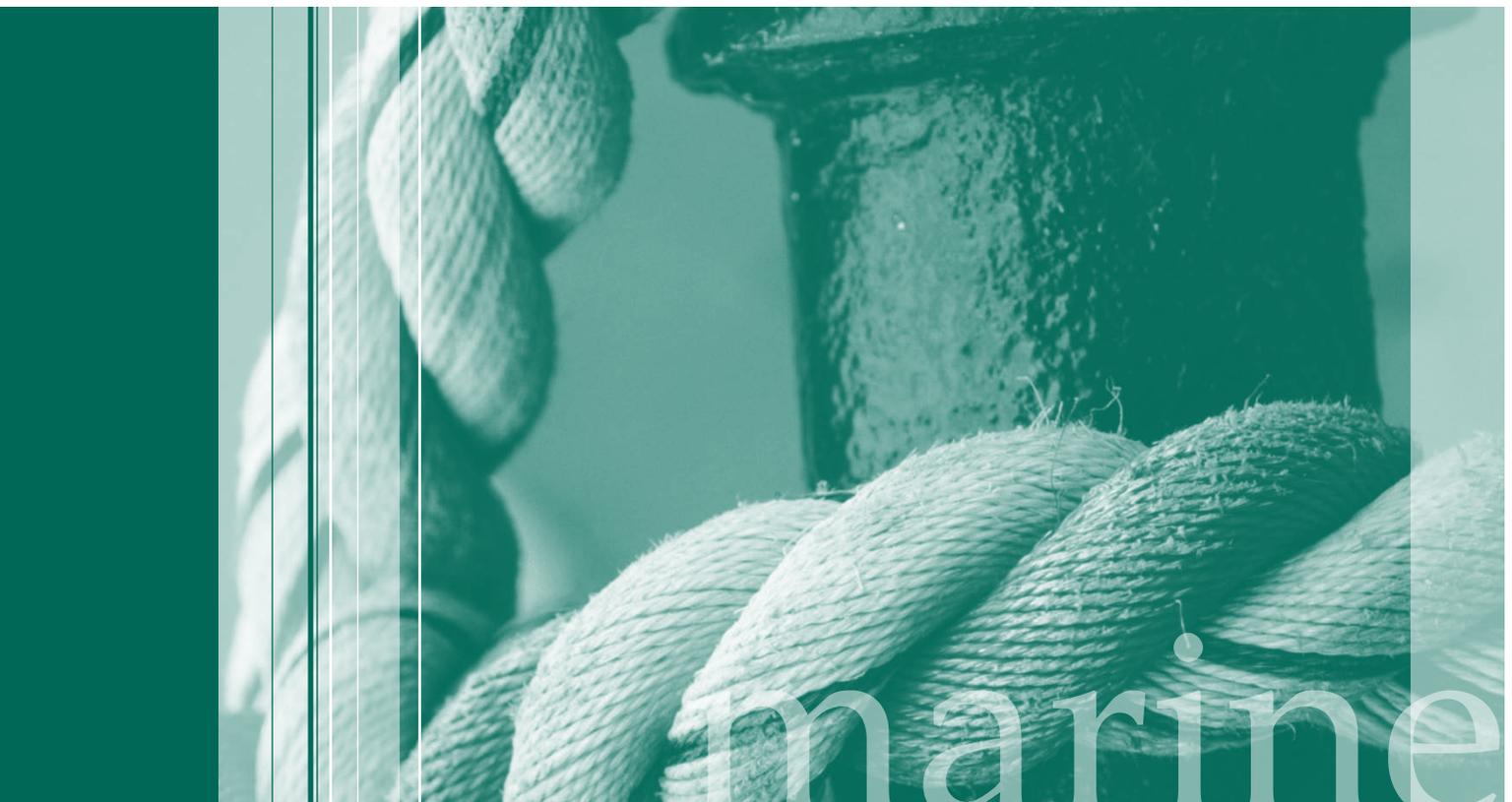


Grounding of U.S. Passenger Vessel  
*Empress of the North*  
Intersection of Lynn Canal and Icy Strait  
Southeast Alaska  
May 14, 2007



ACCIDENT REPORT

NTSB/MAR-08/02  
PB2008-916402



**National  
Transportation  
Safety Board**



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# Marine Accident Report

Grounding of U.S. Passenger Vessel  
*Empress of the North*  
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Southeast Alaska  
May 14, 2007



**National  
Transportation  
Safety Board**

490 L'Enfant Plaza, S.W.  
Washington, D.C. 20594

**National Transportation Safety Board. 2008. *Grounding of U.S. Passenger Vessel Empress of the North, Intersection of Lynn Canal and Icy Strait, Southeast Alaska, May 14, 2007. Marine Accident Report NTSB/MAR-08/02. Washington, DC.***

**Abstract:** This report discusses the May 14, 2007, accident in which the passenger vessel *Empress of the North* grounded on Rocky Island, about 20 miles southwest of Juneau. The vessel was carrying 206 passengers and 75 crewmembers on a cruise through Alaska's Inland Passage. The junior third mate, a newly licensed officer, was on his first navigation watch at the time of the accident. The U.S. Coast Guard and good Samaritan vessels evacuated passengers and crewmembers and transported them back to Juneau. No injuries or pollution resulted from the accident. The cost of repairing the vessel and returning it to service was estimated at \$4.8 million.

The National Transportation Safety Board identified the following safety issues as a result of its accident investigation: the master's decision to put an inexperienced third mate on watch without supervision or guidance; the junior third mate's actions; watchkeeping procedures; documentation deficiencies; and malfunctioning lifesaving devices.

As a result of its investigation, the Safety Board made recommendations to the U.S. state and Federal maritime academies and to the Passenger Vessel Association. Earlier recommendations were made to the Coast Guard.

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## ACRONYMS AND ABBREVIATIONS

<b>AB</b>	able-bodied seaman
<b>ACG</b>	Ambassadors Cruise Group
<b>AIS</b>	automatic identification system
<b>ARPA</b>	automatic radar plotting aid
<b>CFR</b>	<i>Code of Federal Regulations</i>
<b>COI</b>	certificate of inspection
<b>ECDIS</b>	electronic chart display and information system
<b>GPS</b>	global positioning system
<b>IBA</b>	inflatable buoyant apparatus
<b>ICR</b>	inspection criteria reference
<b>IEC</b>	International Electrotechnical Commission
<b>ISM</b>	International Safety Management
<b>NMEA</b>	National Marine Electronics Association
<b>NVIC</b>	navigation and vessel inspection circular
<b>OCMI</b>	officer in charge, marine inspection
<b>SOLAS</b>	International Convention for the Safety of Life at Sea
<b>STCW</b>	Seafarer's Training, Certification, and Watchkeeping
<b>VDR</b>	voyage data recorder
<b>VHF</b>	very high frequency

## EXECUTIVE SUMMARY

About 0130 on Monday, May 14, 2007, the 300-foot passenger vessel *Empress of the North*, operated by Majestic America Line, grounded on a charted rock at the intersection of Lynn Canal and Icy Strait in southeastern Alaska, about 20 miles southwest of Juneau. The vessel was negotiating a turn west out of Lynn Canal into Icy Strait on its way to Glacier Bay, the next stop on a 7-day cruise, carrying 206 passengers and 75 crewmembers. The junior third mate, a newly licensed officer, was on his first navigation watch when the vessel struck the rock, known as Rocky Island, which was illuminated by a flashing green navigation light. The U.S. Coast Guard and several good Samaritan vessels assisted in evacuating the passengers and nonessential crewmembers and safely transporting them back to Juneau. No injuries or pollution resulted from the accident, but the vessel sustained significant damage to its starboard underside and propulsion system.

The National Transportation Safety Board determines that the probable cause of the grounding of the *Empress of the North* was the failure of the officer of the watch and the helmsman to navigate the turn at Rocky Island, which resulted from the master's decision to assign to the midnight-to-0400 watch an inexperienced, newly licensed deck officer who was not familiar with the route, the vessel's handling characteristics, or the equipment on the vessel's bridge.

The Safety Board's investigation of the accident identified the following safety issues:

- Master's decision to put an inexperienced third mate on watch without supervision or guidance.
- Junior third mate's actions.
- Watchkeeping procedures.
- Documentation deficiencies.
- Malfunctioning lifesaving devices.

As a result of its investigation, the Safety Board makes recommendations to the U.S. state and Federal maritime academies and to the Passenger Vessel Association. Earlier recommendations were made to the Coast Guard.

## FACTUAL INFORMATION

### Accident Narrative

At 0710<sup>1</sup> on Sunday, May 13, 2007, the passenger vessel *Empress of the North* (figure 1), operated by Majestic America Line, arrived at Skagway, Alaska, on a 7-day cruise of southeast Alaska that began in Juneau on May 12 and called at Skagway, Glacier Bay, and Sitka before returning to Juneau (figure 2). The cruise was the vessel's first round-trip through Alaska's Inland Passage of the 2007 season. The *Empress of the North* began the season with cruises on the Columbia, Willamette, and Snake rivers of Oregon and Washington, then was repositioned from Oregon to Juneau between April 28 and May 12. Passengers joined the "repositioning cruise" in Seattle on April 30 and disembarked in Juneau on May 12.

The *Empress of the North* was inspected and certificated by the U.S. Coast Guard under Title 46 *Code of Federal Regulations* (CFR) parts 70-89 (subchapter H). As a passenger vessel that traveled in international (Canadian) waters, it was also required to comply with certain standards of the International Maritime Organization,<sup>2</sup> including the 1974 International Convention for the Safety of Life at Sea (SOLAS), the International Safety Management (ISM) code,<sup>3</sup> and the Seafarer's Training, Certification, and Watchkeeping (STCW) code.<sup>4</sup>

In Skagway, the crew tested gear<sup>5</sup> in preparation for the trip south toward Glacier Bay. No problems were found. At 1720 on May 13, the vessel departed Skagway under the command of a licensed master, carrying 206 passengers and a crew of 75. As listed on the crew manifest, the ship's officers, in addition to the master, consisted of a chief mate, a second mate, two third mates, a chief engineer, a first engineer, a second engineer, and a third engineer. Among the unlicensed crew were five able-bodied seamen (ABs) and three deckhands.

One of the third mates had joined the crew the day before, the start of his first maritime job after graduating from the California Maritime Academy. The

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<sup>1</sup> All times are Alaska daylight saving time according to the 24-hour clock.

<sup>2</sup> The International Maritime Organization is a specialized agency of the United Nations.

<sup>3</sup> The full name of the code is International Management Code for the Safe Operation of Ships and for Pollution Prevention. For more information, see "Safety Management System" subsection of "Operational Management Information" section, later in this report.

<sup>4</sup> The STCW code is attached to the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers, as amended in 1995; it is incorporated in the Coast Guard regulations at 46 CFR 10.205.

<sup>5</sup> A marine term used to describe the required testing of propulsion, communications, steering, and other critical systems before a vessel's departure from port.

new, or junior, third mate's employment-related activities between graduating and joining the crew of the *Empress of the North* were as follows:

- April 28 ..... Graduate from California Maritime Academy;  
receive Coast Guard third mate's license
- May 11..... Report for work at Majestic America Line offices in  
Portland, Oregon; sign employment papers
- May 11..... Fly to Seattle, Washington
- May 12..... Fly to Juneau, Alaska, to join *Empress of the North*

The company had arranged for the junior third mate to spend 7 days on the vessel before beginning a regular 4-week duty on May 19. The master told investigators that his plan for the junior third mate was to have him observe operations during his first 7 days, when his duty schedule would overlap that of the senior third mate. After that, the junior third mate would serve as a watchstander and the senior third mate would go off duty.

According to interviews, when the junior third mate came on board, he introduced himself, observed deck operations, and talked to the mates and other deck crewmembers. The junior third mate stood a port watch when the vessel was docked in Skagway, while the second mate conducted bridge tours for passengers.



**Figure 1.** The *Empress of the North* under way in Auke Bay, Alaska. The newly constructed ship had four passenger decks and was designed to mimic Mississippi River paddle wheelers (the red paddle wheel is barely visible at the vessel's stern). Passengers embarked and disembarked using the gangway at the bow, shown here in the raised position.



**Figure 2.** *Empress of the North* accident site and other southeast Alaska locations referenced in the report. Inset shows the vessel's path to its grounding on Rocky Island.

On May 13, the senior third mate had the watch from midnight to 0400. During his watch, he experienced gastrointestinal distress and could not complete the duty. The chief mate relieved him. Later that morning, the vessel docked in Skagway, where a local physician examined the senior third mate and recommended that he remain isolated on the vessel and off duty until his condition improved.

The chief mate told investigators that he informed the master later on the morning of May 13 about the senior third mate's illness. He said that he did not discuss with the master replacing the ill third mate with the junior third mate. The master told investigators, however, that he briefly talked to the chief mate about replacing the ill third mate with the junior third mate, and that "the chief mate was in agreement." According to the master, replacing the ill third mate on the midnight-to-0400 watch "wasn't really a decision per se." But he said, "I felt that it was an easy watch, so it was a good place to start." He added that he considered the junior third mate "qualified for the assignment I gave him, for sure . . . by virtue of his training and by virtue of what he saw on the bridge." The second mate told investigators that when he discussed with the master assigning the junior third mate to the watch, "We had agreed that it was an easy watch, much easier than [the] Snake River or the Columbia River, even, and one, two, three – three course changes, fairly easy." The chief mate said that there was no discussion with the master about familiarizing the junior third mate with the route or the vessel before he was to take the watch.

The junior third mate told investigators that the master told him that "due to the circumstance of the [other] mate being sick, that I would need to do that [stand watch]." The junior mate said, "My understanding was he [the helmsman] would be in control of the boat, and I would be there because I have a license." When asked whether he had felt ready to assume the watch, the junior third mate told investigators,

I felt comfortable enough to be up there, and I knew that if . . . there was anything that . . . was out of the ordinary, I'd just give him [the master] a call, and that he would be there, but I never, did not attempt to do that.

