safety officer reported to the staff captain and was responsible for all crew safety training, maintenance and inspection of safety equipment (excluding fixed firefighting systems), and compliance with the ship's emergency plan and station bill.

The ship had three watchkeeping officers (two second officers and one third officer) each of whom worked one of the traditional watchkeeping periods of 8–12 (AM and PM), 12–4, or 4–8. In addition to their watchkeeping duties, the watchkeeping officers had maintenance and inspection duties.

The senior deck rating, the bosun, reported to the staff captain and supervised all deck maintenance activities. The deck department was responsible for the maintenance and upkeep of the ship's hull and superstructure, crew emergency duty training and compliance, lifesaving and firefighting equipment maintenance, and operational readiness.

Engine Department. The chief engineer reported to the master and was responsible for the engineering spaces and machinery. He was also responsible for monitoring the condition of fixed and mobile firefighting systems and appliances and ensuring that they were in constant readiness. The first engineer was subordinate to the chief engineer and was responsible for the

maintenance of the main engines and auxiliary equipment. He did not stand a watch but oversaw all maintenance and repair activities with the engines.

There were three watchkeeping engineers (a second engineer and two third engineers), and each worked the traditional 8–12, 12–4, and 4–8 watch schedule in parallel with bridge personnel. Normally, two motormen were also assigned to each watch and carried out routine inspections, maintenance, and rounds in the engine spaces. However, just prior to the accident, one of the six motormen signed off the ship and his position on the 4–8 watch was filled by a wiper.

The remainder of the engine department staff were dayworkers who did not stand watch.

Hotel Department. The largest department on the ship was the hotel department, which was under the supervision of the hotel director. The hotel director reported to the master and was responsible for all hotel operations, such as passenger comfort and accommodations, food and beverage preparation and delivery, bar and galley spaces, passenger entertainment, and onboard revenue. During an emergency, the hotel director and his staff were responsible for the evacuation, mustering, and accountability of the passengers.

1.4.3 Emergency Plan and Station Bill

The *emergency plan and station bill* provided all crewmembers with their emergency duties and survival craft assignments. It outlined the ship's emergency signals and specific teams that were designated to respond to emergencies such as a fire, man overboard, oil spill, security incident, medical emergency, general emergency, or abandonment.

Investigators found two different versions of the emergency plan and station bill on board the *Caribbean Fantasy* following the accident. A plan found posted in the engine control room was stamped “approved” by the vessel's classification society, RINA Services S.p.A, and dated February 2, 2016.²¹ Another plan found on the bridge was stamped “provisionally approved” and dated July 3, 2016 (the date that the vessel left the Tunisian shipyard). The two plans differed significantly, with variations in survival craft assignments, code words and signals, and emergency duties of crewmembers. For example, the code for a fire emergency in the February plan was “red-red-red,” while the code for the same emergency on the July plan was “Mr. Skylight.”

Prior to 2016, the *Caribbean Fantasy* had used an emergency plan and station bill for an extended period of time, and the crew was familiar with this plan. According to statements by crewmembers and company representatives, the plan that was introduced on February 2, 2016, implemented several changes to the previous plan and required training and familiarization with the crew. However, soon after the February plan was approved, most of the hotel crew left the ship when the *Caribbean Fantasy* entered the Tunisian shipyard. The crew rejoined the ship less than a week before the US Coast Guard port state control inspection, and thus they had little time to become familiar with and train on the February plan. Therefore, in order to successfully complete the inspection, the decision was made to revert back to the former plan that the crew was familiar with. The former plan was reinstated with the approval of the July 3 emergency plan and station bill and was in effect during the accident voyage.

²¹ *Classification societies* are nongovernmental organizations that establish and maintain standards for shipbuilding and operations. They may also be delegated by a flag state to perform certain flag-state vessel inspection and certification functions. A classification society carrying out responsibilities on behalf of the flag state is known as a *recognized organization*.

The RINA head office had only a record of the February 2 emergency plan and station bill. When interviewed by investigators, RINA representatives stated that the July 3 emergency plan and station bill was approved locally by the classification society's surveyor in Tunisia, and no further submission of documentation was required. RINA representatives told investigators that the classification society approved only the format of the emergency plan and station bill and not its specific contents.

Unless otherwise stated, references to the emergency plan and station bill in this report are from the July 3 plan.

Command and Control. The emergency plan and station bill for the *Caribbean Fantasy* established the duties for various personnel on the bridge during an emergency. During such an event, the bridge was designated as the command center and organized to manage tasks and activities during the response. The master, in overall command, was responsible for overseeing the safety of navigation, operation of the vessel, and the emergency response. He was also in charge of announcements to passengers. The staff captain was responsible for managing the actual emergency while in communication with the on-scene commander—the safety officer—and other emergency teams. According to the emergency plan and station bill, the first officer was responsible for the ship's intact and damage stability condition and the use of the bilge and ballast system. During the accident voyage, no first officer was assigned to the ship, and thus one of two second officers was assigned these responsibilities. The other second officer was tasked with relieving the watchkeeping officer on duty and overseeing emergency communications and operation of the ship's global maritime distress and safety system (GMDSS) equipment. In addition to these four deck officers, a deck rating was assigned to the bridge as helmsman.

Fire Response Teams. As the on-scene commander, the safety officer was responsible for the organization, deployment, and accountability of the fire response teams. The four teams of crewmembers were assigned specific tasking and equipment for fire response. The teams were organized as follows:

- Quick-response team consisting of the on-scene commander and three crewmembers.
- Fire squad no. 1 consisting of seven crewmembers, four with SCBAs and firefighter's outfits, specializing in firefighting in accommodation spaces.
- Fire squad no. 2 consisting of six crewmembers, four with SCBAs and firefighter's outfits, specializing in firefighting in engine spaces. Four members of this squad were from the engine department.
- Boundary cooling team consisting of five crewmembers, none of which had SCBAs or firefighter's outfits.

Engine Control Room Team. According to the emergency plan and station bill, the ECR team was to be led by the chief engineer and manned by seven people responsible for managing all aspects of machinery and propulsion systems, emergency systems and fixed firefighting systems in machinery spaces, and communications with the command and control team. The chief engineer was responsible for maintaining accountability of personnel in machinery and technical spaces, activating the ship's CO₂ fixed firefighting system, and communications with the bridge. The first engineer reported to the chief engineer and was responsible for the activation of both the water-mist and drencher fixed firefighting systems. A third engineer and motorman were assigned to relieve the engineer and motorman on duty in the ECR. The chief electrician and first electrician

managed electrical distribution from the main switchboard and the emergency diesel generator. The air conditioning engineer was responsible for isolating ventilation in various spaces as directed by the command and control team. This included the operation and shutdown of various fans and fire dampers throughout the vessel.

The ECR was in the main engine room and was not separated from that space by any fire protection boundaries. The emergency plan and station bill and supplementing emergency organization instructions did not identify a secondary area for the ECR team to assemble in the event of a fire in the main engine room.

Evacuation Control Team. The evacuation control team was responsible for managing the evacuation of passengers and crew from accommodation spaces, confirming that all accommodation spaces were evacuated, guiding the passengers to their respective muster stations, providing crowd control, and accounting for all on board. The team was led by the hotel director. The chief purser assisted the hotel director by managing the passenger reception area and the manifest of all passengers and crew.

Each hotel department head or manager on board the ship reported to the hotel director when their respective zone had been searched and cleared: the chief housekeeper was responsible for all passenger cabins; the bar manager was responsible for all public areas; the dining room manager was responsible for all restaurant and buffet areas; and the executive chef was responsible for all galleys and crew mess rooms. Each team leader had a checklist to keep track of spaces that were reported clear and informed the hotel director of the evacuation progress. The hotel director, in turn, would communicate this progress to the command center on the bridge.

Lifeboats and Liferafts. Upon the order to abandon the ship, each of the deck watchkeeping officers was assigned to command one of the ship's three lifeboats, with an engineering officer also assigned to each boat. Other officers and crew were assigned duties in a lifeboat or liferaft. The master was assigned to command liferaft no. 24, notionally the last liferaft to be launched and occupied in a ship abandonment.

1.5 Injuries

The *Caribbean Fantasy's* charterer could not provide the Coast Guard with an accurate total number of crew and passengers who required medical treatment beyond first aid, as only the individuals taken to two of the nine hospitals that treated passengers were tracked by name. Records provided by America Cruise Ferries stated that 50 people were treated at the various hospitals. According to computer-aided dispatch records provided to investigators, a total of 49 passengers and crew were transported to local area hospitals. Records stated that patients were treated for knee, ankle, and leg injuries; hypertension; high blood pressure; fainting; body aches; breathing difficulties; vomiting; dehydration; and conditions related to pregnancy.

Based on the dispatch records and other documents obtained by the National Transportation Safety Board (NTSB), only six injuries were considered serious according to International Civil Aviation Organization (ICAO) criteria.²² These included ankle injuries incurred while sliding down the MES and one case of smoke inhalation.

²² The NTSB uses the ICAO injury criteria in all of its accident reports, regardless of transportation mode. A serious injury is a non-fatal injury that requires hospitalization for more than 48 hours, commencing within 7 days

1.6 Damage

The damage to the *Caribbean Fantasy* was estimated at \$20.1 million, according to a survey conducted by Braemar Technical Services, Inc.²³ Engine room machinery and equipment, steel plating and structures, and cargo sustained heat and smoke damage. Fixed firefighting systems were damaged due to heat. Engine room spaces, cargo decks, and accommodation spaces were affected by soot. Additionally, lifesaving appliances were damaged during deployment and postaccident handling. In lieu of making repairs, Baja Ferries elected to scrap the vessel.

1.7 Engineering Factors

1.7.1 Main Propulsion Engines

The *Caribbean Fantasy*'s main propulsion was provided by two medium-speed Mitsubishi MAN B&W 8L58/64 diesel engines. The engines were constructed and installed at Mitsubishi Heavy Industries in Kobe, Japan, under a license agreement with MAN B&W Diesel AG (now MAN Diesel & Turbo SE). Each four-stroke, in-line (single-bank), non-reversing engine had eight cylinders and was capable of producing 14,203 horsepower (10,591 kW).

Each engine was connected via a Vulkan coupling to a single helical reduction gear and then via a shaft to a four-bladed, 20.8-foot- (6.37-meter-) diameter controllable-pitch propeller.²⁴ The vessel's service speed was 22 knots, with a maximum speed of 24.5 knots at 413 rpm and a controllable pitch angle of 35 degrees ahead.

The *Caribbean Fantasy* had engine propulsion control stations on the bridge and in the ECR. This arrangement enabled operators to transfer control of engine speed and direction of thrust between the bridge and the ECR. Maneuvering lever commands and associated rpm and speed tables were found on metal placards near the engine control stations on both the bridge and in the ECR.

1.7.2 End Flange on Port Main Engine Fuel System

The end flange on the port main engine fuel system supply line where the leak was reported to have occurred was closed off using a blanking plate and four threaded bolts and nuts, with gasket material between the flange and plate.²⁵ During postaccident examination, the end flange, gasket, and blanking plate were found heavily sooted and covered with fuel. In the vicinity of the end flange, an area of clean burn was found on the turbocharger exhaust duct.

Investigators reviewed corrective and preventative maintenance records and engine log book entries, but found no record of when the blanking plate, gasket material, and fasteners for the end flange were last repaired or replaced. The blanking plate was not produced by the original equipment manufacturer (OEM). Had it been provided by the OEM, it would have been fabricated to a design or quality standard (for example, Japanese Industrial Standards [JIS] or ASTM

from the date the injury was received; results in a fracture of any bone; causes severe hemorrhages, nerve, muscle, or tendon damage; involves any internal organ; or involves second- or third-degree burns, or any burn affecting more than 5 percent of the body surface.

²³ Braemar Technical Services Inc., "*Caribbean Fantasy*" Advice No. 3 Summary, January 18, 2017.

²⁴ *Vulkan* is the name brand of marine drivetrain couplings manufactured by VULKAN Kupplungs- und Getriebbau Bernhard Hackforth GmbH & Co. KG.

²⁵ A *blanking plate* is a circular metal plate that is fitted in a piping system between two flanges or on an end flange. When installed with a gasket, the plate prevents the passage of fluid past a flange.

International standards). The plate's diameter did not match the flange, and it did not have a raised face. Further, the blanking plate had eight unused fastener holes in addition to the four that were used to secure it to the flange.

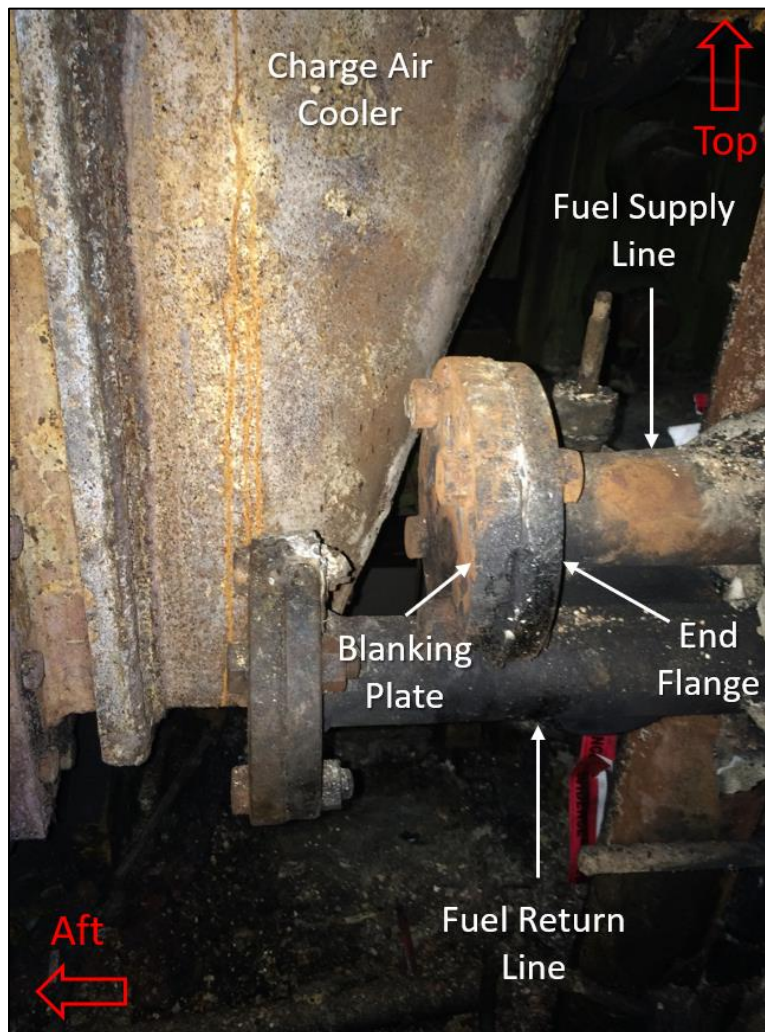


Figure 15. Postaccident photo of the fuel supply line end flange on the port main engine. A similar end flange for the fuel return line is below the supply end flange.

The OEM's specification for the gasket material to be used with the end flange and blanking plate was a joint sheet made from a non-asbestos fiber mixed with a heat- and chemical-resistant nitrile butyl rubber binder. After the accident, the gasket material from the *Caribbean Fantasy's* end flange was recovered and analyzed by the NTSB materials laboratory and a third-party laboratory. A spectral analysis found that the material was a strong match to polydimethylsiloxane, also known as silicone rubber. Silicone rubber has a low resistance to breakdown by fuel. Gasket material from the starboard main engine fuel system was also analyzed and determined to be nitrile rubber, which has a higher resistance to breakdown by fuel.

There was no inspection of or lifecycle management for the gasket material for any of the main engine fuel supply and return lines. Gaskets were being replaced only after failure. (Maintenance records showed that the starboard fuel supply end flange gasket had been replaced on August 11 as a result of a discovered leak. The replacement gasket for the starboard end flange was hand-cut by the motorman performing the repair.)



Figure 16. Fuel supply line end flange and gasket material, left, and blanking plate, right.

1.7.3 Fuel Lines and Splash Guards

SOLAS regulation requires that fuel be “screened or otherwise suitably protected to avoid oil spray or oil leakage onto possible ignition sources.”²⁶ The purpose of the regulation is to prevent the ignition of combustible materials or flammable liquids. MAN Diesel & Turbo developed and distributed a customer information letter, CUS 321, in February 2013, titled *Splash Guard, Instruction for correcting guarding*. The letter informed owners of the SOLAS requirement and offered solution packages from MAN-approved providers. The customer information letter was sent on March 11, 2013, via mail to Baja Ferries in Mexico.