The master switched the schedule of one of the ABs to allow him to serve as helmsman during the junior third mate's first watch. The master described that AB as experienced in the local waterways and knowledgeable about the bridge equipment.<sup>6</sup> The master said that he assigned the most experienced AB to serve as helmsman with the junior third mate because he knew that the AB "would not withhold anything [and] would try to help him [the junior third mate] as best he can." He described the AB as "a well-spoken, soft-spoken guy that . . . would be very unintimidating." He also said that he knew the AB was familiar with the alarms on the bridge and could explain them to the junior third mate. The master said that he told the junior third mate that he, the master, would be available throughout the watch and that the junior third mate should not hesitate to call him with questions.

<sup>6</sup> The AB told investigators that he had traveled on the accident route only once before, and that was as ordinary seaman, not helmsman. His AB experience had been on the *Empress of the North's* river routes.

At 2323 on May 13, the junior third mate entered the bridge and met with the second mate, whom he was relieving as officer on watch, the AB on watch, and the relieving AB. The junior third mate and the second mate discussed the route, the vessel's equipment, and other information relevant to watchkeeping. The bridge was equipped with a printed navigation chart for the area<sup>7</sup> and two electronic navigational charting systems—ECDIS (electronic chart display and information system) and Nobeltec.<sup>8</sup> Also available to the watchstanders were a general voyage plan (appendix B) and the vessel's standing orders (appendix C).<sup>9</sup> The first entry on the voyage plan for the day of the accident states: "Security call for rounding Rocky Is, west bound," at Point Couverden.<sup>10</sup> The master left no night orders for the trip (orders to the night watchstanders including course changes, weather, speed, warnings of hazards, and so forth).<sup>11</sup>

The navigation charts showed two tracklines, one between Rocky Island and Point Couverden and the other south of Rocky Island (see "Bridge Equipment" section for details). According to both the master and the chief mate, the decision about which trackline to take was left to the officer of the watch. The waterway between Rocky Island and Point Couverden was about 0.5 mile wide. The second mate told investigators:

I showed him [the junior third mate] that if he followed the tracklines, he'd have no problem. He could either go south of Rocky Island, or in the Nobeltec and on the ECDIS, it has us actually going between—a half-mile between land [and the island]. On the Snake River, we have plenty of times where we're [in passages] less than half a mile [wide]. Not a big deal, so I didn't really think it was an issue. I told him that he needed to go south of the island if he didn't feel comfortable, or he could go right down through the channel there. He didn't tell me what he was going to do either way. He just nodded his head.

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<sup>7</sup> *Lynn Canal: Icy Strait to Point Sherman*, chart 17316, Coast Survey, United States, Alaska—Southeast Coast (Washington, DC: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 2002; corrected through Notice to Mariners 35/05 and 44/06).

<sup>8</sup> ECDIS and Nobeltec are electronic versions of navigation charts. They provide navigation information but do not direct a vessel along a particular route.

<sup>9</sup> Standing orders are written instructions to the watch officer concerning responsibilities, duties to be performed, and precautions to be observed for safe vessel operation while on watch. As an ISM-compliant vessel, the *Empress of the North* was required to have a safety management system. The safety management system required masters to issue standing orders (Majestic America Line, *Fleet Instructions: Empress of the North*, subsection 1.9.1, "Standing Orders") and gave a compilation of standing orders from various company vessels that masters were allowed to modify as necessary. The safety management system is described further in the "Operational and Management Information" section.

<sup>10</sup> A security call is an informational message of a safety nature issued to all area vessels.

<sup>11</sup> The company's safety management system treated night orders as optional: "Night orders may be used to supplement Standing Orders" (*Fleet Instructions*, section 7.0, "Operations at Sea—Navigation," 7.9, "Bridge Resource Management," subsection 7.9.1, "Standing Orders"). Night orders came about because vessel masters cannot stay up 24 hours a day. The orders are generally kept in a night order book that watchstanders must sign before they go on watch. Investigators found that a total of seven night orders had been issued for the *Empress of the North* between the nights of February 18-19 and May 9-10.

The recordings from the bridge made by the vessel's voyage data recorder (VDR)<sup>12</sup> show that during the 20 minutes in which the second mate and the junior third mate were changing the watch, seven other crewmembers were either coming on the bridge or going off, including two crewmembers who had no duties on the bridge. At 2334, the two nonwatchstanding crewmembers entered the bridge and for about 10 minutes, according to the VDR record, engaged the mates and the AB in conversation not related to vessel navigation. The bridge watch standing orders for the *Empress of the North* stated, "While underway no visitors are to be allowed on the bridge that are not involved with the navigational watch," in accordance with 46 CFR 78.10-1.<sup>13</sup>

While the nonwatchstanding crewmembers were on the bridge, the second mate and the junior third mate attempted to continue their discussion of navigation issues. The only navigation information they exchanged, as recorded by the VDR, was vessel position and track, when to take fixes, and vessel speed. The second mate also gave the junior third mate his room number and told him that he should feel free to call him during the watch and that he would be happy to answer any questions.

The two nonwatchstanding crewmembers left the bridge at 2342. The second mate left the bridge at 2343, around the time the relief AB came on watch. The junior third mate began his watch with the relief AB serving as helmsman. Two other crewmembers, an AB and a deckhand, were serving as lookouts on the bridge but left about midnight for a scheduled hourly security round that lasted 30 to 40 minutes.

The vessel was traveling south at about 12 knots when the watch changed. The weather was cloudy and drizzly, and the helmsman was steering by autopilot (he stated that he used the autopilot throughout the voyage). Radar images captured by the vessel's VDR show that the high-resolution X-band radar (3-centimeter wavelength) was tuned to the 6-mile scale throughout the entire accident sequence.<sup>14</sup>

The standing orders for the *Empress of the North* stated, "All bridge watch officers shall have a thorough understanding of bridge equipment and electronics and their use." During the voyage, the helmsman attempted to explain the autopilot and other bridge equipment to the junior third mate. After the accident, the junior third mate told investigators that he was unfamiliar with the bridge equipment and bridge procedures.

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<sup>12</sup> VDRs, which are similar to the flight data and cockpit voice recorders carried on aircraft, continuously record audio data from the bridge in addition to maintaining continuous, sequential records of data items relating to a ship's equipment.

<sup>13</sup> Title 46 CFR 78.10-1 states: "Masters and pilots shall exclude from the pilothouse and navigation bridge while underway, all persons not connected with the navigation of the vessel." The regulations allow others on the bridge, such as licensed officers of vessels, pilot trainees, and Coast Guard or Safety Board officials, "upon the responsibility of the master or pilot."

<sup>14</sup> The vessel was also equipped with a long-range S-band radar (10-centimeter wavelength). The VDR did not capture images from that radar.

In accordance with Coast Guard regulations, the company's fleet instructions required watch officers to assure "an alert all-round visual and aural lookout."<sup>15</sup> At 0100, the AB and deckhand left the bridge on their second scheduled hourly security check, leaving the helmsman to serve as lookout while the vessel approached Rocky Island.<sup>16</sup> According to the STCW code,<sup>17</sup>

The duties of the lookout and helmsperson are separate and the helmsperson shall not be considered to be the lookout while steering, except in small ships where an unobstructed all-around view is provided at the steering position and there is no impairment of night vision or other impediment to the keeping of a proper lookout.

About 0126, according to the VDR audio recording from the bridge, both the helmsman and the junior third mate saw the flashing green navigation light on Rocky Island.<sup>18</sup> VDR radar data show that Rocky Island was about 0.9 mile away at that point. The navigation chart for the area indicates that the light, placed 43 feet high on the island, flashes at 4-second intervals and is visible for 4 miles in clear weather. The VDR data indicate that although the vessel's automatic radar plotting aid (ARPA) was turned on, the watchstanders did not use it to acquire the island as a radar contact (that is, to display its range and bearing).<sup>19</sup>

About 0127, according to VDR data, the helmsman began an 80° turn to the west that would take the vessel north of Rocky Island, between the island and Point Couverden. The junior third mate told investigators, "There wasn't any conversation between him and I when he was going to turn. I relied on his expertise when to initiate it and how much [to] turn." Sailing between Point Couverden and Rocky Island, rather than south of Rocky Island, would have saved an estimated 6 minutes of travel time, according to the master. Both the junior third mate and the helmsman told investigators that the *Empress of the North* was not behind schedule and that neither had felt compelled to save time.

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<sup>15</sup> Majestic America Line, *Fleet Instructions*, section 7.0, "Operations at Sea—Navigation," subsection 7.1, "Watchstanding Requirements and Duties of Watch Officers," paragraph 1. The Coast Guard's international and inland navigation rules state: "Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate to the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision" (U.S. Department of Transportation, United States Coast Guard, *Navigation Rules: International—Inland*, part B, "Steering and Sailing Rules," section 1, "Conduct of Vessels in Any Condition of Visibility," rule 5).

<sup>16</sup> Coast Guard regulations at 46 CFR 78.30-5 state: "In addition to the licensed deck officer or pilot, there shall be at least one member of the crew also on watch in or near the pilothouse at all times while the vessel is being navigated."

<sup>17</sup> Section A-VIII/2, part 3-1, "Principles to be observed in keeping a navigational watch."

<sup>18</sup> Appendix D contains a transcript of conversations recorded on the bridge from a few minutes before the accident until about 1/2 hour afterward. Appendix E shows plots of data recorded by the vessel's VDR immediately before the accident, with conversations between the junior third mate and the helmsman superimposed.

<sup>19</sup> Fleet instructions for the *Empress of the North* (section 7.2, "Navigating and Maneuvering," paragraph 5) state: "When using radar, select an appropriate range scale and ensure that plotting or systematic analysis is commenced in ample time." As noted earlier, the waterway was about 0.5 mile wide between Point Couverden and Rocky Island.

After beginning the turn, the helmsman told the junior third mate that he did not think the vessel was turning fast enough. The master told investigators that the crew typically turned the vessel at 10° per minute, increasing a turn in increments of 10° per minute as needed. He said that if the vessel turned faster than 20° per minute, wineglasses would spill and, when it approached a turn rate of 30° per minute, the vessel would begin to heel unless the speed was very slow (“under about 5 kilometers” per hour).

After the helmsman’s remark about the vessel not turning fast enough, the junior third mate said that he walked over and saw the helmsman increase the rate of turn. “At that point,” said the junior third mate, “I lost visual contact with the light,” that is, the flashing green light on Rocky Island he had seen earlier. The lookouts (the AB and the deckhand) were not on the bridge, and the bridge layout did not obstruct the light. After the accident, the Coast Guard surveyed the aids to navigation in the area, including the flashing light on Rocky Island, and reported that all were “watching properly.”

About half a minute before the vessel grounded, VDR data show that the helmsman, without receiving a steering command from the junior third mate or announcing his intentions, altered the course to the left. The junior third mate walked to the starboard side to continue looking for the flashing light, saw rocks, and immediately gave the helmsman his first steering command, “Hard left.” About 0130, the vessel struck submerged rocks on its starboard side, then floated free.

Within 15 seconds, the master arrived on the bridge from his quarters, where he had been sleeping, and began emergency action. He notified the Coast Guard in Juneau of the grounding<sup>20</sup> and arranged to evacuate all passengers and nonessential crewmembers. Some of the vessel’s lifesaving equipment (evacuation slides and liferaft releases) failed to deploy properly, but the passengers and nonessential crewmembers, all wearing lifejackets, were safely transferred to other vessels in the vicinity (see “Survival Aspects” section for details). The master described weather conditions in a call to the Coast Guard as “zero wind . . . drizzle . . . it’s calm outside . . . seas and swell are slight, calm and a slight chop.”

The master learned that the hull had been breached because the vessel began listing to starboard during the first hour after the grounding. He ordered the chief engineer and other crew to check the belowdeck spaces for flooding. Because there was no flooding in the interior of the vessel, the master said he that thought he had holed an underdeck void that stretched across the beam of the ship, and that as it filled with water, the vessel would level out. The engineers continued to monitor belowdeck spaces for signs of flooding throughout the evacuation of passengers and nonessential crewmembers, which was completed at 0521.

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<sup>20</sup> As recorded on the VDR, the master first stated the accident location to the Coast Guard as Couverden Rock, then he gave the location as “just south of Hanus Rock” [Hanus Reef], which is about 3 miles southeast of Rocky Island. See appendix D.

Both the chief engineer and the first engineer, who was standing watch with an oiler<sup>21</sup> in the engineroom at the time of the accident, stated in interviews with investigators that the *Empress of the North* had experienced no propulsion, steering, or any other engineering plant problems before the grounding. The oiler stated that he had been on watch since 1800, which was 7 1/2 hours before the grounding, and that the engineering plant had been operating with all conditions normal—it was a “normal watch up to the grounding.” The master also stated in his interview that the vessel’s machinery was operating “correctly” at the time of the grounding.

At 2345, the first engineer had reported to the engineering operating station (the area of the engineroom containing the propulsion controls, monitoring equipment for the power and auxiliary systems, and communications equipment) to assume the midnight-to-1200 watch from the second engineer. Normally, the first engineer had the watch from 0800 to 1600, but he said that he took the midnight watch because a new third engineer had reported on board only the day before (along with the junior third mate). The first engineer stated, “The new third engineer was fresh out of school, and I didn’t want him standing watch by himself.”

The first engineer said that when the vessel grounded, he heard a “strange grounding, growling, nasty, vibration, like we just ran over an island.” The noise persisted for what he estimated to be about 5 seconds and the vibration continued along the vessel’s entire length. Immediately, the first engineer saw that the propulsion drives “went slack,” meaning that the propellers had stopped. It was later determined that the bridge had brought the throttle controls to the stopped position.