Several engineering crewmembers told investigators that the fuel supply end flange was wrapped with SOLAS-approved spray tape. The multilayer adhesive tape composed of aluminum, glasscloth, and a polyethylene terephthalate (PET) liner was designed to mitigate the risk of fuel spray on surface temperatures greater than 428 degrees F (220 degrees C). Investigators reviewed several manufacturers’ instructions for installing anti-spray tape, and in each case the manufacturer recommended at least two layers of tape around the surface to be protected. However, during the postaccident examination of the *Caribbean Fantasy*’s engine room, investigators discovered several places where only one layer of tape was fitted around the fuel flanges and connections and at least one flange where no tape was installed. Photo evidence indicates that there was only one layer of tape on the fuel supply end flange where the fire started.

²⁶ IMO, SOLAS Chapter II-2, Regulation 4, *Probability of Ignition*.

1.7.4 Quick-Closing Valves

Fuel and lube oil QCVs are positive shutoff valves on fuel and lube oil system tanks designed to isolate the tanks in the event of an emergency. For the safety of the crew and the vessel, these valves can be remotely operated in situations where local operation is impossible or impracticable due to a hazardous situation. In some circumstances, QCVs may be the only means of shutting off the fuel to a flammable-liquid fire. Proper routine maintenance and, in some cases, approved modifications or replacement of components may be necessary to ensure reliability of the remote operation and closure of the valves. On January 31, 2011, the Coast Guard issued a Marine Safety Alert after port state control officers discovered many QCVs that were intentionally modified and poorly maintained, which prevented the valves from operating as designed during an emergency.²⁷

After the *Caribbean Fantasy* had been detained in Gibraltar in early July 2016, a RINA surveyor conducted a “Port State Control Preventive Assessment” to verify the deficiencies recorded. In the surveyor’s report, a photograph of the portside lube oil storage tank QCV shows a bolt and nut lodged in the valve mechanism, which would have prevented the valve from operating as designed. No deficiencies relating to QCVs were recorded in the narrative section of the RINA report form.²⁸

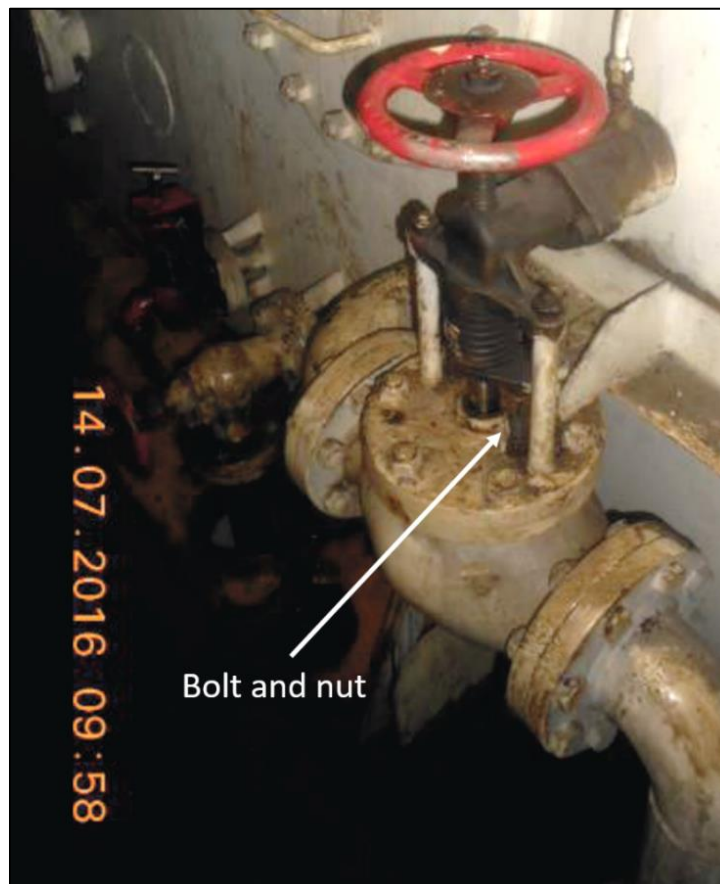


Figure 17. Enlargement from photograph of the portside lube oil storage tank QCV in RINA Port State Control Preventive Assessment report.

²⁷ US Coast Guard, *Inspection of Fuel Oil Quick-Closing Valves*, Marine Safety Alert 01-11, January 31, 2011.

²⁸ RINA, *Port State Control Preventive Assessment*, RINA no. 7647, File no. 16/XA/695/01.

Operation of QCVs were spot-checked during the Coast Guard port state control inspection on August 9, 2016, in San Juan. No deficiencies were noted. The port state control officers allowed the ship's crew to demonstrate the QCVs' operation using shipboard procedures. The port state control officers and the ship's crew told investigators that a bolt and nut were placed between the valve stems to keep the vital systems online and avoid a blackout during the inspection. Investigators were not able to find the shipboard procedure for the testing and inspection of the QCVs.

After the accident, investigators discovered that all eight fuel and lube oil QCVs were blocked open with a bolt and nut, which rendered the valves unable to isolate fuel and lube oil from the main engine room during the fire.



Figure 18. Postaccident photo of *Caribbean Fantasy's* starboard heavy fuel oil (HFO) storage tank QCV that was blocked open with a bolt and nut.

Figure 18 above shows the starboard heavy fuel oil (HFO) storage tank QCV that was blocked open with a bolt and nut. The bolt is under compression in the photograph. Red paint (the same color as the valve body), dust, dirt, and rust were present on the nut and bolt threads. The presence of soot in this area was minimal.

After the accident, the parties to the investigation and the chief engineer evaluated the port lube oil storage tank QCV. The chief engineer removed the bolt and nut blocking the valve open, and the valve stem moved in the downward direction about 2 inches, closing the valve.

Under the SOLAS regulation, vessel owners and operators are required to have a maintenance plan in place for fuel supply emergency shutdown equipment. Further, this emergency shutdown equipment should be kept in good order to ensure readiness for immediate use during a fire. Investigators requested maintenance records from the owner and operator to determine the last maintenance or functional tests performed on the eight QCVs. No corrective or preventative maintenance records were on board the vessel, and the QCVs were not specifically listed as part of the monthly, quarterly, semiannual, or annual maintenance checks.

1.7.5 Ventilation Dampers

Four dampers were installed in the ventilation on each side of the *Caribbean Fantasy*'s main engine room. As he evacuated the ECR, the chief engineer actuated the ventilation shutdown pneumatic valve. Despite the closure, photographs and video of the *Caribbean Fantasy* during the accident show smoke exiting from the stacks.

1.7.6 Firefighting and Fire Prevention Systems and Equipment

Carbon Dioxide Fixed Firefighting System. The CO₂ fixed firefighting system for the main engine room and auxiliary engine room was designed by Minimax and was required by SOLAS regulation. CO₂ systems extinguish a fire by starving it of oxygen. The CO₂ room was located on the port aft corner of garage B on deck 3, with a ladder and hatch to deck 4. (During the postaccident examination, this hatch was inoperable from deck 4 and was found to be strapped closed from inside the CO₂ room.) The system contained a total of 110 60-liter (45-kilogram) CO₂ cylinders. After the accident, all of the bottles in the CO₂ room were weighed and determined to be empty of gas.

Water-Mist Fixed Firefighting System. The HPN Nebula water-mist fixed firefighting system, manufactured by Ciodue Acqua S.r.l., was installed in various machinery spaces on the *Caribbean Fantasy* in 2005 as required by SOLAS regulation. This type of system is designed to suppress a fire in a localized area through a high-speed mist containing small droplets with a very large total water surface area, providing efficient cooling of the fire. The speed of the droplets enables the mist to penetrate combustion-related gases and reach the source of the fire and heat. The HPN Nebula system was an open-nozzle, dry-pipe (supply pipes normally empty when not in operation) system, which could be activated either manually or automatically. It was manually activated by pressing a button for the affected area on the system panel in the ECR, at the system skid in the air conditioning machinery room forward of the engine room, or at one of three remote activation panels: one located outside the engine workshop, another in the auxiliary engine room, and the third at the entrance to the engine room in garage A. The system was automatically activated when the water-mist control panel received a fire alarm (either smoke or heat) in an area protected by water-mist. The control panel also illuminated visual indicators and sounded audible alarms to signal that the system had been activated. Water-mist application nozzles were installed over the main engines (4 nozzles per engine), diesel generators (2 nozzles per generator), fuel purifiers and boilers (3 nozzles), and fuel booster pumps (1 nozzle per pump). When the system was activated, freshwater from the no. 8 port and starboard tanks flowed to selected nozzles. The system was also attached to the fire main, which could supply seawater when manually aligned.

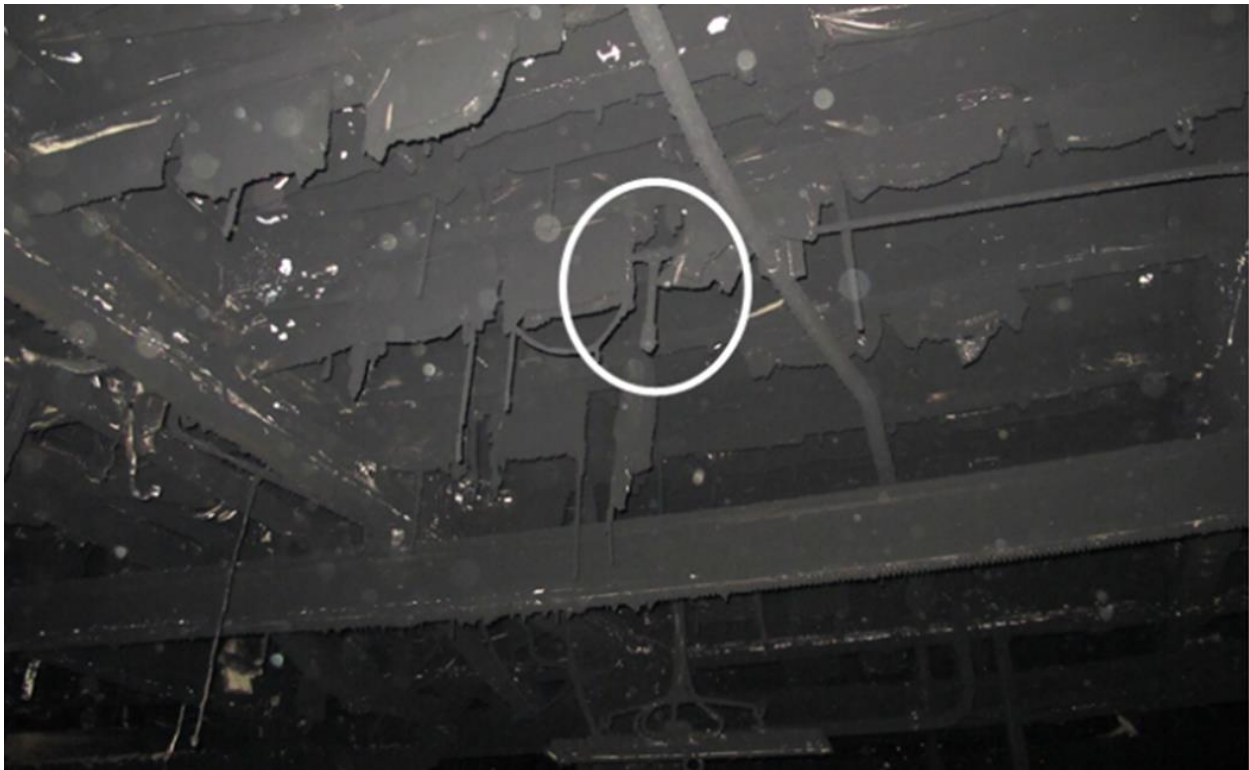


Figure 19. Water-mist system nozzle after the fire.

The chief engineer stated during his interview that he manually actuated the water-mist system by pushing the buttons located on the control panel in the ECR. Several smoke detectors alarmed during the event, which also would have activated the system, but the closed fire detection loop responsible for the automatic release of the system was in “fault” and inoperative at the time of the fire. According to the pressure gauges on the system skid, the water-mist system activated for both main propulsion engines, a fuel booster pump, and the no. 2 and no. 3 diesel generators. These activations were verified by VDR data.

The chief engineer stated in his interview that the panel in the ECR was in manual mode before the fire. This could not be confirmed as the switch position was unmarked on the panel.

Water Drencher System. A water drencher system (also known as a deluge system), required by SOLAS regulation, was installed on all three garage decks of the *Caribbean Fantasy*, with a total of 1,165 removable nozzles. Drencher systems are used for special hazards where rapid fire spread is a concern, as they provide a simultaneous application of water over the entire hazard area.

The system on board the *Caribbean Fantasy* required manual activation at a station located on deck 5 near the engine casing port side. An audible alarm sounded when the system was actuated. It was a dry system, and, when activated, freshwater from the no. 8 port and starboard tanks flowed to nozzles in selected zones. The drencher system was also attached to the fire main, which could supply seawater when manually aligned.

Per the emergency plan and station bill, the first engineer was assigned the task of activating the drencher system. He told investigators that during the fire he opened the system valves for all three garages. Investigators found that the drencher system actuation valves for all zones in garage A and garage B were open. Valves for all zones in garage C, except for one, were closed.

The no. 8 port and starboard freshwater tanks that supplied the system had been filled with water when the ship was last in port at San Juan. The tanks were sounded postaccident and found to be nearly empty.

Other Firefighting Systems and Equipment. A Minimax water sprinkler system was installed in all accommodation areas (corridors, cabins, offices, store, paint locker, and public areas), the CO₂ station, and in all stairwells. Along with the sprinklers in the CO₂ room, several sprinkler heads were found actuated in various areas of the ship during the postaccident examination.

Fireman's outfits and SCBAs were found scattered throughout various parts of the ship. Several firefighting hoses were found deployed but showed no signs that they had been charged. The safety officer told investigators that she ordered both fire squads to boundary cool in garage B but had them evacuate to garage C because of the high concentration of smoke in garage B. The abandon-ship order came before any firefighting or boundary-cooling efforts commenced.

A-60 Bulkheads and Decks. Per International Maritime Organization (IMO) regulations, A-60 divisions are to be insulated with approved non-combustible materials such that the average temperature of the unexposed side will not rise more than 284 degrees F (140 degrees C) above the normal temperature nor will the temperature at any one-point rise more than 356 degrees F (180 degrees C) within 60 minutes. The construction must be capable of preventing the passage of smoke and flames. Although the deck separating the main engine room from garage B on the *Caribbean Fantasy* was a main vertical zone with A-60 rated insulation, the fire was not contained in the engine room. The fire spread to garage B above, and vehicles in the garage caught fire.

1.7.7 Voyage Data Recorder

The *Caribbean Fantasy* was equipped with a VDR, as required by SOLAS regulation, produced by Consilium Marine and Safety AB and installed by the manufacturer in 2012. SOLAS regulation requires an annual performance test (APT) for VDRs by an approved testing or servicing facility to verify the accuracy, duration, and recoverability of recorded data. Consilium performed APTs on the system annually starting in 2013. The most recent APT was conducted on February 7, 2016.

Over 24 hours of bridge audio, radar, and navigational and engineering parametric data were recovered from the VDR capsule. The entire accident voyage and abandonment were recorded. The Consilium VDR recorded the radar video image once every 15 seconds; other parameters were recorded in text files, 60 seconds in duration. The VDR stopped recording at 1350 on August 17.

1.8 Survival Factors

1.8.1 Lifeboats

Schat-Harding AS designed and manufactured the lifeboats and davits supplied to the *Caribbean Fantasy*. Lifeboats no. 1 and no. 2, located on the starboard and port side of the vessel, respectively, were a partially enclosed lifeboat design constructed of glass-fiber-reinforced plastic (GRP), with a capacity of 150 persons. Lifeboat no. 3, located on the starboard side, was a fully enclosed lifeboat design constructed of GRP, with a capacity of 70 persons.



Figure 20. Photo left is *Caribbean Fantasy* lifeboat no. 2 on the pier in San Juan after the accident. Photo right is lifeboat no. 3 suspended from the davit falls on *Caribbean Fantasy* after the accident.

Each of the *Caribbean Fantasy* lifeboats was launched using a gravity davit. The davits and embarkation areas for lifeboats no. 1 and no. 3 were located in the starboard-side muster station A on deck 7. The davit and embarkation area for lifeboat no. 2 were located in the portside muster station B, also on deck 7. Unlike lifeboats no. 1 and 2, lifeboat no. 3 was embarked from a platform on deck 7 while the boat was in the stowed position.