The first engineer saw and heard the bilge level sensors on the engineroom alarm panel go into alarm status. According to the datalogger, five belowdeck spaces began to flood through breaches in the hull within 5 minutes of the grounding. The engineering crew was unaware that the starboard fuel tank, which had been emptied of fuel about a week before the accident, had also been breached. An alarm that sounded for the starboard propulsion unit indicated to the first engineer that the unit had been struck during the grounding.

Immediately after the vessel grounded, the first engineer woke the chief engineer to inform him of the accident. He then sounded the “engineers’ assistance needed” alarm, waking all engineroom crewmembers and alerting them to report immediately to the engineering operating station. While waiting for the crew, the first engineer directed the oiler to go forward and check for water in the internal spaces. He also started the ship’s bow thruster and passed control of it to the bridge, in case it should be needed to control the vessel.

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<sup>21</sup> The oiler was an unlicensed crewmember responsible for assisting the engineering watch officer by making rounds, checking pressures and temperatures of the engineering plant’s equipment, and reporting any anomalies to the watch engineer.

The chief engineer arrived in the engine room operating station shortly after being called and took command of the engineering space, the damage control efforts, and his crew. He sent the three unlicensed crewmembers to find leaks and shut tank vents, to prevent breached tanks from discharging water into the vessel. He assigned the engineers to pump out the void spaces. They used all available engine room pumps, including two bilge-and-ballast pumps, two bilge pumps, and the fire pump, which could also be used as a bilge pump. Portable pumps were used in crew accommodation spaces that had taken on water around the deck manhole seals because of pressure from the seawater in the breached voids underneath.

The chief engineer informed the bridge about which tanks had taken on water and the status of the engineering crew's actions and called periodically afterward with updates.<sup>22</sup> The chief engineer also kept the bridge informed about the degree of starboard list, which he estimated had increased to a maximum of 8° about 1 hour after the accident. As the crew controlled the flooding over the next few hours, the vessel eased back toward even keel. No fuel oil was released to the environment as a result of the grounding.

About 2 hours after the grounding, the first engineer shut down one of the generators because the vessel was no longer under way. The chief engineer told investigators that throughout the accident period, the vessel never lost power from the main generators. He stated that the damage to the starboard propulsion unit did not interfere with the vessel's power generation or auxiliary systems. At no time did the engineers operate the emergency generator to provide power to the vessel's emergency lighting and control circuits.

The crew's pumping of the breached spaces decreased the flooding to a manageable rate by the time the passengers had evacuated. The master decided that because the flooding rate was under control, he would try to return the vessel to port under its own power. Once the vessel received the Coast Guard's clearance to transit back to Auke Bay, Juneau, the crew prepared for getting under way.

The vessel got under way for the transit to Auke Bay at 0600, according to bridge log entries. On leaving the accident site, the vessel used both port and starboard propulsion drives, but about 0715, the engineering staff shut down the starboard propulsion drive after observing that it was drawing less current than the port drive, indicating that the starboard propellers had been damaged. The *Empress of the North* arrived dockside in Auke Bay at 1030 on May 14.

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<sup>22</sup> Communication between the engine room and the bridge was carried out primarily by phone instead of by radio, to avoid interfering with the deck officers' emergency communications.

## Injuries

No passengers or crewmembers were injured in the accident. According to an incident report from the Capital City (Juneau) Fire and Rescue duty officer who was on watch at the time of the accident, two passengers were transported to a hospital by ambulance because of medical complaints not related to the accident. One other passenger requested medical evaluation but refused any treatment or transport.

## Damages

Majestic America Line officials estimated that the total cost of repairing damage to the hull and machinery of the *Empress of the North* and of returning the vessel to service was \$4.8 million. The ship returned to service on July 7, 2007.

## Personnel Information

### *Regulatory Requirements*

Under 46 CFR subchapter H, large passenger vessels (those measuring 100 gross tons or more<sup>23</sup>) that carry more than 12 passengers for hire<sup>24</sup> may not operate without a valid Coast Guard certificate of inspection (COI), which is issued by the Coast Guard officer in charge, marine inspection (OCMI), for a particular inspection zone. The COI stipulates a number of operating requirements, including minimum staffing needs. When determining the number and competencies of the crewmembers, the OCMI considers, among other things, the size of the vessel, its route, the type and horsepower of the vessel's propulsion machinery, the number of passengers the vessel will carry, the type and location of lifesaving equipment installed on the vessel, and the hazards peculiar to the route and service. According to its COI, the *Empress of the North* was required to carry the following crew complement: one master, three licensed mates, four able-bodied seamen, two ordinary seamen, one chief engineer, two licensed engineers, two oilers, one wiper, and one patrolman.

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<sup>23</sup> Gross tonnage is a measure of vessel volume, or overall size. The *Empress of the North* measured 296 gross domestic tons. See "Vessel Information" section.

<sup>24</sup> As defined in Title 46 *United States Code*, section 2101(21)(21a), *passenger for hire* means "a passenger for whom consideration is contributed as a condition of carriage on the vessel, whether directly or indirectly flowing to the owner, charterer, operator, agent, or any other person having an interest in the vessel." SOLAS regulation 2(f) defines a passenger ship as "a ship which carries more than twelve passengers."

### Master

The 44-year-old master had been employed as a master by Majestic America Line for over 3 years at the time of the accident. He held Coast Guard licenses as master of steam or motor vessels of any gross tons on oceans, master of auxiliary sail vessels of not more than 200 gross registered tons (domestic) or 500 gross tons (international) on oceans, and master of towing vessels on oceans and western rivers. His license included the endorsements of first-class pilot of any-gross-ton vessel on Washington main ship channels, Lake Washington ship canal, Hood Canal, Saratoga Passage, and several Washington State Ferry routes. He also held Coast Guard ratings for any unlicensed deck rating including AB, tank person in charge, storage department food handler, wiper, and person in charge of medical care. He held an STCW certificate, meaning that he met the minimum safety and competence standards of the STCW code.

The master obtained his Coast Guard license after completing high school and attending a maritime training school in Florida. He then joined the Coast Guard and served for 4 years. After his Coast Guard service, he worked in commercial shipping for 22 years on research vessels, break-bulk (noncontainer cargo) vessels, tankers, towing vessels, and, for 7 years, on passenger vessels.

He served for 1 1/2 years as master on the *Columbia Queen*, a passenger vessel operated by Delta Queen Steamboat Company (which became part of Majestic America Line) on Pacific Northwest rivers. The company encountered financial difficulties and he left the company, thereafter serving as master of a passenger ship in Hawaii. After that he served as master of a research vessel, also based in Hawaii, and then joined Majestic America Line.

The master estimated that he woke at 0600 on Friday, May 11. That afternoon, a passenger experienced a medical emergency, and the master oversaw the passenger's evacuation from the vessel. Later that night, the master learned that the passenger had died. The master, the purser, and the AB on watch at the time of the accident<sup>25</sup> informed the passenger's wife of her husband's death. The master then went to bed, at what he estimated to be 0030 to 0100 that night. He rose the next morning about 0630 and oversaw the vessel's return to Juneau, the disembarkation of passengers, and the embarkation of the passengers joining the next 7-day cruise. He estimated that he went to sleep just before midnight on May 12. He rose on May 13 at 0600 in advance of the vessel's planned 0630 arrival in Skagway. He entered the bridge that night at 2200 and left about 2230, went to his cabin, and fell asleep. He was awakened by the sounds of the grounding.

Majestic America Line discharged the master after this accident, and the Coast Guard suspended his license for 5 months.<sup>26</sup> The master had been involved in another grounding of the *Empress of the North* about a year before, on the Columbia

<sup>25</sup> The AB had been trained as a medical technician and performed an onboard assessment of the passenger who fell ill.

<sup>26</sup> The suspension began the week of June 9, 2008.

River. (See “Previous Accidents” section for more information.) The Coast Guard investigated that incident and took no action against the master.

### *Chief Mate*

The 41-year-old chief mate had been employed by Majestic America Line and its predecessor, American West Steamboat Company, for 5 years. He held a Coast Guard license as master of steam or motor vessels of not more than 1,600 gross registered tons (domestic) or 3,000 gross tons (international) on oceans, master of uninspected fishing industry vessels of not more than 2,000 gross registered tons (domestic) or 3,000 gross tons (international), second mate of steam or motor vessels of not more than 2,000 gross registered tons (domestic) or 3,000 gross tons (international) on oceans, third mate of steam or motor vessels of any gross tons on oceans, and also unlimited radar observer. He held an STCW certificate as master and as officer in charge of a navigational watch (second or third mate).

After graduating from the California Maritime Academy in 1989, the chief mate worked as a third mate on vessels based in Fort Lauderdale, Florida, including a passenger vessel. He then worked as a deck officer on the Washington State Ferries, on tankers, and as a master of small passenger vessels. He then served as a chief mate on fishing vessels and after that, on passenger vessels along the U.S. west coast. He joined Glacier Bay Cruise Lines, became a port captain, and assisted as a crewmember on vessels in the Juneau area. He then served as a chief mate on a cable vessel traveling between Oregon and Alaska. He joined American West Steamboat Company about 3 years before the accident as a third mate and became a chief mate 2 years later.

Because of a death in his family around the time of the accident, the chief mate was not available during the on-scene investigation. He was interviewed by telephone 6 weeks after the accident. He told investigators that, after his involvement with the evacuation of the ill passenger, he went to sleep about 2200 on May 11 and rose about 0315 on May 12. He went to bed about 2300 on May 12 but was awakened just after midnight on May 13 because of the ill third mate. He went to the bridge about 0030 and completed the remainder of the senior third mate’s watch and then his own 0400-to-0800 watch. After completing the watches, he returned to his cabin, where he slept from 0830 until he was needed for the master’s safety meeting, about 1000. After the meeting, he returned to his cabin and slept from around noon to about 1515 before rising for the start of his scheduled 1600-to-2000 watch. He went to sleep about 2200 on May 13 and was awakened by the accident.

### *Second Mate*

The 34-year-old second mate had worked for Majestic America Line since February 2007. The repositioning cruise was his first voyage on the accident route.

He held a Coast Guard license as master of steam or motor vessels of not more than 1,600 gross tons (domestic) or 3,000 gross tons (international) on oceans, unlimited radar observer, and second mate of steam or motor vessels of any gross tons on oceans. He held an STCW certificate as master and as officer in charge of a navigational watch (second mate).

The second mate graduated from the U.S. Merchant Marine Academy at Kings Point in 1995 and joined the U.S. Navy. In 1998, he left the Navy and joined Maritime Limited as a third mate, sailing on large medium-speed roll-on/roll-off vessels that carried military supplies. In 2001 he rejoined the Navy, then left in 2004. He worked in Iraq until October 2006.

The second mate came on watch at 0800 the day before the accident. After his watch, which he spent correcting charts, he went to sleep about 1630 and woke about 1900. He showered and ate before assuming the 2000-to-midnight watch. He turned over the watch to the junior third mate at midnight and returned to his quarters, where he fell asleep about 0100. He was awakened by the accident and went to the bridge, his duty station during emergencies. He told investigators that before his watch he “had had plenty of sleep” and would have stayed with the junior third mate on watch if asked.

### *Senior Third Mate*

The 53-year-old senior third mate began working for Majestic America Line in April 2007 and joined the crew of the *Empress of the North* at the end of the month, after riding the vessel for 4 days on the Columbia River as an observer. The repositioning cruise was his first voyage on the accident route. He held a Coast Guard license as master of steam or motor vessels on inland waters and was authorized for near-coastal service on the sheltered waters of British Columbia south of Moresby Island; he also held an STCW certificate as master on those British Columbia waters. He held a first-class pilot’s license for vessels of any gross tons on ferry routes in Puget Sound and the San Juan Islands of Washington, as well as an unlimited radar observer’s license.

The senior third mate joined the Navy after graduating from high school. After leaving the Navy, he worked in the construction industry, then joined the Washington State Ferries in 1977 as an AB. He worked as master on the Washington State Ferries from 1991 until he retired in 2006, then did not work until he joined Majestic America Line a year later. He said that he had familiarized himself with the *Empress of the North* for 3 or 4 days after coming on board. He told investigators that the midnight-to-0400 watch was “traditionally” the third mate’s. As noted earlier, he fell ill before his midnight watch on May 14 and was told to remain apart from passengers and crew by his examining physician. He said that after the accident, he dressed, left his cabin, and helped launch the liferafts (experiencing the difficulties in deploying the rafts noted earlier) and made sure the passengers wore their lifejackets.

### *Junior Third Mate*

The 22-year-old junior third mate began his employment with Majestic America Line on May 11, 2007, after graduating from the California Maritime Academy on April 28 with a BS degree in marine transportation. The day of his graduation, he received a Coast Guard license as third mate of steam and motor vessels of any gross tons on oceans and as unlimited radar observer. He also received an STCW certificate as officer in charge of a navigational watch (third mate) and a Coast Guard Merchant Mariner's Document with the following ratings: wiper, steward's department (food handler), person in charge of medical care, life boatman, fast rescue boat, tank assistant, and any unlicensed deck rating, including AB.

The junior third mate had served as a student deck officer at sea on the California Maritime Academy vessel *Golden Bear* for 4 months—2 months in the summer of 2004, after his freshman year, and 2 months in the summer of 2006, after his junior year. The junior third mate passed both courses, worth eight credits each. He also passed two 2-credit courses that involved navigation on a bridge simulator, one in the spring of 2006, his junior year, and one in the fall of 2006, his senior year.

Safety Board investigators interviewed six of the junior third mate's instructors at the California Maritime Academy whose classes addressed deck officer skills.<sup>27</sup> Each instructor characterized the junior third mate's performance in class as "average" and "in the middle," except for an instructor in ship handling, who described his skills as excellent. Instructors who oversaw his navigation in either the bridge simulator or on the bridge of the school's training vessel expressed confidence that he could successfully determine a vessel's position, execute a turn, and perform the basic navigational duties of a recent graduate of a maritime college. The instructors stated that the junior third mate was qualified to serve as a watch officer. They also stated that, in general, it was imprudent to place a recent graduate of the school, with no watch experience outside a training environment, on watch, at night, in pilotage waters, in an unfamiliar vessel, and without additional preparation or supervision.

The junior third mate had met the *Empress of the North* master in January 2007, when the master visited the California Maritime Academy campus for a job fair. The junior third mate, one of several students who had expressed an interest in employment with Majestic America Line, had impressed the master because of his enthusiasm for the company, whose operations he had researched. Before he graduated, the junior third mate was offered a job as a deck officer by Majestic America Line and by another company, not a passenger carrier. He accepted Majestic America Line's offer because he wanted to work on a passenger vessel.

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<sup>27</sup> Other instructors taught courses that were required for a degree but did not offer opportunities to observe the junior third mate's navigation or ship-handling skills—for example, introduction to sociology, English literature, and rules of the road.

The junior third mate told investigators that on May 11, a company human resources representative in Portland told him that he would most likely go through a training program on the *Empress of the North*. The company arranged for him to fly to Juneau, by way of Seattle, to join the vessel on May 12. In Juneau he met the master and other crewmembers, was given a passenger stateroom, and met the purser in order to get a crew identity card. He went to the bridge about the time the senior third mate was relieving the second mate, introduced himself to both mates and to the ABs, and walked around the vessel. He went back to the bridge and between 1600 and 1800 observed the departure from Juneau while the chief mate was on watch. The chief mate introduced him to additional deckhands, and he started to "ask the chief mate about operations." The chief mate also informed the junior third mate that the master was to hold a weekly all-crew meeting the next morning to review safety and operational items but that he did not have to attend. The junior third mate had dinner about 1800.

The junior third mate estimated that he went to sleep between 2100 and 2200 on May 12 and woke at 0500 on May 13. He went to the bridge at 0530, observed the arrival and mooring at Skagway at 0645, and assisted in passenger disembarkation. He then attended the master's safety meeting with the crew. Afterward he went ashore. When he returned, he learned about the ill third mate, who was given the junior third mate's cabin. The junior third mate moved into and shared the cabin of the second mate. The junior third mate then reported to the bridge and took the 1200-to-1600 watch while the vessel was docked in Skagway. During that watch, the master informed him that he would need to stand the midnight-to-0400 underway watch. The junior third mate remained on the bridge with the chief mate and observed him test gear. He had dinner at 1700, then slept from 1800 to 2300. He arrived on the bridge about 2320.

After the accident, Majestic America Line discharged the junior third mate.

### ***Able-Bodied Seaman***

The 36-year-old AB who was at the helm at the time of the accident had been employed by Majestic America Line for 17 months. Before that, he worked for U.S. Army intelligence. After leaving the Army, he trained in and practiced nursing, and later joined a National Park Service concessionaire managing a hotel. He then worked for Glacier Bay Cruise Lines as a hotel manager for 2 years. In that time, he said, he "fell in love with the ocean" and decided to become a deck officer. He stayed with Glacier Bay Cruise Lines in management for the rest of the season, then worked periodically on deck to build up his sea time. His transition to the bridge started with that cruise line. Glacier Bay Cruise Lines went bankrupt, and he joined Majestic America Line as an ordinary seaman about 17 months before the accident. He served as an ordinary seaman in 2006, then became an AB for the 2007 season. He told investigators, "I had been in the area [the accident route] before, but not as an AB."

On May 11, the AB went to sleep about 1900 and rose at 0600 on May 12. He went to sleep about 1900 on May 12 and rose at 0600 on the day of the accident. Later that day, he went to sleep about 1500 and rose at 2300.

### *Chief Engineer*

The chief engineer, 26 years old, began working for Majestic America Line in January 2006, initially as a third engineer. He held a Coast Guard second assistant engineer's license with unlimited horsepower endorsements for steam, motor, and gas turbine powerplants. After graduating from the U.S. Merchant Marine Academy in 2003, he worked for 2 years on various merchant vessels, employed through a union, from the port of Houston. He was promoted to chief engineer on the *Empress of the North* in October 2006. His typical daily work schedule was from 0600 to 1800. His work/vacation schedule was 30 days on duty, followed by 30 days off the vessel. He had been on duty nearly 1 month at the time of the grounding.

During their routine postaccident review of officer licenses, Safety Board investigators noted that the chief engineer's license did not contain a chief engineer's endorsement and sought to clarify whether his license was compliant for his position. Company officials said that they had assumed that the Coast Guard regulations implied that a second assistant engineer's license qualified the holder to serve as chief engineer. The Division of License Credentialing Program Policy at Coast Guard headquarters stated that a second engineer's unlimited license would not authorize a crewmember to serve as chief engineer. A Sector Juneau representative confirmed that the chief engineer should have had an additional endorsement to be properly certificated to sail as chief engineer on the *Empress of the North*. On August 31, 2007, the chief engineer's license was amended to include an additional endorsement as "designated duty engineer of steam, motor, or gas vessels of any horsepower limited to vessels of not more than 500 gross registered tons (domestic tonnage) when operating beyond the boundary line."

## **Vessel Information**

### *Construction and Equipment*

The *Empress of the North* was built in 2003 by Nichols Brothers Boat Builders in Freeland, Washington. Constructed of welded steel, the vessel had four decks with passenger accommodations, a gangway on the bow that could be lowered to allow passengers to embark and disembark, and a paddle wheel at the stern (figure 3).



**Figure 3.** Paddle wheel at the stern of the *Empress of the North*. To save fuel, the paddle wheel was usually allowed to freewheel during vessel transits, as during the accident voyage, rather than being powered by its driving motor.

The vessel was 299.3 feet long and had a beam of 58.3 feet. Its gross tonnage was 296 domestic tons and 5,975 international tons. The vessel was delivered to American West Steamboat Company (which later became Majestic America Line) on August 7, 2003.

### *Propulsion and Associated Engineering Equipment*

The *Empress of the North's* main and propulsion power was supplied by four 16-cylinder, 2,450-horsepower model 3516B diesel engines manufactured by Caterpillar, Inc. Three engines were generally sufficient to run the vessel at normal sea speed and supply its other power needs. The engines were coupled to 1,825-kilowatt generator sets that could run independently or in parallel, depending on the vessel's power requirements. The generators supplied power to a common switchboard that distributed power for consumption throughout the ship, as well as to the motors that drove the propulsion thrusters.

The vessel was propelled by two Schottel-manufactured thrusters at the stern, one on each side of the vessel. Each thruster had two three-bladed propellers, an arrangement that minimized noise. The thrusters were each driven by a 2,000-horsepower General Electric direct-current motor located in the engine room. The thrusters were capable of 360° directional thrust, affording the *Empress of the North*

a high degree of maneuverability and allowing its speed to be controlled from stations in the engine room and on the bridge.<sup>28</sup>

The bow thruster at the vessel's forward end was manufactured by Schottel and powered by a 1,000-horsepower General Electric motor. The bow thruster was of the waterjet type, using a pump to discharge water at high speed, and could provide 360° thrust. The paddle wheel at the vessel's stern was driven by a 1,000-horsepower General Electric motor.

### **Bridge Equipment**

The electronic and communications equipment on the bridge of the *Empress of the North* included the following:

- Furuno model FAR-2127 radar (high-resolution X-band (3-centimeter wavelength) and long-range S-band (10-centimeter wavelength) with ARPA.
- ECDIS, Raytheon model Pathfinder/ST MK-2.
- Electronic chart, Nobeltec Admiral model.
- Global maritime distress and safety system, Skanti model Skanbridge A3 series.
- Gyrocompass, Anschütz Standard 20.
- Autopilot, Anschütz Pilotstar D type AP02-S0.1.
- Global positioning system (GPS), Northstar model 941X.
- Very-high-frequency (VHF) radios (2), Skanti model 1000 DSC (digital selective calling function).
- Automatic identification system (AIS) unit,<sup>29</sup> Japan Radio Company model JHS-182.
- Echosounders (2), L-3 Communications ELAC Nautik model LAZ 5000.
- Speed log, Consilium model SAL-R1.
- Portable two-way radios (30), Motorola Radius CP 200.
- Fire detection annunciator, Notifier model AM2020/AFP 1010.

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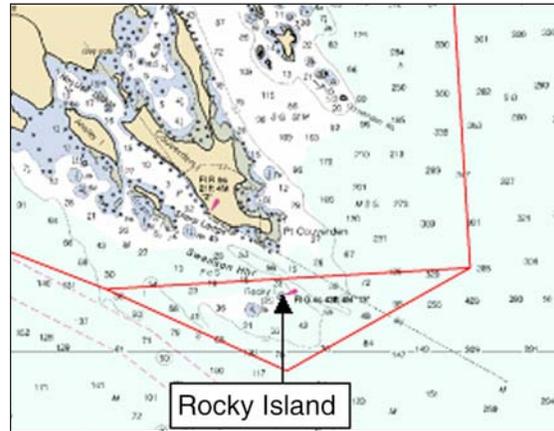
<sup>28</sup> Because the propellers could be rotated in any direction, a rudder was unnecessary.

<sup>29</sup> All ships of 300 gross tons or more engaged on international voyages are required by SOLAS chapter V, regulation 19.2, to be fitted with an AIS—a shipboard broadcast system, operating in the VHF maritime band, that can send and receive ship information such as identity, position, course, and speed. In U.S. waters governed by vessel traffic service or vessel movement reporting systems, certain commercial and towing vessels and all passenger vessels carrying 150 or more passengers are required to carry AIS equipment.

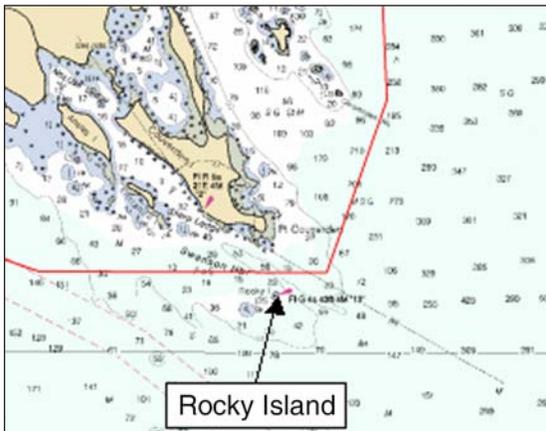
The monitors for the two electronic navigation charts were next to the helmsman's station (figure 4). The Nobeltec showed a trackline going between Rocky Island and Point Couverden, the ECDIS showed a trackline going south of Rocky Island, and the paper chart showed tracklines both north and south of Rocky Island. The paper chart was used to mark navigation fixes (vessel positions), but the Nobeltec was used for navigation purposes, according to Majestic America Line.



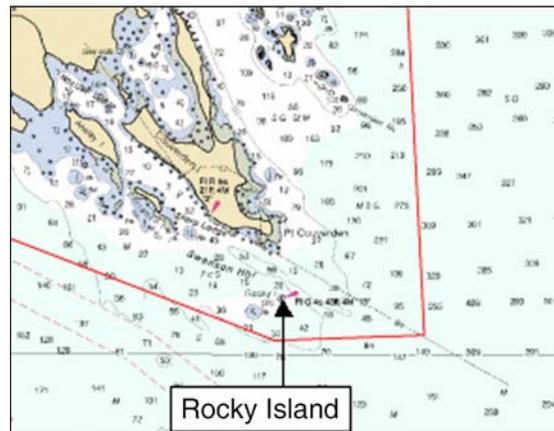
**Figure 4a.** View of bridge showing location of monitors for Nobeltec (front) and ECDIS (rear) at helmsman's post.



**Figure 4b.** Tracklines marked on paper navigation chart.



**Figure 4c.** Trackline marked on Nobeltec.



**Figure 4d.** Trackline marked on ECDIS

The vessel was also equipped with a model MER VDR manufactured by AVECS Corporation AG (head office Fichtenwalde, Germany). The VDR recorded inputs from two audio channels, 12 data channels, and a video source (ARPA radar). The audio data were recorded by six microphones on or near the ship's bridge (four on the bridge itself and two on the bridge wings) and from transmissions and receptions on channel 16 of the ship's VHF radio.

### *Certification and Inspection*

Sector Portland (Oregon) was the local Coast Guard office in charge of inspecting the *Empress of the North* and issuing its COI. The *Empress of the North* was inspected by Sector Portland because Portland was the vessel's home port, although its Alaskan route took it into the area of responsibility of Sector Juneau. Personnel from Sector Juneau examined the damaged vessel after the accident.

The COI issued after the *Empress of the North's* last annual inspection on February 17, 2007, permitted the vessel to operate in sheltered waters off the west coast of North America. The total number of persons permitted on board was 327, including 237 passengers and 90 crewmembers. The vessel was drydocked for a complete hull examination during the 2007 annual inspection.

**Pilotage.** The *Empress of the North's* COI contained the following endorsement regarding pilotage:

When not sailing on register<sup>30</sup> and operating upon the navigable waters of the United States, all deck officers shall meet the requirements as first class pilot of inspected vessels of at least 1600 gross registered tons<sup>31</sup> . . . on both designated and non-designated pilotage waters in accordance with 46 CFR 15.812(b) and (c); and Table 15.812(e)(1).<sup>32</sup>

The *Empress of the North's* COI required its deck officers to be qualified pilots when operating on the navigable waters of the United States,<sup>33</sup> whether or not those waters were designated pilotage waters.<sup>34</sup> The vessel's pilotage requirement thus applied both to the waters of southeast Alaska (all of which are designated pilotage waters) where the accident occurred and to the waters of the Columbia, Willamette, and Snake rivers (some of which are designated pilotage waters and some of which are not) where the vessel also operated.