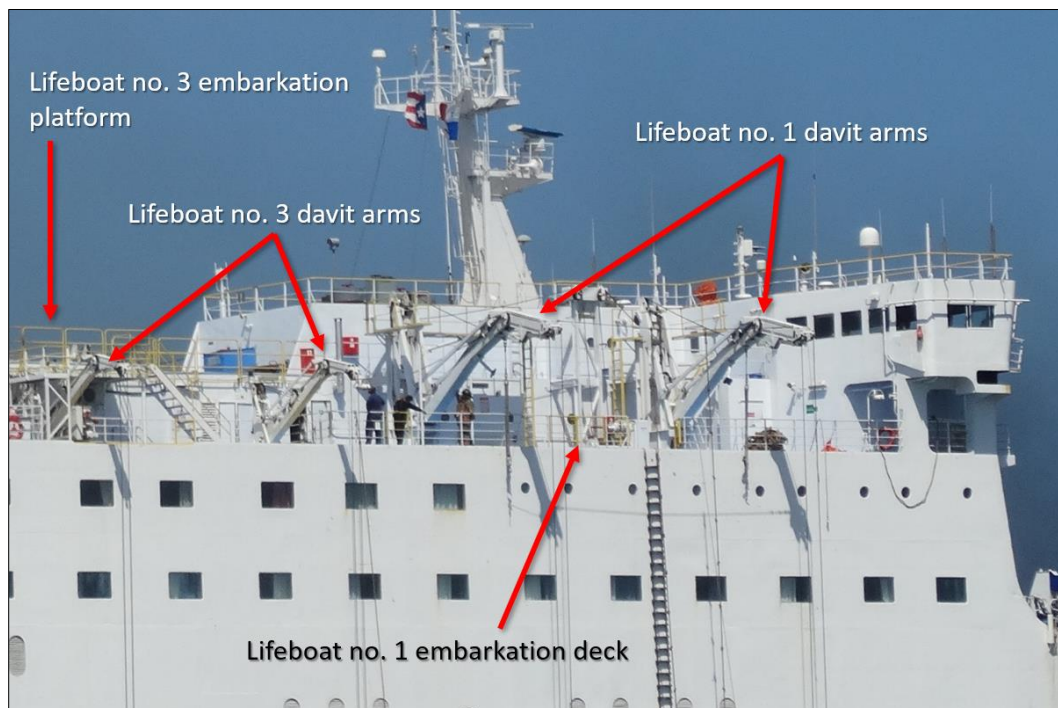


Figure 21. *Caribbean Fantasy* starboard side (Photo by Coast Guard)

As noted previously in this report, all lifeboat release hooks had been replaced during the shipyard maintenance period in Tunisia. The new hooks were “U-Hook” release systems designed and installed by Bianchi & Cecchi Service Inc. (BC Service). The hooks were replaced to comply with a recently implemented SOLAS regulation that was enacted to reduce the number of accidental releases of lifeboats.²⁹ Each U-Hook included a “recovery pin” that prevented the hook from inadvertently releasing when the boat was hoisted after inspections and drills. The previous hook arrangements did not include this design feature.

As the recognized organization (RO) designated by the flag state of Panama, RINA was responsible for ensuring that the *Caribbean Fantasy* complied with SOLAS and other regulations. On June 22, 2016, the three lifeboats were examined and tested. A surveyor employed by the shipyard and authorized to carry out the exams on behalf of RINA documented his findings in a service report for each lifeboat. The reports noted that the examinations and operational tests were conducted in compliance with SOLAS regulation and included an operational test of all the lifeboat hook releases, running the lifeboat engines for 3 minutes, and making sure each lifeboat bilge pump operated. Based on the results, RINA approved the use of the U-hooks and issued the vessel its passenger vessel safety certificate.

Investigators reviewed lifeboat documentation on the *Caribbean Fantasy*. The hook manual provided by the manufacturer to the ship included guidance to visually check to confirm that the recovery pins were in their stored position when preparing to lower the lifeboat. However, the procedure found in the vessel’s *Shipboard Emergency Organization* manual and *SOLAS Training Manual* did not contain a step to ensure that the recovery pins for the lifeboat hooks were in their stored position.

According to the U-hook manual, there were three methods for opening the release hooks:

- **Normal Procedure.** As the lifeboat “touches down and becomes waterborne,” a hydrostatic interlock on each hook opens, and an indicator on the release control unit (RCU) moves from green (closed) to red (open). The lifeboat commander then removes the safety pin from the RCU and lifts and rotates the release handle until it stops in the open position, releasing the hooks.
- **Hydrostatic Interlock Manual Override Procedure.** If the normal procedure does not work and the lifeboat is in the water, the crew breaks a clear plastic cover on the RCU with the safety pin and then uses it to move the hydrostatic interlock indicator from the green to the red position to disengage the hydrostatic interlock. While holding the indicator in the red position, the lifeboat commander then lifts and rotates the release handle until it stops in the open position, releasing the hooks. This operation required two trained crewmembers, one to operate the release handle and another to hold the interlock in the red position.
- **Emergency Manual Release Procedure.** If the hydrostatic interlock override procedure does not release the hooks, crewmembers position themselves at each hook and wait for the lifeboat commander’s order to use wrenches to open the hooks. (The wrenches should be stowed at the forward and aft hatches of the boat.) While the release handle is in the

²⁹ In May 2011, the IMO amended the SOLAS regulations for lifeboat release and retrieval systems based on a review of casualties that occurred during drills and inspections. Deaths and injuries had occurred when lifeboat hooks accidentally released during raising and lowering operations, dropping the boats with crewmembers embarked.

open position, the wrenches are then used by trained crewmembers to rotate the manual release stud on the hook mechanism. This must be done simultaneously.

If the procedures in the manual did not work, the crew could lift the gate, designed to keep the hook from releasing prematurely when the falls become slack, and then manually maneuver the lifting ring on the falls out from under the hook. This process was dangerous and a last resort as it involved risk of injury to persons manning the hooks.

During the accident, none of the three lifeboat crews could release the hooks from their falls when the boats first entered the water. The crews in lifeboats no. 1 and no. 2 were only successful when they attempted the last-resort procedure for releasing the hooks. The crew in lifeboat no. 3 was never able to release the hooks, and the boat was eventually hoisted out of the water to avoid further damage from wave action that caused it to repeatedly hit the side of the *Caribbean Fantasy*.

On August 24, 2016, investigators examined the *Caribbean Fantasy* lifeboats. Lifeboats no. 1 and no. 2 had been lifted out of the water by a crane and placed on the pier, and thus investigators could not document their immediate postaccident condition. During the examination, investigators evaluated the function of the release hooks, noting that the clear plastic covers for the hydrostatic interlock overrides were still intact on both lifeboats. Investigators used the release handle inside lifeboat no. 2 in an attempt to open the boat's hooks. The two hooks did not open. Investigators then attempted to use the manual release wrench on the hooks for both lifeboats no. 1 and no. 2. Only one of the four hooks released; the forward hook on lifeboat no. 1 opened with difficulty.

The *Caribbean Fantasy* entered the port of San Juan with lifeboat no. 3 hanging by its falls at the ship's side. When investigators examined the lifeboat after the accident, they found the safety pin for the release handle inserted in the RCU, and the clear plastic cover for the interlock override was intact. A successful release test was conducted dockside by dropping the boat onto truck tires after operating the release handle. Before the test, the team examined the release hooks and found the recovery pins in the position for recovering the lifeboat—inserted through the hook mechanism to lock it closed and prevent it from accidentally opening during hoisting. (When a lifeboat is not being hoisted, recovery pins should be in the stowed position—in a holder mounted on the side of the hook—in preparation for immediate lowering and launching of lifeboats in an emergency.) According to the commander of lifeboat no. 3, the pins were put in the recovery position prior to the attempted hoist of the lifeboat back to the embarkation deck. It could not be determined if the pins were in the stowed or recovery position prior to the boat being lowered.

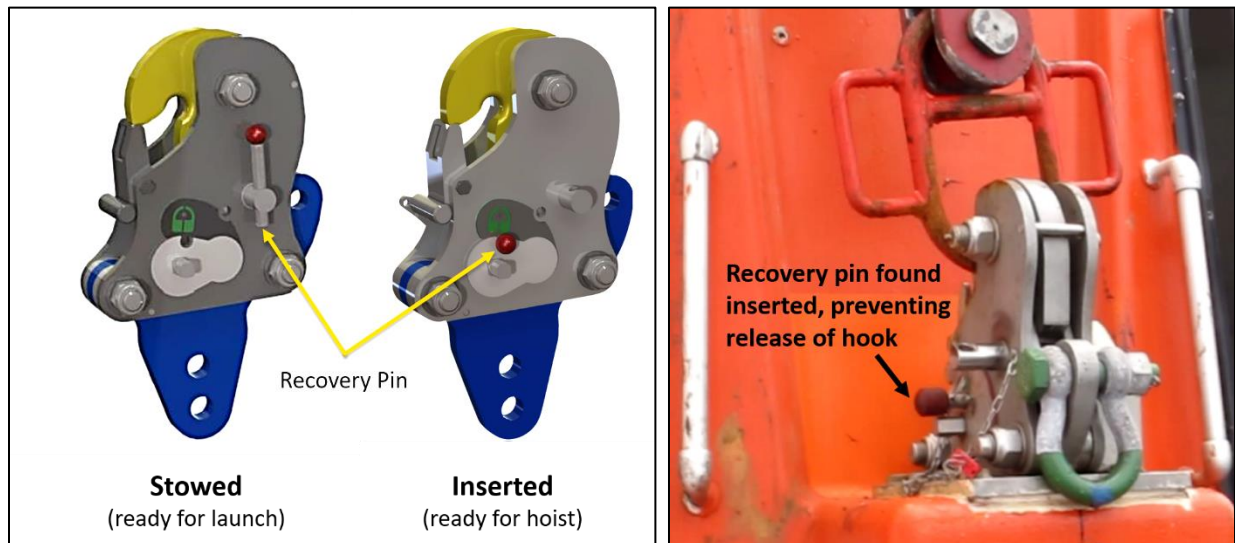


Figure 22. At left, the U-hook with recovery pin in stowed and inserted positions. (Source: *U-Hook 3–6–10–15 ton Operation and Maintenance Manual*) At right, *Caribbean Fantasy* lifeboat no. 3 aft hook with the recovery pin inserted in the hook mechanism.

All lifeboat manuals on board the *Caribbean Fantasy* contained instructions for operating the previous release hooks that had been replaced in the shipyard. SOLAS requires posters or signs containing the relevant instructions and procedures for operating the hooks to be placed in the vicinity of survival craft launching controls. Investigators found posted instructions in lifeboat no. 3 that explained how to release the newly installed U-hooks. However, instruction sheets in lifeboats no. 1 and no. 2 were for the previously removed release hooks.

On September 16, 2016, a service team of four representatives from BC Service (the U-Hook manufacturer), accompanied by a representative from the Coast Guard Cruise Ship National Center of Expertise (CSNCOE), examined the hooks installed on lifeboats no. 1 and no. 2. The Coast Guard asked the BC Service representatives to examine the hooks to help investigators determine why they did not release on the day of the accident and why investigators were unable to open the hooks during their initial examination on August 24.

The service team first examined the RCU for lifeboat no. 2. The team concluded the RCU mechanism was functional. However, when they then examined the hooks and tried to open them using the RCU, the hooks did not open. The team observed that the hooks had been moved inward, “most likely when the lifeboats were incorrectly moved by shore side cranes from the water to the pier” after the accident. Once the BC Service team moved the hooks into their original positions, the hooks opened by using the RCU. The team found lifeboat no. 1 in the same condition. After adjustment, the hooks opened using the RCU.

The lifeboats had been lifted out of the water after the accident using slings attached to a single lifting point. To prevent damage to the boats or slings, the manufacturer’s lifting instructions for single point lifts required a spreader bar or slings longer than 1.5 times the length of the boat. The BC Service team’s report concluded that the damage sustained to the lifeboat hooks was consistent with damage resulting from a crane using a single-point lift and short slings. The BC Service report also stated that the hydrostatic interlock moved freely for lifeboat no. 2 and a

Teleflex cable was found damaged on the no. 1 lifeboat.³⁰ (The vendor suggested that the damage to the cable may have been caused by previous attempts to open the hooks while in the wrong position.)

BC Service representatives found no problems with the releasing system for lifeboat no. 3; the hook release system worked as designed. BC Service noted that there were no reports of problems or any service requests made from the *Caribbean Fantasy* after the installation and testing of the hooks were completed in Tunisia in May 2016.

In addition to problems with the release hooks, the lifeboat no. 1 commander told investigators that the engine was never able to start, and seawater entered from a crack that opened on the port side from hitting the ship's side when the lifeboat was unable to be released from the falls. On October 12, 2016, at the request of the Coast Guard, a representative from Schat-Harding (now acquired by Palfinger Marine) examined the lifeboats accompanied by a member of the CSNCOE. He also conducted a document check of lifeboat examination records and guidance. His findings stated:

- Hook damage may have occurred after the accident. There is evidence that the hook systems of lifeboats no. 1 and no. 2 suffered damage caused by the improper lifting of the lifeboats by means of a shore crane with a single lifting point.
- The aft release cables installed on lifeboats no. 1 and no. 2 were longer than prescribed. This fact may have prevented hook release once waterborne. The excessive length increased the resistance in the push-pull cables.
- There was evidence that the lifeboat no. 1 engine had been under repair at the time of the incident. Bolts surrounding the engine compartment had been removed, brackets holding cables and tubes were unfastened, the end cover was missing, and the coolant tank was empty.
- The lifeboat no. 1 drain plug was missing and could not be located. If the drain plug had been in place, even in the open position, it would have prevented water from entering the vessel. A floater valve would have prevented water intrusion. The drain plug was designed to keep the floater ball in place.
- Lifeboats no. 1, no. 2, and no. 3 incurred GRP, hand rail, and hatch damage that included fractures and laminate shearing.

1.8.2 Marine Evacuation Systems and Liferafts

VIKING LIFE-SAVING EQUIPMENT A/S designed and manufactured the MESs and liferafts supplied to the *Caribbean Fantasy*. Each MES was deployed by pulling a release handle on the system's stowage box at the landing. This action inflated the slide and the floating platform. The operator was then to use the bousing line and winch to position the platform.

³⁰ *Teleflex* is the name brand of a control cable manufacturer. The cables have a stationary outer sheath surrounding a moveable inner cable. The inner cable transfers mechanical force from an actuator, such as a lever, to a moveable terminal connection such as a throttle or, in the case of the *Caribbean Fantasy* lifeboats, the hook release.

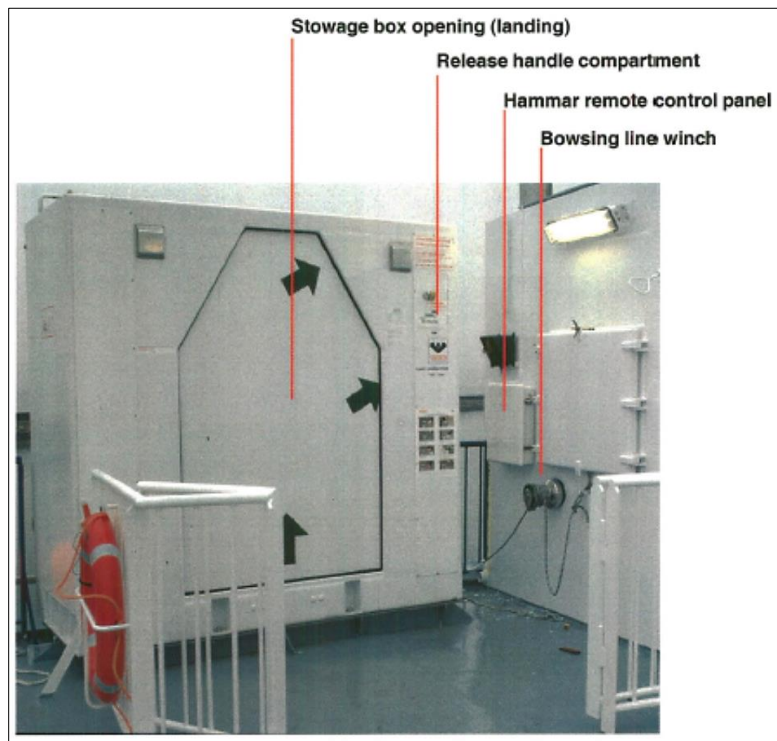


Figure 23. MES stowage box components similar to those on board the *Caribbean Fantasy*. (Source: *Caribbean Fantasy MES Training and Operations Manual*)

The liferafts were integrated with the MESs and were installed on the port and starboard sides of the vessel in reclining racks on deck 7, one deck above the MES equipment. The liferaft containers could be released remotely by activating a Hammar release pump mechanism from a box adjacent to the MES landing on deck 5. According to the *MES Training and Operations Manual*, liferaft containers were to be launched one at a time, starting with liferaft no. 1, when the platform crew was ready to haul the container to the platform and inflate the liferaft. If the remote Hammar release failed, there was another Hammar release mechanism at the liferaft rack. The liferaft containers could also be manually released using a release bar at the rack or by individually releasing each container at the securing link. In addition to the retrieving line used to pull the liferaft containers alongside the MES platform, each liferaft container also had a painter line connected to the ship. The purpose of the painter was to automatically inflate the liferaft in the event that the ship sank. When the liferaft containers were released in conjunction with an MES deployment, the Hammar mechanism cut the sea painter to prevent the liferafts from prematurely inflating.