Coast Guard navigation and vessel inspection circular (NVIC) 8-94 explains that according to Federal regulations, two categories of mariners may serve as pilot. One is a mariner holding a Federal first-class pilot's license with endorsement

<sup>30</sup> "On register" means employed in foreign trade.

<sup>31</sup> In March 2008, Sector Portland corrected this portion of the vessel's COI to read "inspected vessels of not more than 1600 gross registered tons." The *Empress of the North* was 296 gross tons.

<sup>32</sup> Title 46 CFR 15.812 contains the Coast Guard pilotage requirements. Table 15.812(e)(1) is a quick-reference tool within that regulation.

<sup>33</sup> *Navigable waters* are defined at 33 CFR 2.36 as follows: "(1) Territorial seas of the United States; (2) Internal waters of the United States that are subject to tidal influence; and (3) Internal waters of the United States not subject to tidal influence that: (i) Are or have been used, or are or have been susceptible for use, by themselves or in connection with other waters, as highways for substantial interstate or foreign commerce, notwithstanding natural or man-made obstructions that require portage, or (ii) A governmental or non-governmental body, having expertise in waterway improvement, determines to be capable of improvement at a reasonable cost (a favorable balance between cost and need) to provide, by themselves or in connection with other waters, as highways for substantial interstate or foreign commerce."

<sup>34</sup> The Coast Guard designates pilotage waters. According to information from the OCMI for Sector Juneau, all southeast Alaska waters are designated for pilotage purposes (OCMI Southeast Alaska, "Letter of Promulgation for Southeast Alaska Pilot License Requirements," April 4, 2007).

for the route, in accordance with 46 CFR 15.812(b)(1). The other is what the NVIC terms an “acting as” pilot, that is, a licensed member of the crew who also meets the requirements of 46 CFR 15.812(b)(2), as follows:

- Must be at least 21 years old.
- Must maintain a current knowledge of the waters to be navigated (one round-trip within the past 60 months).
- Must have four round-trips on the route. If the route is to be traversed during darkness, at least one of the round-trips must be made during darkness.

“Acting as” pilots self-certify as to their qualifications for a route, that is, they are not issued a pilot’s license or an endorsement on their license that specifies the waters on which they are authorized to serve as pilot.<sup>35</sup> Title 46 CFR 15.812(d) requires pilots, when asked, to furnish documentation to the Coast Guard proving that they have complied with the pilotage regulations. They must produce either a first-class pilot’s license or documents showing that they have met the self-certification requirements, including having made the required number and type of round-trips. NVIC 8-94 states that if the Coast Guard “has reason to doubt an individual’s qualifications to ‘act as’ a pilot . . . the vessel’s departure could be delayed pending receipt of satisfactory evidence [that] the required round trips have been made.”

According to the company’s safety management system, the master was responsible for ensuring that his vessel was manned in accordance with its COI.<sup>36</sup> None of the *Empress of the North’s* deck officers held a first-class pilot’s license valid for the accident route (the master and senior third mate held first-class pilot’s licenses valid on the waters of Washington state). The junior third mate, the officer of the watch on the accident voyage, did not have current knowledge of the waters and had not been on any round-trips on the route in daylight or darkness. The senior third mate and the second mate had both joined the company recently and had not made four round-trips on the route before the accident. The master and chief mate had worked for the company for 3 and 5 years respectively and met the experience requirements of 46 CFR 15.812(b)(2).

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<sup>35</sup> NVIC 8-94 states: “A description of the route requirements for a licensed first class pilot and an ‘acting as’ pilot may be obtained from the OCMI concerned. It is incumbent upon the mariner who will ‘act as’ a pilot to determine in advance whether he/she meets the local pilotage requirements. . . . For purposes of establishing the requisite number of round trips in a given pilotage route segment, the local knowledge requirements may be satisfied when the licensed individual has transited the length of the segment or, if the local pilotage requirements permit, has made trips to one or more facilities within the segment.”

<sup>36</sup> Majestic America Line, *Office Safety Management Manual*, section 7.1, “Manning Levels.” See “Operational and Management Information” section for information on the company’s safety management system at the time of the accident.

**Document of Compliance.** The Coast Guard report on the vessel's February 17, 2007, inspection noted that its documents had been "inspected satisfactory." However, 2 weeks after the accident, company management discovered that its document of compliance, which verifies that the company complies with the ISM code, was not valid. A document of compliance is issued for 5 years but requires annual verification. Majestic America Line's document of compliance had not been verified since the company's ISM auditor, the classification society American Bureau of Shipping,<sup>37</sup> issued the document on July 5, 2005. An ISM-compliant vessel such as the *Empress of the North* is not allowed to sail if the company does not possess a valid document of compliance. The Coast Guard can levy a civil penalty of \$6,500 against vessel owners whose documents of compliance are not valid. Majestic America Line was not fined.

**Safety Management Certificate.** The ISM code also requires vessels operating in international waters to hold and display a safety management certificate, signifying that the vessel's operating company and shipboard management operate in accordance with an approved safety management system. According to the Majestic America Line safety management system at the time of the accident, a manager (the ISM "designated person ashore") was responsible for system documentation.<sup>38</sup>

The *Empress of the North* carried a safety management certificate issued by the American Bureau of Shipping on January 12, 2004, that was valid until December 10, 2008. However, the validity of the safety management certificate depended on the validity of the company's document of compliance. Therefore, because the company's document of compliance was invalid, the safety management certificate for the *Empress of the North* was also invalid.

The annual Coast Guard inspection in 2007 did not identify that either the company's document of compliance or the vessel's safety management certificate was out of compliance. On May 30, 2007, the American Bureau of Shipping issued the company a valid interim document of compliance and on June 30, 2007, a valid interim safety management certificate for the *Empress of the North*. On March 10, 2008, the American Bureau of Shipping issued another interim document of compliance to the company, valid until March 9, 2009, and on March 15, 2008, another interim safety management certificate for the *Empress of the North*, valid until September 14, 2008.

**VDR Certification.** SOLAS chapter V, regulation 18.8, requires VDRs to undergo annual performance tests. The VDR carried on the *Empress of the North* was inspected by a certified manufacturer's representative on February 17, 2007 –

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<sup>37</sup> Classification societies are private, independent organizations that establish and apply technical standards for the design, construction, and survey (inspection) of ships. Many countries delegate responsibility for some regulatory functions to classification societies, such as inspection for compliance with certain national and international regulations and issuance of some safety certificates, and may also adopt class society rules as their own national standards.

<sup>38</sup> *Office Safety Management System*, section 6.6.3, "Marine Safety Manager/Designated Person Ashore."

the same day as the annual Coast Guard inspection. Although the manufacturer's representative noted deficiencies in the VDR's engine, rudder, and main alarm recording systems in his report, he issued a certificate of compliance on February 18, 2007, which the master signed. The safety management system did not discuss VDRs, but the fleet instructions stated that the master was responsible for "reporting defects" and for "ensuring that all documentation that is designated as 'controlled' is up to date."<sup>39</sup> The Coast Guard did not note the VDR deficiencies in its inspection. If it had done so, it would have issued a notice of inspection requirements but allowed the vessel to sail. The company had the VDR repaired, inspected, and as of the date of this report was awaiting a new certificate of compliance.

### Emergency Equipment

**Lifesaving.** The COI for the *Empress of the North* required the vessel to carry approved lifesaving equipment for 327 people, as follows:

Adult lifejackets	348
Child lifejackets	24
Rescue boats/platforms	2
Inflatable liferafts <sup>40</sup>	20
Ring buoys	12
Immersion suits	10
Portable lifeboat radios	3

The *Empress of the North* carried two types of inflatable survival craft for use if the vessel had to be abandoned, plus inflatable slides for escaping from the vessel into the survival craft. Twenty inflatable liferafts, which held 50 people each, were kept in overhead cradles along the main outer deck, 10 on either side of the vessel (figure 5).

Each liferaft had two remote-release units, model H20 manufactured by Hammar, that would free the raft from its cradle. If the vessel sank, the liferafts would be launched automatically by a unit that, when submerged to a predetermined depth, would sever the line securing the raft. Manually releasing a liferaft required the use of a hydrostatic hand pump located on the vessel bulkhead, next to the rafts (figure 6).

<sup>39</sup> *Fleet Instructions*, section 2.0, "Personnel Resources and Responsibilities," subsection 2.6.1, "Captain."

<sup>40</sup> The vessel had a SOLAS exemption issued by the Coast Guard that allowed it to substitute inflatable liferafts for required lifeboats. A typical passenger vessel of the *Empress of the North's* size would be required to have lifeboats on each side of the vessel capable of carrying 37.5 percent of the total number of persons on board in addition to liferafts (46 CFR part 199.201 [b][i]).



**Figure 5.** Liferrafts mounted in overhead cradles above the main deck of the *Empress of the North*.

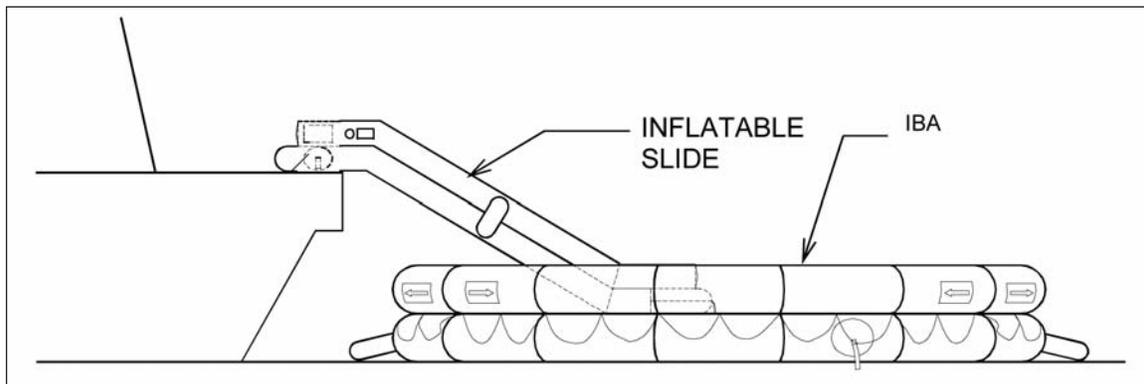


**Figure 6.** Liferaft remote-release unit mounted on a bulkhead near one of the liferafts.

Activating the pump would sever the line, freeing the liferaft from its cradle and allowing it to drop into the water alongside the vessel. A placard posted below each pump directed, "Pump plunger two to six times until the raft releases." The release units were disposable, to be replaced after 2 years of use. All release units on the vessel had expiration dates of February 2009.

Although not required by the vessel's CIO, one inflatable buoyant apparatus (IBA),<sup>41</sup> holding 50 people, was stowed on each side among the liferafts. Regulations at 46 CFR 199.190 (g)(i),(ii) require liferafts and IBAs to be serviced annually. Pacific Marine Distributors in Portland, Oregon, serviced all the liferafts and IBAs on the *Empress of the North* between January 5 and January 18, 2007.

Also not part of its required lifesaving apparatus, the *Empress of the North* carried two Coast Guard-approved model SL32 inflatable marine evacuation slides manufactured in December 2002 by DBC Marine Safety Systems, Ltd., of Richmond (Vancouver), British Columbia. When inflated, the evacuation slides would create an escape route from the vessel into an IBA (figure 7), from which evacuees could easily enter the liferafts.



**Figure 7.** Drawing showing inflatable evacuation slide leading from ship's deck into an IBA.

The evaluation slides were packed in fabric valises and stored separately in a locker on the main deck. Arrows were stenciled on the outside of the valises to indicate whether an end should face inboard or outboard and also where to find the pull-cord that would inflate the slide. The chief mate told investigators that the valises were brought out during drills and installed in their launching position for practice; the crew did not inflate or repack the slides during the drills.

Evacuation slides require annual servicing by an authorized facility to maintain Coast Guard approval. Annual servicing involves inflating, inspecting, and repacking the slides. Marine Safety Services in Seattle, which the Coast Guard

<sup>41</sup> Buoyant apparatus are similar in size and construction to liferafts but do not offer the protection of a canopy, as do liferafts.

had approved to do the work, last serviced both slides before the accident on February 5, 2007. Coast Guard regulations require that a gas inflation test must be done every 5 years (46 CFR 160.151-57[g]). Marine Safety Services last gas-inflated the slides on the *Empress of the North* in August 2003 and March 2004.

The person servicing the slides had to be certified by the manufacturer, and the training had to comply with Coast Guard regulations regarding the training of servicing technicians (46 CFR 160.151-39). The slides were inspected by a DBC-certified servicing technician at Marine Safety Services. The technician had most recently completed a training course May 1, 2007. The technician's last previous certification course was on September 17, 2004.

**Firefighting.** According to its COI, the *Empress of the North* was required to carry the following firefighting equipment:

- Three fire pumps.
- Thirty-three firehoses, each 75 feet long.
- Seventy portable fire extinguishers (29 class A-II, 27 class B-II, 14 class C-II).<sup>42</sup>
- Four fixed carbon dioxide fire-extinguishing systems (a 3,100-pound-capacity system in the engineroom, 35-pound-capacity systems for the bow thruster motor and paint locker, and a 50-pound system for the paddle wheel motor).

The vessel was also equipped with water mist fire-extinguishing systems in the accommodation and public spaces and a potassium-based fire suppression system in the galley. A fire-detection annunciator was located on the vessel's bridge.

## Wreckage

### *Damage Assessment*

On May 15, the day after the grounding, divers in Juneau conducted a preliminary dockside hull survey of the *Empress of the North* and made emergency repairs to seal the vessel's breached spaces. On May 20, the vessel left Juneau for Ketchikan to undergo initial repairs at Alaska Ship and Drydock and a further damage assessment on May 24.

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<sup>42</sup> Class A extinguishers are for fires involving ordinary combustibles, such as wood, cloth, and paper. Class B extinguishers are for fires involving flammable liquid, grease, or gas. Class C extinguishers are for fires involving energized electrical equipment, such as appliances, switches, panel boxes, and power tools (these extinguishers are also rated for class A and class B fires). According to the Coast Guard classification system, type A-II portable extinguishers hold 5 pounds of dry chemical; class B-II, 10 pounds; class B-V, 50 pounds; and class C-II, 10 pounds.

The description of the wreckage that follows is based on those surveys, as well as on the company's temporary repair plan for the *Empress of the North* before it was moved to Oregon for permanent repairs. The plan outlined repairs to the vessel's stem (bow), the No. 2 starboard fuel tank, and void spaces 1 through 4.

All the underwater damage was to the vessel's starboard side. Both propellers on the starboard propulsion thruster were damaged to such a degree that they had to be replaced (figure 8). The grounding also extensively damaged the steel plating on the underwater hull's starboard side (figure 9).

The underwater damage is described below, going from bow to stern and referencing the transverse frames, which were numbered from 0 to 150, starting at the bow (figure 10). The vessel's stem below the waterline, just forward and above the point where the keel transitioned upward toward the bow, sustained damage that bent this section of the hull to the port side. The stem was also cracked open for several feet in the same area. The empty starboard fuel tank between frames 37 and 53 was breached during the grounding and was split at the chine.<sup>43</sup> The split was intermittent from frames 40 to 53 and about 0.5 inch wide for approximately 30 feet.

Void 1, aft of the starboard fuel tank between frames 53 and 73, was breached along its flat centerline keel plate, as well as at the chine at frame 73. Some vertical internal framing members were also bent back by the force of the grounding. Void 2, on the vessel's bottom from frames 73 to 89, was holed at the chine at frame 73. The 0.5-inch-wide split ran approximately 3 feet along the length of the hull. The damage at frame 73 also buckled the internal bulkhead between voids 1 and 2, causing a loss of watertight integrity between the two spaces. Void 2 also had bent internal frames.

Void 3, which ran along the hull's underside from frames 89 to 109, was breached at the keel at frame 99. The crack was approximately 1.5 feet long and 0.5 inch wide. Frames in void 3 were also bent. Void 4, from frames 109 to 113, took on water after the grounding. The space had lost its watertight integrity when the bulkhead between it and void 3 buckled at frame 109.

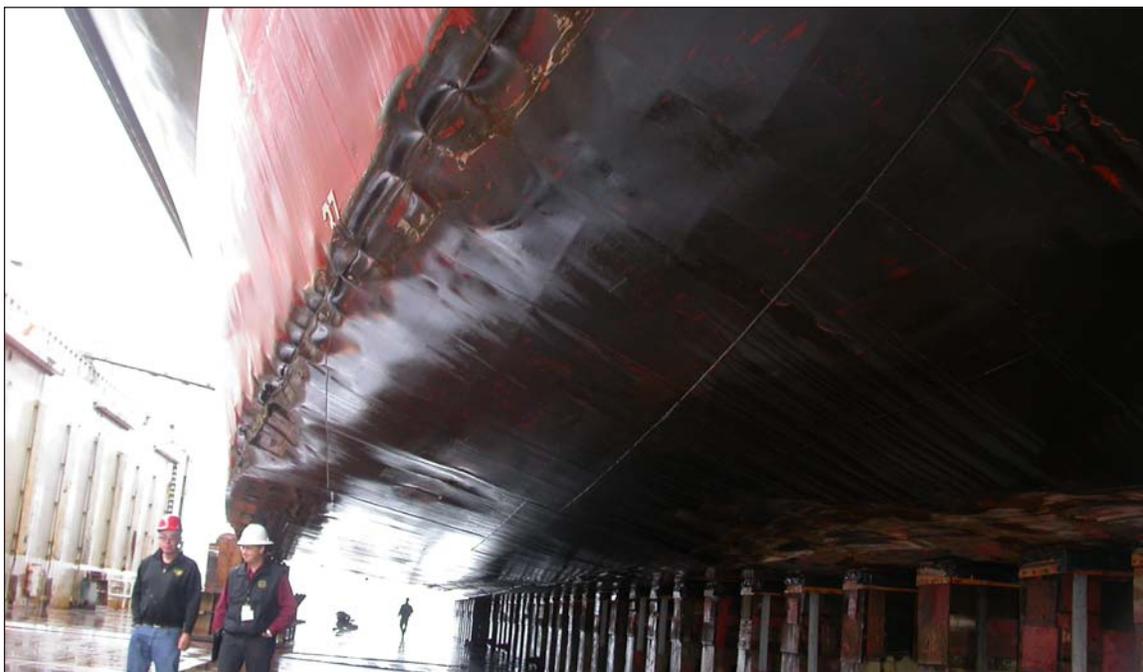
Once the initial repairs in Ketchikan were complete, the *Empress of the North* sailed to Cascade General Shipyard in Portland for final repair work, arriving there on June 9. About 52.5 tons of steel were replaced in repairing the vessel. The repairs were completed on June 27, 2007, and the vessel returned to service in Alaska on July 7.

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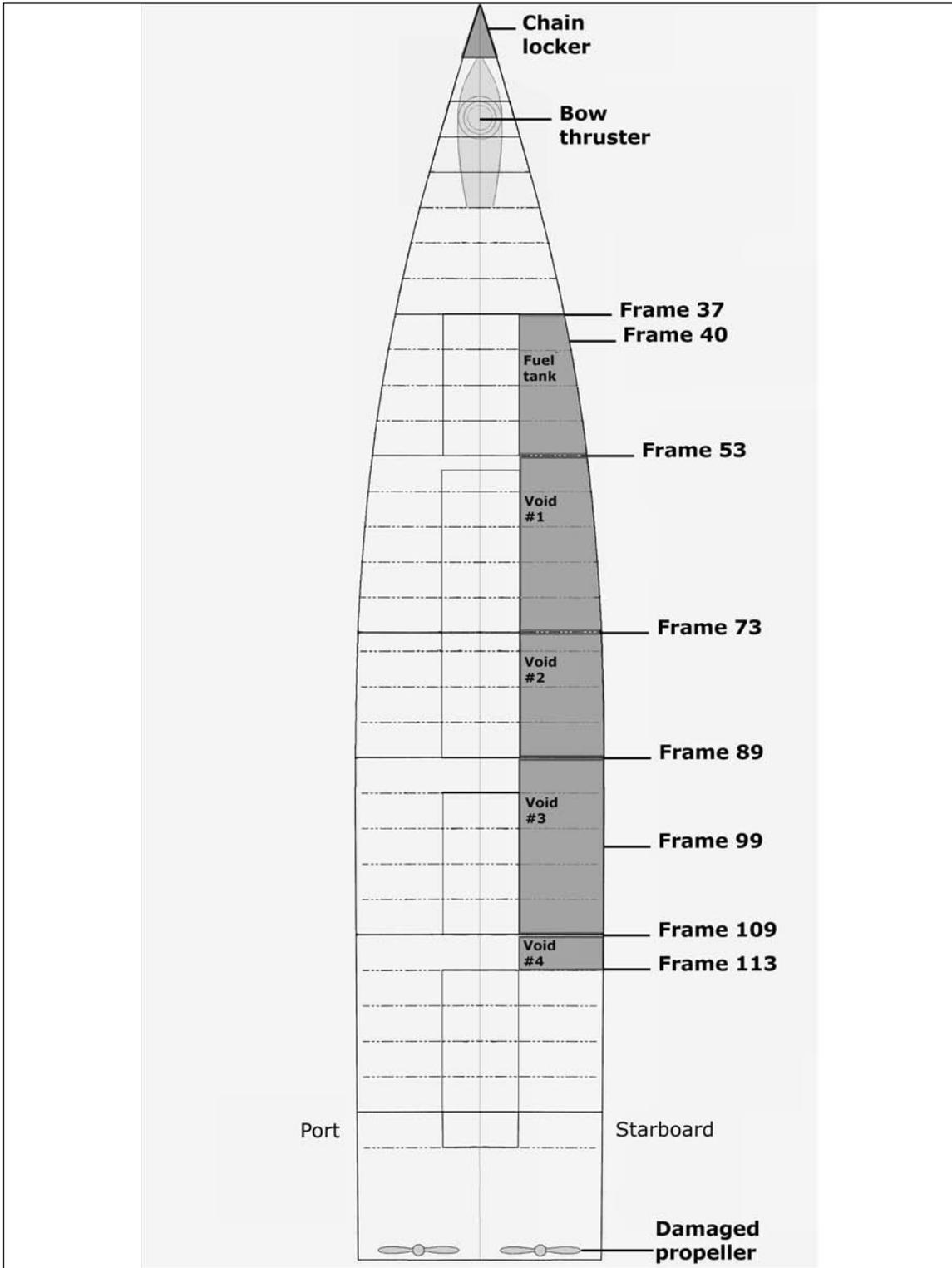
<sup>43</sup> The chine is the transitional section from the relatively flat underside of the vessel's hull to the upward vertical side plating along its exterior.



**Figure 8.** Damage to propeller blades of starboard propulsion thruster (foreground). Port thruster (rear) was not damaged in the grounding.



**Figure 9.** Damage to steel plating on starboard side of the *Empress of the North* hull.



**Figure 10.** Damage to underwater hull and starboard propeller. Dark-shaded sections were breached. Bow thruster was not damaged but is shown for reference.

### *Vessel Stability*

The stability book<sup>44</sup> for the *Empress of the North* demonstrated, in accordance with 46 CFR 170-110<sup>45</sup> and stability testing carried out at Coastal Transport, Inc., Seattle, on July 17 and August 1, 2003, and witnessed by the American Bureau of Shipping, that the *Empress of the North* had sufficient intact and damaged stability<sup>46</sup> to comply with Coast Guard and SOLAS rules for passenger vessels in operation on restricted coastal service.

According to the stability book, the *Empress of the North* was restricted to operating 25 miles from shore from May to September and between Portland and Juneau. The stability book was approved by the American Bureau of Shipping on behalf of the Coast Guard on August 6, 2003.

**Subdivision.** Calculations indicated that, when operated in accordance with the approved stability book, the *Empress of the North* would remain afloat and upright with any one major compartment flooded (one-compartment subdivision). A major compartment is the total space between any two adjacent main transverse watertight bulkheads. The watertight bulkheads were located at frames 9, 21, 37, 53, 73, 89, 109, and 129. There was one class 3 watertight door<sup>47</sup> in frames 21, 37, 53, 73, 89, and 109.

**Damage Survival.** Calculations indicated that the *Empress of the North* would stay upright (no more than 7° of list under ideal conditions – minimal wind, wave, and passenger movement) after side damage when the side damage was limited to any one major compartment and more than 11.40 feet inboard from the side of the hull.

Hull damage was found to extend from frame 37 through frame 113, an area that contained five main watertight zones. However, flooding was restricted to the starboard side voids and tanks and did not extend throughout each main watertight zone. The greatest angle of list at any time during the accident was about 8°.

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<sup>44</sup> A stability book describes a vessel's stability characteristics (such as the angle to which it can heel before capsizing or the amount of reserve energy available to right it) and is a tool for the master and crew to use in controlling the vessel under different conditions.

<sup>45</sup> Because of its gross tonnage and passenger load, the vessel was required to comply with 46 CFR parts 70-89 (subchapter H). Title 46 CFR 170.080 directs stability and subdivision considerations to 46 CFR parts 170-174 (subchapter S).

<sup>46</sup> Intact stability is a naval architecture term referring to how an intact, or undamaged, vessel will respond when heeled over. Damaged stability is the "worst intact condition," assessed by analytically opening various combinations of watertight compartments to the sea.

<sup>47</sup> As defined by 46 CFR 170.250, a class 3 watertight door is a "sliding door, operated by power and by hand gear."

The vessel was stability-limited to a maximum allowable vertical center of gravity,<sup>48</sup> as specified in the stability book, and the maximum draft was not to exceed the Plimsoll mark.<sup>49</sup>

## Waterway Information

The grounding occurred in the Inland Passage of southeast Alaska off Point Couverden, which is at the southernmost end of an isthmus that extends into the junction of the east end of Icy Strait (running northwest to southeast) and Lynn Canal (running roughly north and south). The ship grounded on the southeastern shoals of Rocky Island (58° 10.6' N and 135° 03.1' W). (Refer to figure 2.)

According to the *United States Coast Pilot*, Icy Strait is part of a 61-mile-long waterway that connects the northern part of the Inland Passage to the sea. The waterway averages 4 to 8 miles wide. Lynn Canal is described as 5 miles wide at Rocky Island, “nearly free of dangers,” and “generally very deep.”<sup>50</sup> The navigation chart for the area shows a stretch of navigable water between Rocky Island and Point Couverden about 0.5 mile wide. The rocks advance to the south of Point Couverden by about 0.3 mile and form the right boundary of the navigable water between the island and the point. The *Coast Pilot* describes Rocky Island as

grass covered and marked by a light, . . . 3.2 miles NW of Hanus Reef. The water is deep to within 250 yards of the island. As currents are erratic in the channel between Rocky Island and Point Couverden, the slight saving in distance this channel offers does not warrant its use; however, if used, vessels should favor Rocky Island, as shoal water extends from Point Couverden.<sup>51</sup>

The *Coast Pilot* characterizes currents in the southern part of the canal as 0.3 to 1 knots, with “strong tide rips” at the entrance to Swanson Harbor (just west of Point Couverden and Rocky Island). Tidal data for Juneau (the closest data station) show that at the time of the accident, the tide had just begun to ebb.<sup>52</sup> The Coast Guard reported a 0.5-knot westerly current at the time of the accident and calm

<sup>48</sup> Distance from hull bottom to center of total weight present.