The *Caribbean Fantasy* received 14 new liferafts while in the shipyard in Tunisia. All starboard-side liferafts were replaced with rafts inspected for service in June 2016, except for liferaft no. 21 inspected in May 2016. Portside rafts 2, 4, and 6 were replaced with new rafts inspected in June 2016. Because of travel warnings for Tunisia, authorized VIKING technicians did not travel to the shipyard to install the new rafts and integrate them into the MES system. Instead, shipyard employees who were authorized to carry out the work by the classification society installed the raft containers on the racks. VIKING was not consulted in this arrangement. The portside liferafts that had not been replaced were due for inspection in August 2016. On August 10, 2016, the Panama Maritime Authority issued a letter authorizing a 3-month extension of the inspection deadline for those portside rafts until November 18, 2016.



Figure 24. Postaccident photo of the portside liferaft containers and storage racks on board the *Caribbean Fantasy*.

During the accident, the safety officer deployed the portside MES with assistance of an able-bodied seaman (AB) assigned as the starboard-side MES slide controller. Neither the safety officer nor the AB was assigned to the portside MES team per the emergency plan and station bill, but the safety officer later told investigators that she was near the portside MES when the order came to deploy the system and knew that the crewmembers assigned to the MES were still engaged in lifeboat-launching operations. Once inflation of the MES began, she and the AB left for the starboard-side MES.

The staff captain told investigators that he arrived at the portside MES as it inflated. Seeing that the slide was at a steep angle to the water, the staff captain added additional nitrogen to the slide and platform using the MES's spare refilling valve. The slide alignment did not improve. The staff captain told investigators that he did not use the bowsing line to attempt to position the MES. The portside MES was not used.

During his interview with investigators, the staff captain said that the starboard-side MES deployed as designed, but the crew could not use the bowsing line because it had parted (investigators were not able to determine how or when the line parted). He said that the crew added nitrogen from the spare refilling valve to overcome the effects of the wind, which were causing the slide to collapse, and sent passengers down the slide even though the slide deployed with a steep angle. Investigators determined that the MES slide angle was about 54 degrees to the waterline after it inflated. For safe use of the system, the manufacturer's recommended angle was 30–35 degrees. Eventually, a Coast Guard small boat used a line attached from the MES platform to the bow of the boat to pull the platform forward and improve the alignment of the slide.



Figure 25. *Caribbean Fantasy* starboard-side MES deployed at about a 54-degree angle to the waterline, about 0923 on the morning of the accident. (Photo by US Coast Guard)

A crewmember told investigators that the automatic liferaft container release at the starboard-side MES landing did not work, so he proceeded to the liferaft container racks and released the first two containers using the local Hammar release pump. The staff captain manually released the rest of the containers, one after the other, shortly thereafter.

The liferafts were designed to be inflated by crewmembers once they were pulled alongside the MES platform, but some of the starboard-side liferafts inflated early. A crewmember said he saw four rafts inflate before being pulled to the platform, and a passenger took a photograph showing four empty inflated liferafts with lines still connected to the ship. At the time this took place, the *Caribbean Fantasy* was drifting in a sideways motion at about 1 to 2 knots with the wind on its starboard side.

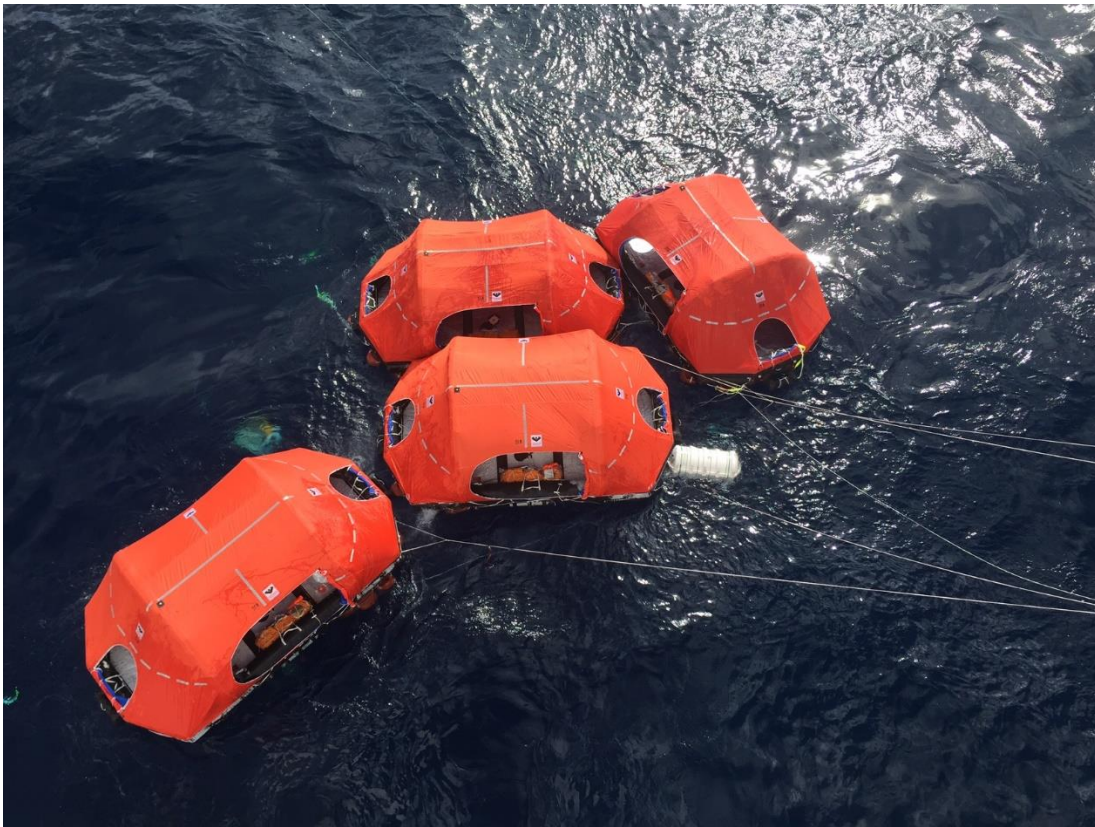


Figure 26. Inflated liferafts without passengers, about 0844 on the morning of the accident. (*Caribbean Fantasy* passenger photo provided by Coast Guard)

A team of six VIKING employees conducted a postaccident examination of the MES and assessed why the port and starboard MES slides buckled during the abandonment. The team evaluated nine failure modes, including improper bowing line operation, failure of the nitrogen gas to inflate the slide properly, and the failure of the system to hold the gas. Although the team could not identify a root cause for the failure of the MESs, they identified nitrogen valves that were leaking during inflation due to leaking gaskets, two of the eight relief valves that had opening pressures slightly below the acceptable limit, and that the crew had not handled the bowing winches correctly. It was noted in the team's report that the system and its components were left exposed to the weather for about a month after the accident and before the team was able to carry out the examination.

The VIKING team could not determine why some of the liferafts were "floating around, not connected with the connection lines." The team noted that the rafts were not installed by an authorized VIKING service technician and offered two possible causes: the rafts were not connected correctly during installation or there was "incorrect handling by the crew during evacuation."

1.9 Personnel

1.9.1 Crew Recruitment and Manning

Baja Ferries utilized third-party crewing agencies for the recruitment and manning of the *Caribbean Fantasy*'s deck and engineering personnel, while the hotel staff were provided by America Cruise Ferries as the charterer of the vessel. Deck officers were recruited by Ship Supply of Florida Inc., and engineering officers were recruited by Midocean (IOM) Limited, which was a division of the Döhle Group. According to the *Caribbean Fantasy*'s designated person ashore

(DPA), both agencies conducted recruitment, first-level vetting and processing (including background checks), and verification of required certifications for crewmembers. The DPA stated to investigators that follow-on vetting, management, and overall evaluations of the crew were conducted by the ship's master and the technical manager. Additionally, promotions were sometimes given on board through consultation between the respective department head, the master, and the company.

Personnel were supplied by the crewing agencies under short-term contracts. Deck and engineering officers worked an average of 4 months on with 2 months off, while hotel staff typically worked 6–9 months on with 2 months off. Due to a recent switch to Midocean from another crewing agency, the engineering officers had been on board for only a short time. The chief engineer, first engineer, and third engineer had worked on the vessel for only 1 month. The remaining officers had less than 1 week on board.

1.9.2 Experience and Training of Key Personnel

This section of the report provides information related to the personnel on the vessel who played a significant role in the accident sequence or the analysis.

Master. The master of the *Caribbean Fantasy* was a French national and was 62 years of age at the time of the accident. His primary language was French, and he demonstrated conversational proficiency in English. He did not speak or understand Spanish. He held a valid certificate of competency as master of unlimited-tonnage vessels, issued by France and endorsed by Panama. The master stated that he also held a marine engineering certificate of competency, which was a national requirement. The master had been sailing since 1974, with 20 years' experience as master on car ferries and seagoing tugboats. The master was recruited directly by Baja Ferries but hired through Ship Supply of Florida. At the time of the accident, he was on his second contract as master of the *Caribbean Fantasy*. His first contract was during the shipyard period in Tunisia, joining the vessel in March 2016 and overlapping with the master on board at the time. After the shipyard period, the master signed off before the vessel crossed the Atlantic Ocean back to Santo Domingo. He returned to the ship on August 5; the master he relieved remained on board until after the Coast Guard port state control inspection was completed.³¹

Staff Captain. The staff captain was a Greek national and was 56 years of age at the time of the accident. His primary language was Greek, and he demonstrated conversational proficiency in English. He did not speak or understand Spanish. The staff captain held a valid certificate of competency as master of unlimited-tonnage vessels, issued by Greece and endorsed by Panama. He told investigators that he had 15 years of experience, mostly on passenger vessels, including time sailing as master on high-speed passenger ferries between the Greek islands. He joined the *Caribbean Fantasy* on June 1, 2016, and was on his second contract with the ship as staff captain.

Safety Officer. The safety officer was a Panamanian national and was 34 years old at the time of the accident. Spanish was her primary language, and she demonstrated conversational proficiency in English. The safety officer held a valid certificate of competency as chief mate of unlimited-tonnage vessels, issued by Panama. She told investigators that she had about 9 years of seagoing experience on cargo vessels. She had sailed as third mate, second mate, and safety officer on board the *Caribbean Fantasy* in the 3 years leading up to the accident. She began her most

³¹ There was no record in the ship's official logbook of when the master took command of the vessel. According to the crew list submitted to investigators, his sign-on date was August 5, 2016, and he was listed as master at that time.

recent contract on October 31, 2015, as second officer, and she was promoted to safety officer on June 10, 2016. This promotion was a transition from a standard watchkeeping role to a senior leadership role.

Second Officer (On Watch). The second officer on watch at the time of the accident was a Panamanian national and was 27 years of age. His primary language was Spanish, and he demonstrated conversational proficiency in English. He held a valid certificate of competency as chief mate of unlimited-tonnage vessels, issued by Panama. He was sailing on a 3-month contract at the time of the accident, which had begun on May 8, 2016. It appeared that this contract had been extended, but the crew certificates list had not been updated with a date beyond August 9, 2016.

Second Officer (Off Watch). The second officer who was not on watch at the time of the accident was a Ukrainian national and was 54 years of age. His primary language was Ukrainian, and he demonstrated conversational proficiency in English. He held a valid certificate of competency as chief mate of unlimited-tonnage vessels, issued by Ukraine and endorsed by Panama. He was sailing on a 4-month contract that had begun on August 13, 2016, just 4 days before the accident. He had no prior experience on the *Caribbean Fantasy*.

Deck Cadet. The deck cadet was a French national and was 21 years of age at the time of the accident. His primary language was French, and he demonstrated conversational proficiency in English. According to interview testimony, he also spoke some Spanish. He did not hold a merchant marine certificate of competency. He was on a 3-month contract and had been on the *Caribbean Fantasy* since July 1, 2016. This was his second contract on the ship. As a cadet, he spent time in both the deck and engine departments.

Chief Engineer. The chief engineer was a Polish national and was 49 years of age at the time of the accident. His primary language was Polish, and he demonstrated conversational proficiency in English. He did not speak or understand Spanish. He held a valid certificate of competency as chief engineer “on ships by main propulsion machinery of 3,000 kW and more,” (indicating an unlimited certificate) issued by Poland and endorsed by Panama. He had been sailing for about 26 years, with 5 years’ experience as chief engineer. He joined the *Caribbean Fantasy* on July 17, 2016, during the Cádiz, Spain, shipyard period. He immediately took over the position upon joining the vessel because the previous chief engineer had been terminated. Another chief engineer with previous experience on the *Caribbean Fantasy* was brought back to the ship to assist the new chief engineer with familiarization and handover. The chief engineer with previous experience remained on board until after the Coast Guard port state control inspection was completed on August 9, 2016.

First Engineer. The first engineer was a Polish national and was 28 years old at the time of the accident. His primary language was Polish, and he demonstrated conversational proficiency in English. He held a valid certificate of competency as chief engineer “on ships by main propulsion machinery of “3,000 kW and more,” issued by Poland and endorsed by Panama. He had 6 years of experience at sea working on oil and gas pipeline diving vessels and accommodation ships. He had been a second engineer on other ships before joining the *Caribbean Fantasy*. He joined the *Caribbean Fantasy* on July 26, 2016, under his first contract with the vessel. As first engineer, he was the direct supervisor for all engineers, motormen, and wipers.

Third Engineer (On Watch). The third engineer on watch at the time of the accident was a Slovakian national and was 33 years of age. His primary language was Slovak, and he

demonstrated conversational proficiency in English. He held a valid certificate of competency as engineer officer in charge of watch “on ships by main propulsion machinery of 750 kW and more,” issued by Poland and endorsed by Panama. He told investigators that before joining the *Caribbean Fantasy* he had worked on a bulk carrier for about 4 months as third engineer and about 11 months as an engine cadet. He was on his first contract on the *Caribbean Fantasy* and had been on board since July 17, 2016.

Hotel Director. The hotel director was a Croatian national and was 56 years of age at the time of the accident. His primary language was Croatian, and he demonstrated conversational proficiency in English. He told investigators that he could also speak Spanish. He had been employed in hotel departments on cruise ships and ferries for about 17 years. The hotel director had been working various contracts on the *Caribbean Fantasy* since 2011 and had been on his current contract since June 16, 2016.

Other positions. Deck and engine crew in safety-critical positions had completed required training in crisis management and human behavior, basic safety training, and security training. Hotel crew were not required to have a certificate of competency; however, most were required to have specific training necessary to fulfill their emergency duties as personnel designated on muster lists to assist passengers in emergency situations, shipboard familiarization training, and safety training for personnel providing direct service to passengers in passenger spaces.

1.9.3 Toxicological Testing

Baja Ferries, at the request of the Coast Guard, conducted drug tests on nine crewmembers who were either on duty or in critical positions at the time of the accident: the master, staff captain, chief engineer, bridge officer of the watch, engine officer of the watch, motorman on watch, wiper on watch, deck cadet, and helmsman on watch. However, testing was not completed during the 32-hour maximum time window following an accident, as required by Title 46 *Code of Federal Regulations* (CFR) as well as the company’s SMS policy. These tests took place on August 20, 2016. All persons tested negative for the following substances: amphetamines, cannabinoids, cocaine, opiates, and propoxyphene.

Alcohol testing, also required by Title 46 CFR and the SMS, was not conducted on any member of the crew. Per the federal regulation, alcohol testing must be conducted within 2 hours of the accident unless precluded by safety concerns and must be completed as soon as the safety concerns are addressed, up to 8 hours afterward. Although all crew and passengers had abandoned the ship within about 6 hours of the start of the fire, Baja Ferries reported that alcohol tests were not conducted “because of the evacuation and abandonment operation.”

1.10 Work/Rest

The company’s SMS stated, “Owners and Captains shall take steps to ensure that officers are adequately rested before they go on watch. It is essential, as a safety measure apart from other considerations, that their efficiency as watchkeeping officers is not impaired by fatigue or others.” The Seafarers’ Training, Certification, and Watchkeeping (STCW) Code and the International Labour Organization (ILO) Maritime Labour Convention (MLC) state that officers in charge of a navigational watch and any rated person forming part of this watch must receive a minimum of 10 hours of rest in any 24-hour period. The STCW Code requires that mariners have 77 hours off duty in any 7-day period—the equivalent of a 91-hour maximum work week. Further, the STCW

Code requires that if rest periods are broken up within a 24-hour period, at least one of the rest periods must be no less than 6 consecutive hours.

According to the record of seafarers' scheduled working arrangements for the *Caribbean Fantasy* in the month of August, all non-watchstanding engineering staff were scheduled to work 13 hours per day, Sunday through Saturday—a total of 91 hours per week. Similar details regarding the deck officers' schedules, including seafarers' scheduled working arrangements, were found posted on the bridge. These had not been updated since July 2016 and did not fully reflect deck personnel who were on board at the time. Additionally, the schedule and working arrangement was signed by a master who was not on board during the accident voyage. Crewmembers stated in interviews that they had time off while in port in Santo Domingo. However, watch schedules posted on the bridge did not indicate this time off.

Though requested, the company did not provide work/rest logs for the crew. According to the chief engineer, work and rest hours were tracked on a computer program that was managed by the storekeeper. He could not remember if there was a procedure in the SMS that specifically addressed work and rest. Investigators did not receive a procedure from the company when it was requested following the accident.

1.11 Language

1.11.1 Regulations and Policy Requirements

SOLAS regulation requires that a working language be established and recorded in the ship's logbook to ensure effective crew performance in safety matters. Crewmembers are required to understand and, where appropriate, give orders and instruction and to report back in that language. The Baja Ferries' SMS established English as the working language for the *Caribbean Fantasy* and stated that "all crew members must be able to communicate between each other, read, hear and understand [International Safety Management (ISM)] instructions." The SMS further required masters and chief engineers on company vessels to ensure that manuals were written in a language they could understand.

The IMO has also issued language recommendations specifically for handling passengers on board Ro/Ro passenger vessels. Maritime Safety Committee Circular 681 states:

Posted or other printed information, as well as announcements, should be in languages likely to be understood by all persons of nationalities normally using the service . . . Crew members who are assigned to direct and assist passengers in an emergency should be able to communicate with passengers in the language or languages appropriate to the principal nationalities of passengers carried on the particular route.

1.11.2 Working Language

1.11.2.1 Internal

Bridge team. According to both the master and the deck cadet, three languages were spoken on the bridge of the *Caribbean Fantasy*: English, Spanish, and French. The cadet explained that the only time languages other than English were spoken on the bridge was when the discussion related to personal matters. However, according to the vessel's VDR audio, all three languages were being spoken on the bridge during the accident sequence.

Passenger announcements. During the accident, the master directed the cadet to make the initial announcement in English, which he did. The second officer then made an announcement in Spanish. The master's intended announcement, given by the cadet, directed passengers to follow the instructions of the crew. However, the second officer's Spanish announcement stated that the fire was out of control and that a decision was made to abandon ship. Because the master did not speak Spanish, he did not realize that the abandon-ship announcement was being made at that time.

Overall Crew Proficiency. According to the DPA, the company was having problems with crewmembers, primarily the hotel staff, not "communicating sufficiently in English." Officers and crew were not required to complete an English-language proficiency exam, although several had records of these exams and scores in their STCW documentation found in onboard records. The DPA stated that this was because they had started having crewmembers take an English proficiency test administered by a United Kingdom-based language training provider. He told investigators that he believed crewmembers were expected to pass the test with at least a 70 percent score, though no documentation was found to support this statement. Some of the officers and crewmembers who had a record of a passed English proficiency exam stated during on-scene interviews that they could not speak English and required a translator. Each individual crewmember's ability to speak English beyond conversational proficiency could not be determined.

1.11.2.2 External

Using VHF channel 16, the OSC aboard the Coast Guard cutter *Joseph Tezanos* communicated with the master of the *Caribbean Fantasy* in English, while communicating with some of the other response vessels in Spanish. At one point, as recorded on the *Caribbean Fantasy*'s VDR, the master said over the radio, "please speak English!" as he did not understand what was being said and did not know who was speaking to whom. The cadet stated in his interview that he attempted to assist the master with communications because internal and external communications were on two different VHF channels and "it was not easy to revert."

1.11.3 Placards and Documentation

Most of the crew and passengers spoke Spanish, yet instructions for emergency equipment and procedures were primarily in English. Moreover, upon examination of the vessel, investigators found multiple cases of drawings, instructions, placards, and emergency equipment manuals in other languages. Ship drawings were in Japanese and engineering drawings were in both Italian and Japanese. The operating instructions for the old lifeboat release hooks that had recently been replaced were still posted at the hook-release locations in lifeboats no. 1 and no. 2. and were written in English and Italian. The water-mist fixed firefighting system manual, as well as operating instructions in the CO₂ room, was printed in English and Italian. The SOLAS training manual aboard the vessel was from previous ownership; the content had not been updated when the ship changed hands to Baja Ferries ownership (although it had a new stamp and a title change to "*Caribbean Fantasy*"), and the languages were also in English and Italian. Additionally, some of the English-language instructions were poorly translated from Italian, with incomplete sentences or incorrect sentence structure.

Furthermore, instructions for passengers were in languages unfamiliar to the predominantly Spanish-speaking travelers and were obsolete. For example, passenger emergency instructions in case of fire shown on a placard on the back of a deck 6 cabin door were in English and Italian and conflicted with the approved emergency plan and station bill. The signal for a major

fire on the placard was “two long blasts followed by the alarm bells,” whereas the emergency plan and station bill had no specific signal to inform passengers of a fire. In another example, lifejacket donning instructions found posted on board were in Japanese and English and provided directions for lifejackets no longer in use aboard the *Caribbean Fantasy*.



Figure 27. Left: Emergency instruction sign in English and Italian on the back of a deck 6 cabin door. Note the masking tape covering the outer edges of the emergency instructions. Right: Lifejacket donning instruction sign in English and Japanese found on deck 6 near fire locker no. 2. The instructions were for lifejacket types not carried on board at the time of the accident.

1.12 Shipboard Training

Training records and logs were maintained on the *Caribbean Fantasy* safety officer’s computer. Although the computer was recovered from the accident site, NTSB investigators were not able to access the computer due to a disk-read error. According to Baja Ferries, these records were maintained only on board and not sent or tracked ashore. Therefore, information regarding shipboard training was gathered from crew interviews and “SOLAS and STCW Certification Records” binders recovered from the safety officer’s office.

1.12.1 Safety Training

Safety training on board the ship was carried out by the safety officer, primarily during “induction” training for new and rejoining crewmembers. The training included a pre-departure phase and five underway phases. The pre-departure phase was held prior to getting under way from the port of embarkation and covered emergency duties, alarms, lifejacket use, emergency stations, opening and closing of fire and watertight doors, and how to raise an alarm. Underway phase 1 training encompassed firefighting familiarization training; phase 2 covered lifesaving appliances and equipment familiarization; phase 3 reviewed company policies and procedures; phase 4 involved lifeboat exercises and first aid/CPR training; and phase 5 finished the program with survival and shipboard health. Records of attendance were maintained by the safety officer in a binder. Rejoining crewmembers would have to retake the induction training on an annual basis. For lifesaving equipment, the training required a demonstration of a liferaft (using a training raft), a guide through a stowed lifeboat, and an exercise in a lifeboat during a drill.

The Baja Ferries SMS provided an additional checklist to track vessel familiarization tasks for newly employed and rejoining crewmembers. For deck and engineering officers, the familiarization was to be completed within a specified duration. There were tasks to be familiar with prior to taking a navigational or engineering watch, other higher-priority tasks to be familiar with within 1 week, and lower-priority tasks to be familiar with within 1 month.

The second officer (off watch), who had joined the ship 4 days prior to the accident, stated that he did not have familiarization training upon reporting. He stated that he did not attend any crew musters or fire drills during his time on the vessel. The familiarization checklist for this second officer was not found in the binder that held all crew familiarization records.

1.12.2 Lifeboat and Marine Evacuation System Training

Each of the three lifeboat commanders had successfully completed a course of training in the Proficiency in Survival Craft and Rescue Boats as required by the STCW Code. The safety officer told investigators that she instructed the boat commanders on how to carry out their roles and provided them with the lifeboat manual for their lifeboat. The second officer (off watch), who commanded lifeboat no. 1 during the accident, stated that he had not received training for the lifeboats on board the *Caribbean Fantasy*, nor had he reviewed the lifeboat manual.

According to the third officer, who was the commander of lifeboat no. 2 at the time of the accident, there was no training on how to operate the new release hooks. He stated that he had read the manual. He also said that the manual explained that when the lifeboat touched the water, the hooks should have released automatically. Investigators found that, contrary to the third officer's statement, there was no automatic means to release the lifeboats once in the water.

No record of training was found in logs and training records, and crewmembers interviewed on-scene confirmed that they had not completed any training related to the manufacturer's procedures for opening the newly installed lifeboat hooks. During the port state control drill held on August 9, 2016, the crew of lifeboat no. 2, the only lifeboat launched during the drill, was only able to manually release the hooks by opening the gate and removing the lifting ring out from under the closed hook from outside the lifeboat in calm waters.

SOLAS regulation requires crew involved in deploying an MES to have participated in the actual deployment of an MES every 2 years. However, none of the *Caribbean Fantasy* crew other than the staff captain had ever deployed an MES or witnessed an MES deployment. The staff captain's training record included a document signed by a VIKING service manager attesting to receiving "instruction in handling and deployment of a VIKING Evacuation Slide" with rafts on June 5, 2014, more than 2 years before the accident. The safety officer, who deployed the port MES and was responsible for training the crew on the system, said she had never seen one deploy until the day of the accident. Her only MES training had been to watch an instructional video shown to *Caribbean Fantasy* crew during recurrent MES training. The third officer, who launched the starboard-side MES, did not have any information in his company training record to document a previous deployment of an MES. The AB who released the first two liferafts from the starboard side told investigators he had never seen an MES deploy.

The safety officer explained that she was responsible for training all crewmembers in their emergency roles and verifying that training required by the STCW Code had been completed when they reported on board. For the MES requirements, she used the instructional video to train the crew in how to deploy and use the system. The training video was not filmed on board the

Caribbean Fantasy and did not include narration explaining each aspect of the operation of the MES and liferafts. The video included short segments covering the entire MES evolution, beginning with the MES deployment and continuing through each stage up to and including the towing of inflated liferafts filled with passengers away from the vessel. The video showed close-up views of the bowsing line winch in operation and a view of the MES but did not demonstrate how to use the winch to position the MES platform with the bowsing line. The training video, guided by the safety officer, was last shown to the crew on August 4, 2016.

On October 21, 2015, the *Caribbean Fantasy* was detained by the US Coast Guard in San Juan for failing to meet minimum safety standards. One of the deficiencies listed on the Port State Control Report of Inspection was “The ship’s crew could not provide documentation that any crewmembers were participating in MES deployments, and when questioned during drills, crew reported never having participated in a deployment.” Coast Guard Sector San Juan cleared this deficiency on November 23, 2015, after RINA informed port state control inspectors that “training for MES party member has been carried out with means of audio video aids.”

1.12.3 Drills

Because the voyage between Santo Domingo and San Juan was scheduled to be less than 24 hours, there was no SOLAS requirement to have newly embarked passengers muster at their assigned emergency locations. However, prior to getting under way from Santo Domingo, the hotel crew conducted a safety briefing for the passengers, in accordance with SOLAS regulations, using a prerecorded announcement. Crewmembers and some passengers interviewed stated that the briefing took place outside the reception area on deck 5 and included instructions on what to do and where to go in the event of an emergency, followed by a lifejacket demonstration.

Crew drills were required to take place no less than weekly based on SOLAS regulations. Weekly drills were conducted on board the *Caribbean Fantasy*; however, investigators were unable to verify crewmember attendance. Attendance checklists were printed from the safety officer’s computer using the emergency plan database and, according to her, attendance records were maintained in that database. It was not possible to recover these records from the safety officer’s computer.

The last general drill, which included fire and abandon ship, was conducted on August 9, 2016. This drill was observed by the Coast Guard during the port state control inspection and documented in the issued certificate of compliance. Before that, a general fire and abandon-ship drill was documented on July 2, 2016.

On a July 2016 schedule spreadsheet titled “Monthly Drills and Training Return,” which was maintained by the safety officer and sent to the company, an X was marked in the date boxes for July 3, 9, 17, 24, and 31 for weekly drills. The official logbook and the spreadsheet matched, with the exception of 1-day discrepancies for the July 3 and July 17 drills, which were recorded 1 day earlier in the logbook. The August 2016 schedule found on the bridge after the accident had drills scheduled for August 5 and 12. The safety officer stated that these drills had been completed, though there were no logbook entries indicating they had taken place.

The last drill recorded in the official logbook prior to July was March 16, 2016. During the time the *Caribbean Fantasy* was in the shipyard in Tunisia (March 26–July 3, 2016), no drills were held. The ship was not operational and only about 14 crewmembers were on board.

In addition to general drills for fire, general emergency, and abandon ship, more limited drills were also carried out and recorded for specific emergency systems, such as the MES. Attendance was documented by a signature next to each attending crewmember's name on paper records kept in the safety officer's office. The last record of attendance for the MES deployment video was on March 1, 2016, although there was a logbook entry for August 4. According to the logbook, a liferaft training drill was carried out on August 7. The last record of individual lifeboat crew drills was dated January 2, 2016.

Fire squad drills were also carried out for those assigned to firefighting positions. The last record of these drills was July 25, 2016, for a drill involving fire squads no. 1 and no. 2 and the boundary cooling and SCBA bottle-filling teams. There was no record of attendance for this drill.

Investigators found no lesson plan or record of drill details for any of the individual drills conducted. According to SOLAS regulation, details of drills for abandon ship, fire, and other lifesaving appliances and onboard training must be recorded.

1.13 Safety Management and Port State Control

1.13.1 General Overview

Responsibility for the safe operation of a vessel lies with the owner, operator, and crew of a vessel. The International Safety Management (ISM) Code was developed to provide a standard for the safe management and operation of ships and for pollution prevention, and under the code companies that own or operate vessels subject to the SOLAS convention must develop, implement, and maintain an SMS.³²

Although ultimate responsibility for the safe operation of the vessel lies with the owner, operator, and crew of the vessel, the ISM Code includes responsibilities for the flag state—the nation where the vessel is registered—to verify and certify that a company and vessel are complying with the provisions of the code, as well as other national and international laws and regulations.

Flag states or their designated ROs verify compliance with the ISM Code by determining:

- 1) the conformity of the SMS with the requirements of the ISM Code, and
- 2) that the SMS ensures compliance with mandatory rules and regulations, and that other applicable codes, guidelines and standards recommended by the flag, classification societies and maritime industry organizations are taken into account.³³

Classification societies are commonly delegated this responsibility as ROs.

³² IMO, "International Management Code for the Safe Operation of Ships and for Pollution Prevention – International Safety Management (ISM) Code," IMO Resolution A741(18), adopted November 4, 1993.

³³ IMO, "Revised Guidelines on the Implementation of the International Safety Management (ISM) Code by Administrations," IMO Assembly Resolution A.1071(28), adopted December 4, 2013.

The flag state issues a document of compliance to the company operating a vessel or vessels once it has verified that the company has an SMS that meets the intent of the code. Once a document of compliance has been issued, the flag state may then issue a safety management certificate to a vessel operated by the company after verifying, through audits and surveys, that the company and its shipboard management operate the vessel in accordance with the approved SMS.

The port state control (PSC) program grew out of the need of maritime nations to ensure that foreign vessels traveling in their waters were safe, properly outfitted, and under the control of skilled mariners. It is the final element in the maritime safety regime, ensuring that other entities with the primary responsibility for compliance—owners, operators, vessel crews, and flag states—have carried out their respective obligations. PSC officers (PSCOs) perform examinations of a vessel's hull, vital equipment, and elements of the SMS to ensure substantial compliance with applicable international laws and domestic regulations. They examine crew certificates and related documentation to ensure that each individual has the appropriate training and competencies to serve in their respective positions on board. In addition, PSCOs observe the crew during an emergency drill, such as a firefighting and an abandon-ship exercise, to further validate the competencies of the individuals who are assigned safety-critical functions on board.

If a vessel and/or its crewmembers who are assigned to safety-sensitive positions are found to be non-compliant or substandard, the PSCO may take a variety of actions to ensure that the condition or conditions are rectified. These actions include the stoppage of all cargo operations, formally detaining the vessel under the appropriate authority, or, in more severe situations, ordering the vessel's departure from port and banning it from future transits upon the waters subject to that nation's authority.