<sup>49</sup> The *Empress of the North* complied with the requirements of regulation 10(2), annex I of the International Convention on Load Lines, 1966. A load line is a symbol, also called a Plimsoll mark, painted amidships on each side of a ship to show whether the ship is overloaded. The purpose of a load line is to ensure that a ship has sufficient freeboard (distance between the waterline and the main deck) to allow it to remain buoyant if the ship sinks deeper into the water. The load line indicates the maximum safe draft (vertical distance between the waterline and the bottom of the hull) and therefore the minimum freeboard for the vessel under various operating conditions.

<sup>50</sup> National Oceanic and Atmospheric Administration, National Ocean Service, *United States Coast Pilot*, vol. 8 (Alaska: Dixon Entrance to Cape Spencer), 2004, pp. 313, 365.

<sup>51</sup> *Coast Pilot*, vol. 8, p. 315.

<sup>52</sup> National Oceanic and Atmospheric Administration data were obtained from the National Climatic Data Center website <[www.ncdc.noaa.gov](http://www.ncdc.noaa.gov)>.

seas. The day after the accident, the Coast Guard recorded the sea temperature at Auke Bay (Juneau) as 37° F.

## Meteorological Information

According to National Climatic Data Center observations for Hoonah Seaplane Base, about 14 miles west of the accident site, skies were overcast at the time of the accident, visibility was 7 miles, the air temperature was 43° F, and winds were from the southeast at 8 to 10 miles per hour. Light rain was recorded at 0056.

The forecast for the coastal waters of Icy Strait issued by the National Weather Service for the night of May 13 and the day and night of May 14 was for east winds varying from northeast to southeast at 20 knots, seas 3 to 4 feet, and rain. Data from the U.S. Naval Observatory in Juneau indicate that for the date and time of the accident, the moon was below the horizon.

## Toxicological Testing

Drug and alcohol testing was conducted on board the *Empress of the North* for eight crewmembers, including the master and all watchstanding personnel, between 0550 and 0717 on May 14. The alcohol tests employed a breathalyzer. Drug tests for the five illicit drugs for which Federal regulations require screening<sup>53</sup> were conducted using urine specimens. All the alcohol and drug tests were negative.

Coast Guard regulations at 46 CFR 4.06 require alcohol tests to be completed within 2 hours and drug tests to be conducted within 32 hours of a serious marine incident “unless precluded by safety concerns directly related to the incident.”<sup>54</sup> Alcohol testing can be conducted up to 8 hours following an accident if a crew is actively engaged in responding to an emergency or ensuring the safety of the vessel. Personnel on the *Empress of the North* were occupied for several hours in responding to the emergency. Alcohol tests were conducted on crewmembers within 8 hours. Drug tests were conducted less than 6 hours after the accident.

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<sup>53</sup> Regulations at 46 CFR 16.113 specify testing for marijuana, cocaine, opiates, phencyclidine, and amphetamines.

<sup>54</sup> A serious marine incident is defined at 46 CFR 4.03-2 as (a) a marine casualty or accident that results in any of the following: (1) one or more deaths, (2) injury that requires medical treatment beyond first aid and renders the individual unfit to perform routine duties, (3) property damage exceeding \$100,000, (4) actual or constructive total loss of an inspected vessel, or (5) actual or constructive total loss of any uninspected vessel that exceeds 100 gross tons; (b) discharge of 10,000 or more gallons of oil into U.S. waters; or (c) the release of a reportable substance into the environment of the United States.

## Survival Aspects

### *On-Scene Emergency Response*

The master arrived on the bridge seconds after the grounding and at 0132 instructed crewmembers to go to the main deck. He then made several emergency calls on VHF radio channel 16. At 0135, he radioed the Coast Guard in Juneau to inform it of the emergency and the vessel's location. At 0140, the Coast Guard issued an urgent marine information broadcast.

At 0142, the master announced the emergency to passengers and shortly afterward, instructed them to dress and report to their muster stations with their lifejackets. (As required by SOLAS, an abandon-ship drill had been held the afternoon of May 12 in Juneau after the passengers had boarded.) He told passengers to remain calm, assured them that the vessel was stable, and kept them informed about evacuation plans. Passengers were accounted for when they reached their muster stations. After the passengers mustered, crewmembers went through all the cabins to ensure that they were clear, marking the doors of those that had been searched and found empty.

The master used two emergency procedures checklists in responding to the grounding. Written emergency procedures are required by the ISM code to be part of any safety management system. The emergency response checklists were kept on the vessel's bridge and were readily accessible.

The master told investigators that he decided to launch liferafts as a precaution, although he considered the liferafts a "last resort" that he did not want to use because of the large number of elderly passengers on board.<sup>55</sup> He said his plan was to launch liferafts on the port side because the vessel was listing to starboard. The purser on the bridge noted that liferafts were launched at 0224.

Postaccident examination of the lifesaving equipment showed that eight liferafts were launched from the port side, along with the IBA for that side, and that four liferafts were launched from the starboard side. The chief mate told investigators that the hand pumps failed to activate about half the mechanisms in the 12 liferafts that were launched. He said that the plungers were pumped "upwards of a dozen to two dozen times" but did not activate the hydrostatic release units. Crewmembers cut the lines with their knives to launch the liferafts. It was later discovered that the pumps connected to the hydrostatic release units had not been lubricated as directed by the manufacturer (see "Safety Board Actions Since the Accident" section).

The vessel's two inflatable evacuation slides were deployed on the port side. The first slide inflated upside-down and as a result, blocked the embarkation area.

<sup>55</sup> The senior vice president of operations told investigators that Majestic America Line catered to passengers over 60.

The crew could not flip the slide into the correct position because the tethering lines were too taut, so they cut it loose. The second slide also inflated upside-down and blocked the exit. It too was cut loose, and crewmembers manually turned both slides over and secured one at the embarkation area. According to the chief mate, the crew spent about 15 minutes trying to deploy each slide.

The chief mate said that all personnel in the vicinity verified that the arrows stenciled on the valises were pointing in the correct direction and that they all believed the slides were installed properly on the deck: "I confirmed with everyone so that everyone could see that it was indeed put in the proper direction." Investigators observed and photographed a valise after the accident showing the correct labeling.

Within minutes of the accident, the *Empress of the North* was in contact with other vessels in the area, including two commercial fishing vessels, the 56-foot *Evening Star* and the 32-foot *Willow*, the small passenger vessel *Spirit of Columbia*, and the towing vessel *Tiger*. The vessel masters all agreed to help evacuate passengers from the cruise ship. The two fishing vessels were the closest. At 0223, the *Evening Star* came alongside the *Empress of the North*, allowing 30 passengers and 3 crewmembers to step onto it from the cruise ship. The *Evening Star* departed at 0239. The *Willow* came alongside at 0251; 13 passengers and 1 crewmember from the *Empress of the North* stepped aboard, and the *Willow* was away at 0308.

At 0329, the *Spirit of Columbia* tied up on the port side of the *Empress of the North*, and 52 persons (including 4 in wheelchairs and 5 needing help to walk) transferred to the *Spirit of Columbia* using the cruise vessel's gangway. Meanwhile, the towing vessel *Tiger* arrived and tied up alongside the fuel barge it was towing. The *Evening Star* and *Willow* then transferred to the *Tiger* the 47 passengers and crewmembers they had rescued. About 0415, the *Tiger* tied up on the starboard side of the *Empress of the North* and took on 22 additional passengers. The *Tiger* now had 65 passengers and 8 crewmembers on board.

The *Spirit of Columbia* got back under way at 0424. At 0438, the Coast Guard cutter *Liberty*, which had arrived at 0405 and assumed on-scene command, tied up on the port side of the *Empress of the North* and took on 89 passengers and 38 nonessential crewmembers (127 persons total). The *Tiger* remained alongside the *Empress of the North* until 0519. A minute or so after the *Tiger* untied, a Coast Guard 47-foot motor lifeboat that had been dispatched to the scene transferred the last four nonessential crewmembers from the *Empress of the North* to the *Tiger*.

While still alongside the *Empress of the North*, the *Liberty's* commanding officer visited the cruise ship's bridge. When he returned to the *Liberty*, he told his executive officer that the *Empress of the North* master seemed to be sober, aware of his surroundings, and handling the stress well. At 0521, the *Liberty* got back under way, leaving 29 essential crewmembers on board the *Empress of the North*. All 206 passengers and 46 nonessential crewmembers (252 persons) were now on board the *Tiger*, the *Spirit of Columbia*, or the *Liberty*.

About 0554, the 418-foot-long ferry *Columbia* arrived. The vessel, part of the Alaska Marine Highway System,<sup>56</sup> had been on a scheduled run to Juneau when it received the Coast Guard's urgent marine information broadcast and diverted to the scene to assist. The Coast Guard decided to transfer all evacuated passengers and crew to the *Columbia* because, according to the Coast Guard chief of response, "It was a much better platform that could house everybody. . . . We didn't like having people all spread out all over the place. So we moved them."

At 0625, after the *Empress of the North* had departed for Auke Bay, the *Liberty* tied up to the *Columbia*, making fast alongside an access to the ferry's car deck that aligned well with the *Liberty*'s main deck. The 127 passengers and crewmembers on the *Liberty* transferred to the *Columbia*. Over the next 2 1/2 hours, the Coast Guard 47-foot motor lifeboat ferried passengers and crewmembers from the *Tiger* and the *Spirit of Columbia* to the *Columbia* by way of the *Liberty*. The transfer was complete by 0840.

After all passengers were safely on board the *Columbia*, the *Liberty* departed at 0855. The Coast Guard conducted a final accountability check before allowing the *Columbia* to depart for Juneau shortly after 0900. The *Columbia* arrived at Auke Bay around 1100 and docked at the Alaska Marine Highway System pier.

### *Coast Guard Response*

The Coast Guard response was structured according to the incident command system, an integrated organizational structure, originally developed to manage wildfires, that allows multiple agencies to respond to an emergency without jurisdictional conflicts. The Coast Guard, the city of Juneau, and the state of Alaska together formed a unified command, with the Coast Guard captain of the port serving as incident commander. State and local government representatives, as well as personnel representing the cruise ship operator, also served on the command staff.

The search-and-rescue operations plan of Coast Guard District 17, which was in charge of search-and-rescue operations for the area where the *Empress of the North* grounded, contained a threat assessment for the area and risk assessments for different vessels operating there. The worst-case scenario was described as "a grounding or fire on board a high capacity passenger vessel or large fish-processing vessel in a remote location that lacks a quick response infrastructure." According to the risk assessment:

A major concern with high capacity passenger vessels is with the disposition of the passengers, many of whom may be elderly, handicapped, injured or requiring special medical care. Local medical facilities will be quickly overwhelmed. Accountability for all passengers and crew will be a priority.

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<sup>56</sup> The Alaska Marine Highway System operates ferries along 8,000 miles of coastline that are not linked by roads.

The plan contained an execution checklist, procedures for evacuee accountability, and a multiagency, quick-start guide for cruise ship emergencies.

Immediately after the Coast Guard communications center at District 17 headquarters received the first emergency radio transmission from the *Empress of the North* at 0135, the command center took charge of coordinating the search-and-rescue effort. At 0138, Air Station Sitka was briefed on the grounding, and the station's two available helicopters were prepared to launch. The communications center then issued the urgent marine information broadcast over VHF radio channel 16 that alerted good Samaritan vessels to the emergency. At 0145, the Coast Guard cutter *Liberty*, a 110-foot patrol boat on standby status, was tasked by District 17 with responding to the accident. The District 17 chief of response was called to the command center and began overseeing the search-and-rescue operation.

The chief of response told investigators that one of his first acts was to contact the Marine Exchange of Alaska<sup>57</sup> for information about vessels operating near the accident site. The Marine Exchange ran a secure system that used satellite and AIS transponders to track vessels in Alaska. The Marine Exchange provided the Coast Guard with the names of AIS-equipped vessels that were nearby, as well as a copy of the AIS playback of the grounding. The chief of response instructed the communications center to call specific vessels identified by the Marine Exchange as being in the vicinity of the *Empress of the North* and request their assistance.

Air Station Sitka launched its first HH-60 Jayhawk helicopter at 0230 and the second at 0245. Station Juneau launched a 47-foot motor lifeboat at 0233. Before those assets arrived on scene, the communications center was kept apprised of the emergency situation by radio updates from the *Empress of the North* as well as by status reports from good Samaritan vessels as they responded to the urgent marine information broadcast.

At 0315, the first helicopter arrived at Icy Strait and assumed on-scene command. According to the chief of response, the helicopter crew's job was to make sure that everyone was evacuated safely and to keep track of the ships that passengers were being evacuated onto. As passengers transferred from the *Empress of the North* to other vessels, the helicopter crew received their names by radio and passed them to the command center. This helicopter crew oversaw the response until 0405, when the cutter *Liberty* arrived. The second helicopter from Sitka arrived on scene at 0318.

Two other aircraft, a Jayhawk helicopter from Cordova and a C-130 from Kodiak, were launched but then called back when it was established that the two Jayhawk helicopters from Sitka were sufficient. A third helicopter was later launched from Air Station Sitka to relieve those on scene. At least one Coast Guard

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<sup>57</sup> Marine Exchange of Alaska is a nonprofit organization, established in 2000, to bring the diverse Alaska maritime community together "by providing information, communications, and services to help ensure safe, secure, efficient and environmentally responsible maritime operations" <[www.mxak.org/](http://www.mxak.org/)> (accessed June 24, 2008).

air asset was present throughout the entire evacuation. Station Juneau launched a 25-foot response boat at 0722 to provide a relief crew for the 47-foot motor lifeboat on scene. The 25-foot boat eventually escorted the *Empress of the North* back to Juneau.