Under US law, a foreign-flagged passenger vessel intending to embark or disembark passengers in a US port must obtain a certificate of compliance. To obtain this certificate, the owner must complete several steps, beginning with the submission to the Coast Guard of vessel plans that address structural fire protection, fire control, and means of escape. These plans are reviewed for compliance with applicable requirements. Once this plan review process is complete, local PSCO personnel conduct an onboard examination of the vessel to validate the accuracy of the drawings and plans, assess the overall condition of the vessel and its equipment, and ensure that crewmembers in safety-critical positions possess the minimum skill and proficiency to perform their duties. This process is known as an initial certificate of compliance (ICOC) plan review and examination, and it is more comprehensive than a fundamental PSC examination that is performed on foreign-flagged cargo or other vessel types.

Once the foreign-flagged passenger vessel has successfully completed the ICOC, the local Coast Guard COTP will issue a certificate of compliance to the vessel, effective for 1 year, allowing passenger operations to begin. After the ICOC, the vessel is subject to periodic examinations where PSCOs confirm that the vessel remains in substantial compliance with applicable laws and regulations.

1.13.2 *Caribbean Fantasy* Port State Control Record

On January 4, 2011, the *Caribbean Fantasy*'s classification society, at the time Bureau Veritas (BV), submitted plans to the Coast Guard's Marine Safety Center (MSC) to begin the ICOC formal review process in anticipation of the vessel's transfer to Santo Domingo/San Juan service. On February 9, BV requested that Sector San Juan personnel attend a test deployment of the vessel's MES and schedule the ship's ICOC examination in early March. Because the plan

review process had not yet been completed by the MSC, Sector San Juan personnel declined to attend the test deployment of the MES or schedule the examination. As the initial plan review process continued into March, the vessel had yet to receive an ICOC or any other approval from the Coast Guard that was needed to operate in US waters.

On March 9, Coast Guard personnel at Sector San Juan learned that the *Caribbean Fantasy* was intending to enter the port of Mayaguez and at that time issued a COTP order directing the vessel to remain no less than 12 nautical miles offshore until the agency had received a nontank vessel response plan.³⁴ On March 11, Sector San Juan personnel rescinded the initial COTP order and issued a new COTP order. The order allowed the vessel to enter the port but prohibited it from engaging in passenger or cargo operations until the appropriate examinations were completed and documents were provided indicating that it was in substantial compliance with applicable treaties and regulations for the particular service.

On March 15, 2011, a Coast Guard Sector San Juan PSCO conducted a PSC examination and determined that the vessel met the minimum requirements to operate as a cargo vessel. The following day, the COTP order was amended to allow the *Caribbean Fantasy* to perform cargo operations, but the vessel was still prohibited from carrying passengers or hazardous materials.

On March 18, 2011, the vessel was expelled from the port of Mayaguez due to issues with its marine sanitation device (MSD). In response, the operating company proposed temporary measures, such as the retention of sewage on board and disposal ashore, as well as permanent repairs to the MSD, and this was accepted by the Coast Guard. The vessel was allowed to return to US waters and resume cargo operations.

In May 2011, the MSC completed the ICOC plan review process. The review identified numerous areas where structural fire protection was inadequate and would need to be either installed or upgraded. Between May 10 and May 13, Sector San Juan PSC personnel visited the vessel multiple times to perform the ICOC examination. The team validated that the plans submitted to and approved by the MSC were accurate, ensured all structural fire protection concerns raised by the MSC were addressed, assessed the overall condition of the vessel and its equipment, and ensured that the crewmembers in safety-critical positions possessed the minimum skill and proficiency to perform their duties. At this point during the examination, the PSC team provided a 174-item worklist to the vessel and did not issue an ICOC. Approximately 80 of the worklist items were corrected or cleared when the team departed the vessel, and the remaining items were outstanding.

Among the worklist items, the PSC team noted that the fixed firefighting drencher system for garages A, B, and C failed during tests, with multiple pipe bursts and discharge nozzles that were clogged due to rust and corrosion. The vessel was prohibited from conducting further cargo operations until the system was repaired and functioned as originally designed. The Sector San Juan PSC team returned to the vessel on May 16 and again on May 19 to continue the ICOC and attempt to clear worklist items. They found that the vessel was still not in substantial compliance with the applicable regulations. The garage drencher system was retested on both days and failed. The Coast Guard issued a letter to a company representative that noted the three failures

³⁴ The *Nontank Vessel Response Plans and Other Response Plan Requirements* final rule, which was published in the *Federal Register* on September 30, 2013, requires vessel owners or operators of nontank vessels 400 gross tons and above to prepare and submit oil spill response plans for vessels operating on the navigable waters of the United States. Source: Coast Guard, *Clarification of Implementation Date and Notice of Arrival Requirements for Nontank Vessel Response Plan Final Rule*, Marine Safety Information Bulletin 38-13, October 25, 2013.

of the drencher system and urged the company to “make any and all necessary repairs.” That letter also warned the company that if the system failed again during future testing, the vessel would be formally detained.

The Coast Guard PSC team visited the vessel on May 26 and returned on May 30, 2011, and at the end of that examination determined that the *Caribbean Fantasy* was in substantial compliance. The Coast Guard issued the ICOC, allowing the vessel to begin carrying passengers for hire. After consultation with the Seventh Coast Guard District, Sector San Juan placed the vessel on a quarterly re-examination schedule to ensure the vessel remained in compliance.

In March 2014, the *Caribbean Fantasy* experienced a fire in its transitional power battery bank, causing significant damage to the space where the equipment was installed. The transitional battery bank was designed to supply electrical power to all the vessel’s vital loads from the time the main generators were stopped or failed during an emergency until the vessel’s emergency generator was brought on line. The *Caribbean Fantasy* was provided with special dispensation from the flag state of Panama that allowed it to continue operations until June 5, 2014, at which time the vessel was to proceed to dry dock for repair.

From July 17 to 18, 2014, Coast Guard PSCOs performed a post dry-docking examination and renewed the vessel’s certificate of compliance for a 1-year period. The team discovered 17 deficiencies during the examination. Two of those deficiencies were related to the emergency power source and the transitional source of emergency power, which were not powering all the required vital systems that the power sources were required to supply.

On August 20, 2014, Coast Guard PSCOs boarded the vessel to follow up on outstanding items from the July 2014 examination and found two serious deficiencies that warranted formal detention of the vessel. Specifically, they found that the vessel’s transitional source of emergency power was still not fully functional, and the automatic sprinkler system was not capable of being discharged because the tank that held firefighting water was not pressurized. The vessel’s crew rectified both conditions that day and a PSCO returned to the vessel to verify the repairs. The *Caribbean Fantasy* was subsequently cleared to resume operations. As a result of this detention, on December 5, 2014, RINA, which had replaced BV as the vessel’s classification society in 2012, placed the vessel on an unscheduled survey scheme. According to RINA representatives, the program required that a RINA surveyor perform an unscheduled survey on the vessel each quarter, and these surveys had the same scope as a regular annual survey.

On January 21, 2015, Coast Guard PSCOs boarded the vessel to complete a quarterly examination and found three deficiencies, one of which noted concerns with the vessel’s VDR. The VDR displayed multiple error codes, including a failure to synchronize with one of the vessel’s global positioning system (GPS) receivers.

On October 21, 2015, while performing a quarterly examination, Coast Guard PSCOs found 21 deficiencies, three of which were serious enough to substantiate a formal detention of the vessel for a second time. A significant amount of oil in the vessel’s bilge and on deck surfaces in the engine room presented a fire hazard. The Sector San Juan Marine Inspection Training Officer told investigators that the PSC team found all the deck plates slippery and coated with oil. The bilges in the engine room had a layer of oil estimated at 1 inch thick on the surface of the water. The PSCO also discovered that the second engineer was not properly certificated to serve on board the vessel and the third engineer’s certificate of competency was missing an endorsement by Panama. Among the 18 lesser deficiencies recorded during this PSC examination, the PSCOs

determined that the “general lack of upkeep and maintenance of the vessel” was enough objective evidence to conclude that the SMS was not fully implemented. Accordingly, the Coast Guard issued a requirement for the vessel to undergo an external ISM audit.

The following day, PSCOs returned to the *Caribbean Fantasy* to verify that the three significant deficiencies that warranted the vessel’s detention were rectified and to begin clearing other deficiencies. The COTP and his deputy commander also visited the vessel to see it firsthand. According to the COTP, the vessel was a concern for the command. PSCOs subsequently cleared the three significant deficiencies, and the vessel was allowed to resume operations.

A surveyor from RINA was also on board the vessel on October 22 to perform a survey following up on the findings of the Coast Guard. At that time, the RINA surveyor issued multiple recommendations of class and submitted an International Association of Classification Societies (IACS) procedural report, form 17, “reporting on deficiencies possibly affecting the implementation of the ISM code on board during surveys.” The RINA surveyor that issued the report was the same individual that had performed audits of the SMS on board the vessel on April 12, 2014, and September 13, 2014, and had issued the vessel its safety management certificate. Additionally, the same individual had performed the initial audit of the SMS at the Baja Ferries company headquarters on December 18, 2014, and issued a full-term ISM Code document of compliance.³⁵

Per IACS requirements, the surveyor’s report, once completed, should have been submitted to the responsible department at RINA for review. The responsible department was required to judge whether the reported deficiencies were affecting the implementation of the ISM Code on board. If the responsible department judged that the reported deficiencies were not affecting the implementation of the ISM Code, the report was to be filed. However, if the reported deficiencies were judged to be affecting the implementation of the ISM Code, the report was to be sent to the flag administration of the vessel, and the RO who audited the SMS system (in this case RINA) was required to review the report and decide what action, if any, was to be taken.

When investigators asked RINA representatives to provide information related to the outcome of this report submission, they indicated that the principal surveyor in the RINA Fort Lauderdale office had performed an additional external ISM Code audit on the vessel, and the organization continued with the unscheduled survey scheme that the vessel had been subjected to since December of 2014. Senior RINA officials from the Fort Lauderdale office met with the chief executive officer (CEO) of Baja Ferries and the DPA afterward to discuss the need for improvement on the vessel.

During the July 2016 port call in Gibraltar, local PSCOs examined the vessel based on the reported blackout. PSCOs visited the vessel on July 6 and returned on July 8 for a more detailed examination. During that second examination, PSCOs discovered three deficiencies, one of which warranted the vessel’s detention. The *Caribbean Fantasy*’s nos. 1, 2, and 3 diesel generators were not operational, and the vessel’s only source of electrical power was its emergency generator. The diesel generator breakdowns were due to failed O-rings allowing water to leak by into the prime mover crankcases. The other deficiencies noted were a seawater feed pump that was not operational, and that overall engine room cleanliness was insufficient. This was the vessel’s third formal detention for non-compliance in 3 consecutive years. Gibraltar Maritime Authority PSCOs carried out a follow-up examination on July 14 and released the vessel from detention.

³⁵ RINA had issued Baja Ferries an interim document of compliance in April 2014.

Just prior to the accident, on August 9, 2016, Coast Guard Sector San Juan PSCOs performed a certificate of compliance renewal examination of the vessel. The PSCOs reported seven deficiencies, three of which remained outstanding at the time of the accident, according to both Coast Guard and RINA documentation. Two of those deficiencies were firefighting related: dampers in two ventilation ducts in the vehicle spaces were not shutting properly and a section of the overhead on garage deck B was missing A-60 insulation. Another deficiency noted that a 120 VAC electrical outlet in a crewmember's cabin was not properly installed and had been modified for service as a 240 VAC outlet. At the completion of the examination, the *Caribbean Fantasy* was issued a certificate that was valid for 1 year.

Because the vessel's cargo loading ramp was located on the starboard side of the vessel, the *Caribbean Fantasy* always moored with its starboard side to the pier. This mooring arrangement and the existing safety protocol found in both IMO guidance, as well as the Coast Guard's Marine Safety Manual, prohibited the Coast Guard Sector San Juan PSCOs from requiring the vessel's crew to demonstrate the launching and in-water operation of lifeboats no. 1 and no. 3 on the starboard side during PSC examinations where an abandon-ship drill was performed. All abandon-ship drills conducted during examinations by the Coast Guard Sector San Juan PSCOs were performed using the port lifeboat no. 2 and its assigned crew. Entries in the *Caribbean Fantasy*'s official logbook indicated that quarterly launching and in-water operations of lifeboats no. 1 and no. 3, as required by SOLAS regulations, had last been conducted in October 2015. Reports to the company during the months of January, February, and March 2016 informed the vessel's management of the problem with putting the starboard-side boats in the water, and the last report noted that this would be done in the shipyard period. Although there was evidence of the starboard-side lifeboats being launched during the shipyard period, the launching was not done with the assigned crew.

1.14 Waterway Information

The waters north of San Juan are unprotected open ocean. The climate is tropical marine with plentiful sunshine (only 5 days a year entirely without sunshine, on average), although there is an average of 255 days a year with measurable precipitation in the port of San Juan. The currents in this area are influenced by the direction and strength of the winds. The prevailing east trade winds generally cause a west drift.³⁶ The water depth at the location where the fire started on the *Caribbean Fantasy* was about 900 feet. The depth decreases sharply approaching the coast of Puerto Rico. The depth at the grounding site was about 22 feet. The seabed at the grounding site consisted of sand and shells.³⁷

1.15 Weather Information

The accident occurred during daylight hours in clear visibility. At 0730, about the time the fire broke out in the engine room, a weather buoy located 1.7 miles east of the San Juan harbor entrance recorded winds from 083 degrees true at 13 knots, with gusts to 17 knots, and an air temperature of 83.7 degrees F. At 0800, the wave height was recorded at 4 feet with a period of 6.1 seconds and a mean wave direction from 054 degrees true. Conditions as recorded at the buoy remained consistent throughout the duration of the abandonment.

³⁶ Climate information from National Oceanic and Atmospheric Administration (NOAA), *Coast Pilot 5*, 45th Edition, Washington DC: Department of Commerce, 2017.

³⁷ Depth and seabed information from NOAA Chart 25668.

2 Analysis

2.1 Exclusions

There were no reported problems with the *Caribbean Fantasy*'s main electrical system, its emergency diesel generator, or its steering systems. The ship's deck and engine officers were properly licensed and certificated for the capacity in which they were working. The weather conditions at the time of the accident were favorable and were not determined to be causal to the accident. Thus, the NTSB concludes that electrical and steering systems, crew licensing and certification, and weather were not causal factors in the accident. Because alcohol testing of the crew was not conducted and drug testing was not completed within the 32-hour maximum time window required by Title 46 CFR and the company's SMS policy, evidence was insufficient to determine whether alcohol or other drug use played a role in this accident.

2.2 Fire

According to statements from the chief engineer, motorman, and wiper, a fuel leak developed at an end flange on the fuel supply line for the port main engine. The leaking fuel sprayed onto the exhaust manifold and turbochargers, igniting the fuel. Postaccident examination of the flange, which was covered in fuel and soot, was consistent with the crewmembers' report of the location of the fuel leak and origin of the fire.

Additionally, the area of clean burn found on the turbocharger exhaust duct is indicative of a pressurized fuel-fed fire. MGO, which was the fuel used in the engine at the time of the accident, has a flashpoint of 140 degrees F (60 degrees C) and an average autoignition temperature of 428 degrees F (220 degrees C).³⁸ The average temperature of the exhaust manifold was 896–932 degrees F (480–500 degrees C) according to the engine manufacturer. Thus, the temperature of the turbocharger exhaust manifold was sufficiently high to ignite the fuel being sprayed from the fuel supply end flange. The NTSB concludes that the fire on the port main propulsion engine started when fuel spraying from a leaking blank flange at the end of the engine's fuel supply line came into contact with the hot exhaust manifold and ignited.

Investigators examined the end flange for the fuel supply line on the port main engine to determine the source of the leak. The blanking plate and gasket were recovered and examined in the NTSB laboratory. The gasket broke off in several pieces when the fuel pipe flange was disassembled. The gasket material was rigid and brittle, and the exposed interior edges were heavily deteriorated. The manufacturer's specification for the gasket material to be used in the port main engine fuel system was a joint sheet made from a non-asbestos fiber mixed with a heat- and chemical-resistant nitrile rubber binder. Laboratory analysis of the gasket material determined that it was likely composed of silicone rubber, a compound that breaks down when exposed to fuel. The NTSB concludes that use of improper gasket material on the pressurized fuel supply end flange for the port main engine resulted in a breakdown of the gasket material and the eventual fuel spray that led to the fire.

³⁸ The standard flashpoint of a combustible liquid is determined experimentally under laboratory conditions. The actual flashpoint can be reduced as much as 100 degrees F (38 degrees C) when the combustible liquid is splashed or aerosolized.

In addition to the faulty gasket material, the blanking plate that was installed on the flange was neither produced by the original equipment manufacturer nor fabricated to a design or quality standard. The blanking plate was not dimensionally accurate compared to the end flange, did not have a raised face, and did not meet the engine manufacturer's specifications. A blanking plate constructed to the manufacturer's specification would have ensured the proper compression of the gasket and an effective seal. The NTSB concludes that the nonstandard blanking plate used on the end flange of the port main engine fuel supply system potentially exacerbated the leak that led to the fire.

Crewmembers attempted to secure the fuel source to the fire by shutting QCVs for the fuel and lube oil systems. However, all eight fuel and lube oil system QCVs were found blocked open following the accident. The condition of the blocking devices suggests that they had been in place for an extended period of time. For example, the nut and bolt used to block open the starboard HFO storage tank QCV had accumulated dust and dirt, as well as paint that matched the paint used on the valve. Further, the RINA Port State Control Preventive Assessment conducted on July 14, 2016 (a month before the accident), included photographic evidence of the port lube oil storage tank QCV with a blocking device in place. Postaccident examination of the port lube oil storage tank revealed the blocking device was in the same position as the photograph from July 14. During the August 9, 2016, port state control inspection, Coast Guard officers witnessed the blocking devices being used on the vessel's QCVs but were told they were only there to facilitate testing. Although the crew stated that the devices were only in place for inspection purposes, the condition of the devices and the fact they were found in place after the accident indicate otherwise. The NTSB concludes that bolts inserted by *Caribbean Fantasy* engineering personnel into the QCVs to prevent their closing were permanently in place for use during routine operations. Blocking QCVs open is a safety hazard that should never be permitted. Per the 2011 Coast Guard safety alert, "Blocking or disabling these valves is unacceptable under any circumstance. It is absolutely critical that they operate correctly, are maintained, and ready for use at all times."

Even if blocking devices are only put in place to facilitate testing of QCVs, use of the devices during examinations, inspections, and surveys does not fully test the QCV functionality because it does not verify that valve closure fully isolates associated systems. The NTSB concludes that testing during recent class surveys and port state control examinations did not adequately test the full functionality of the QCVs. The NTSB recommends that RINA Services require operators to perform full function tests of QCVs during surveys, ensuring that associated systems shutdown as designed and intended. Further, the NTSB recommends that IACS encourage all member organizations to require operators to perform full function tests of QCVs during surveys, ensuring that associated systems shut down as designed and intended. Additionally, the NTSB recommends that the Coast Guard require operators to perform full function tests of QCVs during inspections and examinations, ensuring that the associated systems shut down as designed and intended.

During the postaccident examination of the main engine room, investigators discovered several areas of inadequate installation of spray tape on port and starboard main engine fuel piping flanges and connections. Measures covered in the MAN Diesel & Turbo customer information letter about proper guarding against splashes and sprays were not employed. Spray tape manufacturer's guidance to use multiple layers of tape to prevent fuel spray onto a hot surface were likewise not used. Investigators determined that only one layer of tape was used around the port fuel supply end flange where the fire started.

Based on the improper installation of the spray tape, use of incompatible gasket material and a nonstandard flange blanking plate, and the blocking open of quick-closing valves, the NTSB concludes that a lack of adherence to manufacturer's guidance and proper machinery maintenance procedures contributed to the fire aboard the *Caribbean Fantasy*.

2.3 Firefighting Systems

At the outbreak of the fire, the chief engineer activated the engine room water-mist fixed firefighting system. Water-mist systems are designed to suppress fires in a localized area; the system pumps are not rated to supply pressure to multiple locations at the same time. VDR data showed and postaccident examination confirmed that the water-mist system section valves in five different locations were activated simultaneously, and it is unlikely that the water-mist system pumps could have kept up with the multiple actuations.

Both the water-mist system and the drencher system were configured to use freshwater from the no. 8 port and starboard tanks, although both systems could be aligned to the fire main (seawater) system. When the drencher system was activated, the water supply to the water-mist system was likely reduced. Both freshwater tanks were empty when sounded by salvage teams after the accident.

There is no evidence that the water-mist suppressed or contained the fire based on statements from the chief engineer and staff captain indicating that the fire continued to grow after the system was activated. The NTSB concludes that the water-mist fixed firefighting system did not suppress the fire likely due to the simultaneous activation of multiple coverage zones and a reduced water supply as a result of drencher system activation. Therefore, the NTSB recommends that the company perform a worst-case scenario risk assessment for all active water-based fire-suppression systems on its vessels to evaluate whether the existing freshwater supply is sufficient.

There is no indication that the CO₂ system, once released, suppressed or contained the fire. Based on photographic and video evidence of smoke rising from the *Caribbean Fantasy*'s stacks after the chief engineer had actuated the ventilation damper closing valve, it is likely that some ventilation dampers did not close or did not seal tightly, allowing oxygen to continue to feed the fire while CO₂ escaped the space. The NTSB concludes that the CO₂ fixed firefighting system did not extinguish the fire due to ventilation dampers that failed to properly close.

The deck between the main engine room and garage B was protected by A-60-rated insulation, which is designed to limit the transmission of heat to an adjacent or overhead area for a period of 60 minutes. However, there was a report of an explosion in garage B 30 minutes after the fire started, indicating that the A-60 fire protection was compromised. A-60 boundary design criteria are based on standardized test fires in a laboratory setting and may not be representative of fire conditions in a fuel-fed machinery space fire. Because the QCVs were manually blocked open, the valves did not operate as designed, which prevented crew from cutting off the fuel source to the fire. The NTSB concludes that the uninterrupted flow of fuel to the fire from the blocked-open QCVs allowed the fire to exceed the design criteria of the structural fire protection for the engine room, and as a result the fire spread to the garage deck above.

2.4 Abandonment

About 58 minutes after the fire started, the master announced to the Coast Guard that the fire could not be controlled and the *Caribbean Fantasy* was being abandoned. According to the master, the following factors, taken together, necessitated the abandonment:

- Fire, smoke, and explosions were reported in the engine room and the garages, and the fires were not under control;
- the CO₂ fixed firefighting system had been deployed in the engine room;
- there was no indication or confirmation of the operability of the water-mist system in the engine room;
- the vessel was listing to port about 4 degrees, and further use of the drencher system would have increased the list;
- there was smoke intrusion into the accommodation areas; and
- operating on emergency electrical power, the vessel had no operational hotel support systems such as potable water, toilets, galley equipment, or air conditioning.

When interviewed, the master stated that he was aware of the nearby SAR and response assets available from the port of San Juan and that there was an active Coast Guard base in the port. Although the postaccident condition of the vessel indicates that it may have been possible for passengers to remain safely on board on open decks, the master felt it was safer to have all persons abandon the vessel considering the ship's geographical location. All passengers and crew were brought ashore, and there were only a small number of injuries. The NTSB concludes that the decision to abandon the *Caribbean Fantasy* was reasonable given the availability of nearby response resources, the proximity to a large port, and the uncertainty of the effects on the vessel from the fire.

Although all passengers ultimately got off the vessel and were transported ashore, there were numerous problems, such as difficulties with launching the lifeboats, deploying the MES, and generally following established emergency procedures, that slowed the process and added confusion.

The commanders for all lifeboats reported that during the abandonment they were unable to open the release hooks. When the lifeboats were lowered to the water, the hydrostatic interlocks should have disengaged, allowing the hooks to open when the lifeboat commander rotated the release handle. Failing that, the crew could have broken the clear plastic cover on the RCU, manually disengaged the hydrostatic interlock, and opened the hooks using the release handle. The operations manual provided a final option of opening the hooks by means of designated wrenches. Evidence indicates that back-up options were not attempted on any of the boats, and lifeboats no.1 and no. 2 were released only after the crew employed a dangerous manual method of releasing the lifting ring from each hook. Evidence from lifeboat no. 3 indicates that the safety pin in the RCU was not removed and recovery pins in the hooks were in the inserted position, both of which would have prevented the boat's release. Investigators and the hook manufacturer examined the hooks after the accident and concluded that they were functional at the time of the accident.

The lifeboat no. 1 commander told investigators that he had not received familiarization training for the lifeboats on board the *Caribbean Fantasy*, and the lifeboat no. 2 commander stated that he received no training on the new release hooks. Based on the evidence that the lifeboat no. 3 hooks were not operated per the operations manual during the accident, it is likely that the lifeboat no. 3 commander was also not trained in their use. Familiarization would have been necessary

based on the installation of the new hooks and their additional safety features. Further, contrary to SOLAS regulation, lifeboats no. 1 and no. 3 had not been launched and maneuvered in the water by their assigned operating crew in the 3-month period before the accident. The last time the starboard-side boats were launched was in March 2016 during shipyard maintenance, before the new hooks were installed. The inability of each of the lifeboat crews to open the release hooks significantly delayed or prevented the launching of the boats and required the assistance of multiple response vessels to recover passengers and crew. The inability to quickly release the lifeboats from the hooks significantly increased the risk to the passengers and crews of the lifeboats. During the delay in releasing lifeboat no. 1, two people either jumped or fell into the water and had to be rescued by a Coast Guard small boat. Lifeboat no. 3, meanwhile, repeatedly struck the side of the ship before it could be hoisted back out of the water. As it was being hoisted, the winch tripped off line, leaving the boat suspended about 6 feet above the water. Passengers were then forced to transfer from the elevated lifeboat to a Coast Guard ATON boat. As the passengers were transferring, the lifeboat commander had to convince passengers not to jump into the water, as some of them were beginning to panic. The transfer of passengers was a risky undertaking, though it was likely the only option for getting the passengers to safety. The NTSB concludes that crewmembers assigned to safety-critical roles on the lifeboats were not proficient with the procedures for opening the lifeboat release hooks, which delayed the abandonment and put lives at risk.

Investigators identified numerous issues related to the launching of the MESs on board *Caribbean Fantasy*. The process for using an MES includes first inflating the slide, followed by using the bowing line to properly position the slide to ensure a proper angle to the vessel. The first liferaft container is then launched and pulled to the platform by crewmembers, where the raft is inflated in preparation for boarding. The second liferaft can then be launched and prepared in the same manner. After the rafts are filled to capacity and released, follow-on liferafts are launched, inflated, and loaded.

During the accident, liferafts for the starboard MES inflated before they were brought alongside the floating platform, which made retrieval by the *Caribbean Fantasy* crew difficult and required the assistance of Coast Guard and other response vessels. The liferaft containers were manually launched from the stowage racks at nearly the same time. Due to the manual launch, painter lines remained attached to each of the containers. As the *Caribbean Fantasy* and the liferaft containers drifted apart in the winds and seas, it is likely that the painter lines came under tension, which triggered the automatic inflation of the rafts before the crew could pull them to the MES platform. The NTSB concludes that the crew did not follow the manufacturer's procedures when launching the starboard MES liferafts, which resulted in the premature inflation of the liferafts.

Per the manufacturer's guidance, the MES slide should be at an angle of 30–35 degrees to the waterline when deployed. When the starboard-side MES on the *Caribbean Fantasy* was deployed, the angle to the waterline was about 54 degrees. Despite the extreme slope, passengers and crew were sent down the MES slide. Evacuees descended down the slide faster than intended before slowing abruptly as the chute turned toward the floating platform. Three passengers and two crewmembers suffered ankle injuries before the slide angle was corrected using the Coast Guard response boat. The NTSB concludes that the five ankle injuries resulted from using the MES deployed at a steeper angle than designed.

Per SOLAS regulations, MESs are required to be deployed on board each vessel every 5 years for testing and training purposes. Additionally, each crewmember assigned to MES duties is required to participate in the deployment of a system every 2 years (but in no case longer than

3 years). Of the crewmembers responsible for the deployment of the MESs on *Caribbean Fantasy*, only one had witnessed a deployment of an MES prior to the accident. The safety officer—the person tasked with training and familiarizing the crew with the ship’s MES—had not witnessed or participated in a deployment. In October 2015, the Coast Guard detained the *Caribbean Fantasy* in part because “the ship’s crew could not provide documentation that any crewmembers were participating in MES deployments, and when questioned during crew drills, crew reported never having participated in a deployment.” The deficiency was cleared by RINA in November 2015 with a statement that “training for MES party member has been carried out with means of audio video aids. The proper familiarization for the MES deployment has been verified during our attendance by direct interview to MES party members about deployment procedure iwo the [Life Saving Appliance] equipment.” Investigators reviewed the video used for MES training on board the *Caribbean Fantasy*. The video, which had no audio, was designed to be instructor-led; however, the safety officer who led the training had not received any training beyond watching the video herself. Given the difficulties discovered in the deployment of the MES during the accident, the NTSB concludes that the crew assigned to deploy the MES and liferafts were not adequately trained, which delayed the abandonment. Based on the identified training deficiencies of the lifeboat crews and MES teams, the NTSB recommends that the company review its lifesaving appliance training program, including recordkeeping procedures, and revise the program to ensure that crewmembers have proficiency with onboard systems.

PA system announcements informing the passengers about the fire provided two different orders in two different languages in quick succession. The significant variation in the announcements—only one of which directed preparations to abandon ship—went unnoticed by the bridge team. Also, neither of these announcements were coordinated with signals from the ship’s alarm bell and whistle. Thus, the response to the accident was almost immediately thrown into confusion. That confusion continued throughout the accident events. Some crewmembers were unsure of whether to go to their emergency stations or directly to their assigned survival craft. Others were untrained for their responsibilities when they arrived at their assigned stations.

For passenger ships, SOLAS regulation requires that all survival craft needed in a full abandonment be launched with their full complement of persons and equipment within a period of 30 minutes from the time the abandon-ship signal is given. The Spanish-language announcement to abandon the *Caribbean Fantasy* was made at 0747. The last person removed from lifeboat no. 3 that was suspended from the side of the vessel was about 1130, 3 hours and 43 minutes after the abandon-ship order was given. According to the passenger ship safety certificate, the number of passengers and crew that the ship was permitted to carry was 1,150. At the time of the accident, the vessel was at almost half that capacity. As noted above, the abandonment was delayed by the crew’s lack of training on the lifesaving equipment and unfamiliarity with the abandonment process. Although all passengers survived the accident, the NTSB concludes that the abandonment process on board the *Caribbean Fantasy* was disorganized and inefficient. Had the circumstances been different—further from port, in inclement weather, or at nighttime—and had there been less time to leave the vessel, the result could have been catastrophic.

2.5 Mass Rescue Operations

Despite communications difficulties experienced during the rescue, all individuals on board were brought ashore, and there were only a small number of injuries. Given the chaotic abandonment process on board the ship, the safe recovery of the passengers and crew is proof alone that the MRO was successful. Sufficient response vessels and aircraft responded to the scene, an on-scene coordinator directed the actions of most response assets, a shoreside receiving area

for the management and care of the survivors was established, and most importantly, all passengers and crew were evacuated from the vessel. The NTSB concludes that the mass rescue operation was effective.

When investigators analyzed the multiple aspects of the response that resulted in the success of the MRO, two key factors stood out. First, at the time of the accident, the *Caribbean Fantasy* was in close proximity to the entrance of the port of San Juan. Coast Guard Sector San Juan and subordinate Coast Guard commands such as the small boat station and the cutter *Joseph Tezanos* were located either in the port or nearby. Many of the other organizations that responded to the vessel's call for assistance, including CBP, PREMA, and the City of San Juan's EOC, EMS, police, and fire department, were also located in the area and had sufficient staffing and response assets available. Additionally, many of the good Samaritan and commercial vessels that assisted were either based in the port or operating just offshore.

Second, the development, design, and functional exercises of the various elements of Coast Guard Sector San Juan's MRO plan, led by the unit's PVSS and other command personnel, proved significant to the outcome. The written plan addressed all aspects of a response to a large-scale incident by multiple agencies. Just as important, the Coast Guard personnel responsible for managing the plan performed frequent training exercises, above and beyond agency requirements, to educate and better prepare other federal, state, and local response organizations, as well as local maritime stakeholders, for an actual event. As noted, Coast Guard Sector San Juan is unique in that it has a dedicated PVSS; all other PVSSs are assigned at the district level. The NTSB concludes that the presence of a PVSS at Coast Guard Sector San Juan, who had trained and worked with local officials, contributed to the success of the *Caribbean Fantasy* MRO. The NTSB recommends that the Coast Guard evaluate the feasibility of creating a PVSS billet at each sector that has the potential for a SAR activity characterized by the need for immediate assistance to a large number of persons in distress, and staff sector-level billets, as appropriate, based on the findings of that evaluation.

2.6 Safety Oversight

To meet the intent of the ISM Code, a company must have a well-constructed SMS that is implemented at all levels of the organization. Successful implementation of an SMS requires a genuine commitment and a proactive effort from top managers. During postaccident interviews, the CEO and other top managers at Baja Ferries spoke about their personal commitment to safety and the company's safety-oriented culture; however, investigators did not find substantial evidence to validate those claims.

The CEO had no direct involvement with the daily operations of the *Caribbean Fantasy*, vessel manning, or crew training. Despite the company having a total fleet of just four passenger vessels, the CEO last visited the *Caribbean Fantasy* in early 2015, over a year before the accident. He also indicated that he did not review the minutes of the safety meetings conducted on board the vessel by any of its masters and that he did not attend the last external ISM audit of the company headquarters performed by the classification society. Investigators identified instances where the CEO held meetings with senior company staff, the Coast Guard, RINA, and the flag state to discuss safety and the need for operational improvement on board the *Caribbean Fantasy*. But these meetings were predominately a management reaction to an adverse event such as a port state control examination that resulted in multiple deficiencies or a formal detention of the vessel.

The CEO stated that he met 4–6 times a year with the company’s DPA. The DPA, per the ISM Code, is the individual ashore who is charged with ensuring the safe operation of each vessel and serves as the primary communication link between vessel personnel and senior company management. This level of interaction between these two critical safety positions, given the vessel’s historically poor compliance record leading up to the accident, was inadequate.

Safety must not only be a priority for the company, but it also must be a priority on board each vessel operated by the company. One of the most fundamental performance measures used to evaluate the effective implementation of an SMS is the vessel’s compliance record with applicable procedures, regulations, and requirements. Although the DPA performed internal audits and RINA performed external audits of the SMS, investigators found little evidence that those audit findings were successfully used for continuous improvement. For example, on at least two separate occasions, port state control authorities deemed the vessel’s engine room to be a fire risk because of poor housekeeping. During the ICOC inspection, the *Caribbean Fantasy*’s drencher system was significantly degraded, delaying certification, while in a later port state control inspection, the vessel’s sprinkler system was found to be unable to discharge. Engineering equipment was lacking in maintenance, in need of repair, or requiring service during port state control inspections, classification surveys, and the postaccident examination. Shortcomings were captured on audit forms, with the root causes identified and corrective actions to be implemented, yet the shortcomings were often repeated. Port state control officers from the US and Gibraltar found substandard conditions that warranted three formal detentions of the vessel in the years immediately preceding the fire.

The ISM Code also requires that the company ensure that vessels are manned with qualified individuals who are trained in the performance of their duties relating to safety and response to emergency situations. During the *Caribbean Fantasy* fire and the subsequent abandon-ship event, there were multiple instances where crew serving in safety-critical positions did not perform as expected by the vessel’s emergency plan and station bill.

The ISM Code required the operating company to “establish and maintain procedures to control all documents and data which are relevant to the SMS.” It further stated that the company should ensure that “valid documents are available at all relevant locations; changes to documents are reviewed and approved by authorized personnel; and obsolete documents are promptly removed.” The Baja Ferries SMS stated, “The Company has supplied all the safety and environmental protection documentation required for correct operation of the office and the managed ships,” and provided procedures for annual checks for “availability, condition and validity.” Yet during the investigation, numerous documents for shipboard operations and emergency procedures were found to be obsolete or unusable in the working language of the ship. For example, there were two significantly different versions of the emergency plan and station bill posted on the ship, both of which were approved by RINA; instructions for the operation of the water-mist and CO₂ systems were in Italian and poorly translated English; and instructions for operating the release hooks in lifeboats no. 1 and no. 2 were for hooks that had been replaced. Many of these documents were hold-overs from previous vessel owners that had not been verified or updated.

Baja Ferries’ company policy, set in accordance with SOLAS regulations and stated in the SMS, established English as the working language for the *Caribbean Fantasy*. However, during interviews, the DPA, the master, and the safety officer stated that English proficiency was an issue. Further, the safety officer told investigators that she had to conduct training in both English and Spanish due to a lack of proficiency among crewmembers and that she had to reassign some

emergency duties due to language issues. The safety officer also noted in an interview that sometimes she would not know if the crewmembers could speak English prior to attending familiarization and other initial onboard training.

Baja Ferries' SMS assigned responsibility for safety training to the safety officer. The SMS also provided checklists to document the training and familiarization of newly reported personnel. Investigators found that completion of this training was poorly documented, if completed at all. A lack of training was evident in the response to the accident. Crewmembers in many safety-critical positions did not have the necessary training or familiarization to carry out their emergency duties. The second officer (off watch) had been on board the ship for 4 days, was not aware of his emergency position on the bridge, had not completed basic familiarization training or emergency drills, and was unfamiliar with the operation of the lifeboat he was assigned to command. None of the officers assigned to command lifeboats knew how to operate the release hooks once the boats were in the water. Additionally, investigators determined that the starboard-side lifeboats had not been operated in the water since October 2015, which denied the crews of these boats the opportunity to train and become familiar with their operation. Crewmembers assigned to deploy the MES were unfamiliar with the launching sequence for liferaft containers. Only one crewmember had observed an actual deployment of an MES, which was not conducted on board the vessel. The ship operator did not take adequate measures, including training and familiarization of individual crewmembers, to ensure the competency of the ship's crew for their emergency duties.

Regarding engineering practices, the company's SMS required machinery spaces to be "kept clean, tidy and leak free," yet port state control officers found the spaces unsafe due to poor housekeeping and oil on the decks and in the bilges. The SMS also stated that "sources of ignition must be protected from contact with fuel or lubricating oil," but investigators found fuel and lube oil flanges throughout the engineering spaces that were not protected from splash or spray in accordance with the IMO and manufacturer's guidance. Despite recurring visits by shoreside staff (DPA and technical manager) during the shipyard period, recent PSC examinations, and specific SMS guidance to the chief engineer and all engineering officers to ensure the safe and efficient operation of the engineering plant, safety devices were deliberately disabled—fuel and lube oil QCVs were blocked open. Additionally, very few maintenance actions were documented, though required by the SMS, since the shipyard period began in March 2016.

Although the company's written SMS met the objectives of the ISM Code, the NTSB concludes that Baja Ferries failed to successfully implement its SMS, both ashore and on board the *Caribbean Fantasy*. Therefore, NTSB recommends that the company provide formal and recurrent training to shoreside management and senior shipboard officers on the ISM Code to ensure that all senior leaders are fully knowledgeable about the policies and procedures in the SMS.

The preamble to the ISM Code states "the cornerstone of good safety management is commitment from the top." Yet the lack of engagement by Baja Ferries' CEO and company management's reactive vice proactive approach to issues identified on the *Caribbean Fantasy* before the accident demonstrate that this commitment was lacking. Furthermore, the failure of Baja Ferries to ensure that the vessel was properly maintained and manned with an adequately trained crew, its failure to successfully implement the SMS, and its acceptance of unsafe practices such as blocking open QCVs suggests that an unsafe mindset was pervasive throughout the company. The NTSB concludes that Baja Ferries possessed a poor organizational safety culture,

as evidenced by management's lack of commitment to core safety programs and its disconnect from the training, maintenance, and operations on board the *Caribbean Fantasy*.

Although the owner and operator have the ultimate responsibility for the overall condition and safe operation of a vessel, the flag state and the classification society/recognized organization also assume an oversight responsibility. Because conditions on vessels are dynamic in nature, it would be inappropriate to suggest that a single instance of deficient performance on board the *Caribbean Fantasy* during a port state control examination would support the conclusion that additional preventative action was warranted on behalf of either the flag state of Panama or the classification society RINA Services. However, the *Caribbean Fantasy* had a history of poor performance, including three detentions by two different port state control authorities, that should have prompted both Panama and RINA to implement increasingly more assertive actions to correct deficiencies. Although the classification society implemented a heightened monitoring and unscheduled survey program in December 2014, this action had little effect in resolving the conditions on board the *Caribbean Fantasy*. In October 2015, a RINA surveyor examined the vessel, issued multiple recommendations of class, and submitted an IACS procedural report 17 on deficiencies possibly affecting the implementation of the ISM Code. After the *Caribbean Fantasy*'s detention in Gibraltar in July 2016, a RINA surveyor photo-documented a deliberately disabled QCV, which was found in the same condition after the accident. QCV blocking devices had clearly been in place for an extended period of time and should have raised concern with the classification society.

Despite reports from surveys and port state control inspections, no additional actions were taken by Panama or RINA other than to continue unscheduled surveys. Noting a pattern of unsafe operations, Panama could have exercised its authority as flag state to impose sanctions on the owner for repeated non-compliance or remove the vessel from registry, at least temporarily terminating operations. RINA, acting under the delegated authority of Panama, could have suspended or withdrawn the classification certificates it issued to the vessel, which would have also resulted in a stoppage of operations. At the time of the fire, neither Panama nor RINA had taken any steps to escalate the consequences for the owner's failure to maintain the vessel in a state of compliance. The NTSB concludes that the recognized organization, RINA Services, failed to meet its responsibilities, on behalf of the Panama Maritime Authority, to ensure that the *Caribbean Fantasy* met and remained in compliance with international and statutory requirements. Therefore, the NTSB recommends that the classification society RINA Services review the performance of auditors who conducted either ISM Code document of compliance audits at Baja Ferries S.A. de C.V. or safety management certificate audits on the *Caribbean Fantasy* to ensure that their individual actions met the intent of RINA Service's rules and guidance. Furthermore, the NTSB recommends that the Panama Maritime Authority review the performance of RINA Services, acting on behalf of the flag-state administration, to determine whether the classification society is meeting IMO guidelines. Finally, the NTSB recommends that the Panama Maritime Authority review actions taken as the flag state of the *Caribbean Fantasy* and revise procedures to ensure future actions meet the intent of IMO guidelines.

3 Conclusions

3.1 Findings

1. Electrical and steering systems, crew licensing and certification, and weather were not causal factors in the accident.
2. The fire on the port main propulsion engine started when fuel spraying from a leaking blank flange at the end of the engine's fuel supply line came into contact with the hot exhaust manifold and ignited.
3. Use of improper gasket material on the pressurized fuel supply end flange for the port main engine resulted in a breakdown of the gasket material and the eventual fuel spray that led to the fire.
4. The nonstandard blanking plate used on the end flange of the port main engine fuel supply system potentially exacerbated the leak that led to the fire.
5. Bolts inserted by *Caribbean Fantasy* engineering personnel into the quick-closing valves to prevent their closing were permanently in place for use during routine operations.
6. Testing during recent class surveys and port state control examinations did not adequately test the full functionality of the quick-closing valves.
7. Lack of adherence to manufacturer's guidance and proper machinery maintenance procedures contributed to the fire aboard the *Caribbean Fantasy*.
8. The water-mist fixed firefighting system did not suppress the fire likely due to the simultaneous activation of multiple coverage zones and a reduced water supply as a result of drencher system activation.
9. The carbon dioxide fixed firefighting system did not extinguish the fire due to ventilation dampers that failed to properly close.
10. The uninterrupted flow of fuel to the fire from the blocked-open quick-closing valves allowed the fire to exceed the design criteria of the structural fire protection for the engine room, and as a result the fire spread to the garage deck above.
11. The decision to abandon the *Caribbean Fantasy* was reasonable given the availability of nearby response resources, the proximity to a large port, and the uncertainty of the effects on the vessel from the fire.
12. The abandonment process on board the *Caribbean Fantasy* was disorganized and inefficient.
13. Crewmembers assigned to safety-critical roles on the lifeboats were not proficient with the procedures for opening the lifeboat release hooks, which delayed the abandonment and put lives at risk.

14. The crew assigned to deploy the marine evacuation system and liferafts were not adequately trained, which delayed the abandonment.
15. The crew did not follow the manufacturer's procedures when launching the starboard marine evacuation system liferafts, which resulted in the premature inflation of the liferafts.
16. The five ankle injuries resulted from using the marine evacuation system deployed at a steeper angle than designed.
17. The mass rescue operation was effective.
18. The presence of a passenger vessel safety specialist at Coast Guard Sector San Juan, who had trained and worked with local officials, contributed to the success of the *Caribbean Fantasy* mass rescue operation.
19. The company failed to successfully implement its safety management system, both ashore and on board the *Caribbean Fantasy*.
20. Baja Ferries possessed a poor organizational safety culture, as evidenced by management's lack of commitment to core safety programs and its disconnect from the training, maintenance, and operations on board the *Caribbean Fantasy*.
21. The recognized organization, RINA Services, failed to meet its responsibilities, on behalf of the Panama Maritime Authority, to ensure that the *Caribbean Fantasy* met and remained in compliance with international and statutory requirements.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of the fire aboard the roll-on/roll-off passenger vessel *Caribbean Fantasy* was Baja Ferries' poor safety culture and ineffective implementation of their safety management system on board the vessel, where poor maintenance practices led to an uncontained fuel spray from a blank flange at the end of the port main engine fuel supply line onto the hot exhaust manifold of the engine. Contributing to the rapid spread of the fire were fuel and lube oil quick-closing valves that were intentionally blocked open, fixed firefighting systems that were ineffective, and a structural fire boundary that failed. Contributing to the fire and the prolonged abandonment effort was the failure of the Panama Maritime Authority and the recognized organization, RINA Services, to ensure Baja Ferries' safety management system was functional.

4 Recommendations

As a result of its investigation, the National Transportation Safety Board makes the following safety recommendations:

To the US Coast Guard:

Require operators to perform full function tests of quick-closing valves during inspections and examinations, ensuring that the associated systems shut down as designed and intended. (M-18-1)

Evaluate the feasibility of creating a passenger vessel safety specialist billet at each sector that has the potential for a search and rescue activity characterized by the need for immediate assistance to a large number of persons in distress, and staff sector-level billets, as appropriate, based on the findings of that evaluation. (M-18-2)

To Baja Ferries S.A. de C.V.:

Perform a worst-case scenario risk assessment for all active water-based fire suppression systems on your vessels to evaluate whether the existing freshwater supply is sufficient. (M-18-3)

Review your lifesaving appliance training program, including recordkeeping procedures, and revise the program to ensure that crewmembers have proficiency with onboard systems. (M-18-4)

Provide formal and recurrent training to shoreside management and senior shipboard officers on the International Safety Management (ISM) Code to ensure that all senior leaders are fully knowledgeable about the policies and procedures in the safety management system. (M-18-5)

To RINA Services S.p.A:

Require operators to perform full function tests of quick-closing valves during surveys, ensuring that associated systems shut down as designed and intended. (M-18-6)

Review the performance of auditors who conducted either International Safety Management Code document of compliance audits at Baja Ferries S.A. de C.V. or safety management certificate audits on the *Caribbean Fantasy* to ensure that their individual actions met the intent of RINA Service's rules and guidance. (M-18-7)

To the International Association of Classification Societies:

Encourage all member organizations to require operators to perform full function tests of quick-closing valves during surveys, ensuring that associated systems shut down as designed and intended. (M-18-8)

To the Panama Maritime Authority:

Review the performance of RINA Services, acting on behalf of the flag-state administration, to determine whether the classification society is meeting International Maritime Organization guidelines. (M-18-9)

Review actions taken as the flag state of the *Caribbean Fantasy* and revise procedures to ensure future actions meet the intent of International Maritime Organization guidelines. (M-18-10)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

ROBERT L. SUMWALT, III
Chairman

T. BELLA DINH-ZARR
Member

EARL F. WEENER
Member

Adopted: June 5, 2018

Appendixes

Appendix A – Investigation Information

The Coast Guard was the lead federal agency in this investigation. The NTSB launched a team of investigators to the accident scene August 18–26, 2016. While on scene, investigators interviewed crewmembers and passengers from the *Caribbean Fantasy*, as well as first responders from the port of San Juan. In addition, investigators documented the vessel’s characteristics and damage, gathered documentation, and retrieved and reviewed recorded data from the vessel’s VDR and other information systems. Investigators returned to San Juan September 14–16 to participate in the post-casualty examination and surveys of lifesaving systems and the ship’s machinery and accommodation spaces. On March 20, 2017, the Coast Guard conducted a 9-day district formal hearing into the accident. During the hearing, held in San Juan, Coast Guard and NTSB investigators questioned crewmembers, company management, classification society representatives, and Coast Guard personnel.

Appendix B – Vessel Information

Table 1. Vessel Information.

Vessel	<i>Caribbean Fantasy</i>
Owner/Operator	Baja Ferries S.A. de C.V.
Port of registry	Panama City
Flag	Panama
Type	Roll-on/roll off passenger vessel
Year built	1989
IMO number	8814263
Classification society	RINA Services
Construction	Steel
Length	613.9 ft (187.1 m)
Draft	22 ft (6.7 m)
Beam/width	88.7 ft (27 m)
Tonnage	28,112 gross tons
Engine power; manufacturer	Two 14,400 hp (10,738 kW) Mitsubishi MAN B&W 8L58/64 diesel engines
Persons on board	511 (387 passengers, 124 crew)

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