The command center monitored the transfer of passengers onto other vessels, ensured 100-percent accountability, and provided response assets. The center's active role continued until the passengers returned safely to Juneau.

### *Shoreside Emergency Response*

The Coast Guard coordinated closely with the city of Juneau during the rescue operation. On being notified of the accident, the city put into action its plan for a cruise ship disaster. The plan assigned the responsibilities and tasks for emergency and disaster response operations to various departments and agencies operating under the incident command/unified command system. The city practiced its response plan in annual drills. The last drill before the accident was held in Anchorage in January 2007.

An emergency operations center was set up at the Juneau police station, staffed by designated personnel, including the port manager for Juneau and representatives of the fire department and Coast Guard. The duty officer for Capital City (Juneau) Fire and Rescue was the first to arrive at the operations center. He was followed by the city emergency coordinator, a Coast Guard representative, and a representative from the Alaska Marine Highway System. The operations center helped obtain an accurate passenger manifest and prepared to receive the passengers from the *Empress of the North*. Ambulances were waiting for the ferry *Columbia* when it arrived with rescued passengers, and buses were waiting to transport passengers to a reception facility 12 miles away in downtown Juneau. Passengers were accounted for a final time when they arrived at the facility. Food, blankets, cots, and shelter were provided until transportation home could be arranged for all passengers.

## Tests and Research

### *Voyage Data Recorder*

As required by SOLAS, the *Empress of the North* was equipped with a VDR that stored the last 12 hours of bridge, audio, radar, and parametric data in crash-protected memory units.<sup>58</sup> The VDR was not damaged in the grounding and remained on board the vessel. After the accident, Safety Board investigators

<sup>58</sup> SOLAS chapter V, regulation 20, requires passenger ships constructed on or after July 1, 2002, to carry VDRs. Data items to be recorded are established in International Maritime Organization resolution A.861(20) and International Electrotechnical Commission (IEC) standard 61996.

downloaded the VDR data onto a portable hard drive that they delivered to the Board's surface recorder laboratory in Washington, DC.

The laboratory transcribed relevant data from the bridge audio and radar records and from the parametric data specified by National Marine Electronics Association (NMEA) standard 0183.<sup>59</sup> The quality of the audio recording was described as "fair to good."<sup>60</sup> The laboratory identified the following valid NMEA fields as having been recorded: wind speed and angle, water speed and heading, water depth, time and date, true heading, rate of turn, geographic position, datum reference, recommended minimum specific GPS data, commanded port and starboard thruster position, course and speed over the ground, and watertight and fire door status.

SOLAS chapter V, annex 10 (appendix), requires VDRs to record 15 data items, among them engine order, engine response, and actual thruster position. The laboratory determined that the VDR carried on the *Empress of the North* did not record that required information.

### *Lifesaving Equipment*

As noted earlier, the evacuation slides on the *Empress of the North* did not deploy correctly after the accident. On November 6, 2007, Safety Board and Coast Guard investigators visited Marine Safety Services in Seattle, which had serviced the evacuation slides. The company had two employees, one of whom did all servicing, packing, and maintenance. The company had an approved service manual, last updated in 2006, that contained packing instructions for the model SL40 slide, similar to the model SL32 carried on the *Empress of the North*. Investigators interviewed the employees about the packing procedures and reviewed the service manual. One employee said that he would usually refer to the manual only if he encountered a problem with the packing or maintenance, especially for that type of slide, whose packing he regarded as straightforward. The two slides from the *Empress of the North* were the only slides of that type serviced by Marine Safety Services.

On November 7, 2007, the same investigators visited the manufacturer of the evacuation slides, DBC Marine Safety Systems of Vancouver, British Columbia, Canada, to observe and test the procedures used to pack and inflate the slides. No examples of the model SL32 were available, so a model SL25 slide, about 5 feet shorter than the model SL32 but otherwise nearly identical, was used for demonstration purposes. The model SL25 slide was packed into a model SL32

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<sup>59</sup> IEC standard 61162 cites NMEA standard 0183 as an approved method of storing data. The NMEA standard is also used for passing information between pieces of equipment, for example, sending position data from GPS to ECDIS.

<sup>60</sup> According to the Safety Board's VDR audio data report: "Portions of the audio were unintelligible due to the close proximity of commercial satellite and VHF radio speakers to the VDR microphones. Nonpertinent conversation close to one or more microphones also masked relevant bridge conversation."

valise, resulting in a slightly loose fit. DBC Marine Safety Systems engineers told investigators that the loose fit should not affect slide inflation.

Investigators first observed the approved method of packing a slide into its valise. A valise, with the inflation cylinder already packed in the bottom, was placed open on the floor of the company's warehouse. A deflated slide was laid out



**Figure 11.** Evacuation slide laid next to a valise in preparation for packing. Photo was taken during tests at the DBC Marine Safety Systems warehouse in November 2007, after the company had labeled its valises THIS SIDE UP (see “Other Actions Since the Accident” section).

next to the valise (figure 11). On one side of the slide was a pull-cord (to be attached to a firing pin for the inflation cylinder inside the valise) and on either side were two securing lines (to be attached to D-rings on the vessel deck before deploying the slide). The securing lines were 6 inches long with a carabiner (a metal ring with one spring-loaded side) attached to one end.

In the demonstration, the handle of the inflation pull-cord was placed through its designated hole in the valise and into position under the outside flap. The slide was then placed on the bottom half of the valise and folded back on itself several times into a stack. The top half of the valise was folded over the slide and secured to the bottom by a Velcro strap along the edges of the valise. The last step was to connect the line from the inflation handle to the cylinder's firing pin. Once packed in the valise, the slide could be carried by its two handles, similarly to a duffel bag.

Three possible configurations in which a slide might deploy upside-down were identified and tested. The tests

were conducted on a platform approximately 10 feet high to simulate the deck of a ship:

- *Valise upside-down.* In this configuration, the stenciled instructions and the flap with the inflation pull-cord could not be seen. The chief mate told investigators that he could see the stenciled instructions when crewmembers positioned the valises on the deck of the *Empress of the North*. Investigators found that to reach the pull-cord required lifting the side of the valise that contained the 66-pound inflation bottle. Investigators did not try to inflate the slide with the valise in this position.
- *Slide packed in wrong side of valise.* When the valise was open on the floor, investigators observed no marks or other identifiers to indicate into which side the slide should be packed. The slide was then folded according to the servicing manual but placed in the top of the valise instead of the bottom. The slide fit easily into the valise, and the securing lines and pull-cord were accessible. The valise looked as if it were correctly packed, but with the stenciled instructions facing up, the slide was actually upside-down.

To test how the slide would inflate in this condition, the valise was placed on the testing platform according to the stenciled arrows, that is, with the outboard arrow on the valise pointing toward the platform edge. The valise was secured to eyebolts on the platform rather than using the carabiners. Because DBC Marine Safety Systems employees were unsure how the slide would inflate in this configuration, they requested that one of the securing lines not be tied off. One line was put through an eyebolt and held by a Marine Safety Systems employee, who allowed the line to pull free to avoid damaging the slide. When the inflation cord was pulled, the slide inflated outboard in an inverted position.

- *Valise positioned backward.* The slide was then deflated using a vacuum and repacked into the valise according to the manufacturer's instructions. The valise was secured to the testing platform backward, so that the inboard arrow pointed toward the edge. To avoid excessive wear on the slide, the second inflation was conducted using compressed air, which resulted in a longer inflation time. The slide's securing lines were tied on both sides to the eyebolts. When the inflation began, the slide popped out of the valise and fell off the test platform. The securing lines held it in position so that it inflated upward and folded back against the platform, or what would have been the outside of the ship. The slide ended in an inverted position, with the bottom facing inboard.

To confirm that this result was not due to the slower rate of inflation with compressed air, DBC Marine Safety Systems agreed to allow a second gas inflation test. The slide was deflated and packed back into the valise with a new

carbon dioxide charge. The valise was again secured on the testing platform with the inboard arrow pointing toward the edge. The slide was gas-inflated in this position, with the same result as for air inflation. As the slide began to inflate, it was forced off the test platform. The slide was inverted, and because of its position off the platform, it inflated upward and back toward the platform.

DBC Marine Safety Systems created two diagrams showing different postinflation positions for the evacuation slide. The diagrams were sent to the chief mate of the *Empress of the North*, who was asked to identify which position best matched the position of the slides on the vessel. The chief mate identified the position in which the slide was inverted and folded back against the outside of the ship, thereby blocking the embarkation area.

## Operational and Management Information

### *Corporate Organization*

According to the company's website,<sup>61</sup> Majestic America Line was formed in 2006 with the combined assets of American West Steamboat Company and Delta Queen Steamboat Company. Based in Seattle, the company was part of Ambassadors Cruise Group (ACG), a division of Ambassadors International, Inc., a cruise, marine, insurance, and travel and event company.<sup>62</sup> In January 2006, ACG acquired American West Steamboat Company and its two paddle wheelers, the *Empress of the North* and the *Queen of the West*. In April 2006, ACG acquired Delta Queen Steamboat Company, which included three companies and three ships (*American Queen*, *Delta Queen*, and *Mississippi Queen*). Later that year, ACG acquired two more ships, the *Columbia Queen* and the *Executive Explorer*, which it renamed the *Contessa*. In April 2007, ACG acquired Windstar Cruises, a subsidiary of Holland America Line, and its three ships.

The senior vice president of marine operations oversaw deck and engine operations for Majestic America Line. He had been in the position about 2 months when the accident occurred. Before that, he was a maritime consultant and before that, he worked for Holland America Line, first as a passenger vessel master and then as director of environmental compliance. At the time of the accident, he was integrating Windstar operations with those of Majestic America Line. He reported to the president of Majestic America Line and oversaw, among others, the vice president of marine operations. Vessel masters reported to the vice president of marine operations.

On April 29, 2008, Ambassadors International, Inc., announced that it planned to sell Majestic America Line.

<sup>61</sup> <[www.majesticamericaline.com](http://www.majesticamericaline.com)>.

<sup>62</sup> <<http://stocks.us.reuters.com/stocks/fullDescription.asp?symbol=AMIE.O>> (accessed May 19, 2008).

### *Safety Management System*

As a passenger ship traveling on international waters, the *Empress of the North* was required to meet mandatory international certification requirements for safety management systems under the ISM code. The ISM code was incorporated by the International Maritime Organization in SOLAS chapter IX and by the Coast Guard in U.S. regulations at 33 CFR 96, "Rules for the Safe Operation of Vessels and Safety Management Systems."

The objectives of a safety management system are to create a "culture of safety" by documenting a vessel owner's operational policy, chain of authority, and operational and emergency procedures; specifying the responsibilities of the owner or operator, managers, and masters; and outlining procedures for management review, internal audits, and correction of nonconformities (failure to adhere to procedures or regulations). Procedures are compiled in a safety management manual and a copy is kept on board the vessel. A person or persons are designated in writing to monitor the safety management system, and managers conduct regular audits to ensure that employees follow the procedures. Checklists are supplied for critical procedures. A complete list of documents required for a safety management system under Federal regulations is found at 33 CFR 96.250.

Safety management systems are monitored through internal and external audits. Companies establish their own internal audit schedules. When deficiencies are noted or an accident or a noncomformity occurs, corrective action is taken until the problem is resolved. External audits are performed at the company's request by an approved independent third party, usually a marine classification society. A document of compliance, valid for 60 months, is issued after completion of a satisfactory safety management audit. The Coast Guard or another organization authorized to act on behalf of the United States must annually verify that a company's safety management system has complied with the ISM code. The signature of the authorized official must be affixed to the document of compliance after each of the required annual verifications.

At the time of the accident, the safety management system for the *Empress of the North* was documented in two manuals. The 76-page *Office Safety Management Manual*, issued in February 2006, introduced the company's safety management system and stated policies and procedures regarding management, document control, reporting, audits, operation of ships, shipboard maintenance, and emergency situation with respect to the ISM code. The 117-page manual of *Fleet Instructions*, first issued in 2003 and revised in 2004, covered preparations for sea, such as bridge equipment tests, voyage plans, and predeparture checklists; operations at sea, such as watchstanding requirements and duties of watch officers, watch changes, steering and lookout, and bridge resource management; and duties and responsibilities of the engineering department. The instructions also dealt with personnel, administration, emergency preparedness, and preventive maintenance and inspection.

On January 12, 2004, the American Bureau of Shipping issued a safety management certificate for the *Empress of the North* certifying that the ship's safety management system had been audited and that it complied with the ISM code. The document was valid until December 10, 2008, but as noted earlier, was invalid at the time of the accident because the company's document of compliance had not received its required annual verification.

About 2 weeks before the accident, Majestic America Line hired a former vessel master to serve as director of marine compliance and as the "designated person ashore," a position required by ISM-compliant vessels, but that employee had not yet joined the company. A senior manager was serving as the designated person in the interim but had numerous other responsibilities and duties. As the senior vice president explained to investigators, the position of director of marine compliance was part of the company's efforts to upgrade its safety management system. Of the Majestic America Line vessels, only the *Empress of the North* was required to have a safety management system because the ship traveled in international waters between the United States and Canada. However, the company intended to upgrade the safety management system and apply it to all vessels in its fleet.

The company was also in the process of restructuring its marine operations department, with the vice president of marine operations becoming the vice president of technical operations. Other positions were to be modified into vice president of nautical operations and technical superintendents based in Portland, Oregon, and St. Louis, Missouri. Senior management, including the company president, went onto each vessel in the spring, met with the crew, and showed a video about the company's safety policies.

### *Previous Accidents*

The *Empress of the North* had been involved in three earlier accidents, two while under previous management. The first accident occurred on October 22, 2003, on the Snake River in Washington state. The *Empress of the North*, bound upriver, entered Ice Harbor Lock and Dam (figure 12). When the lock was filled, the upstream gate was lowered and the lock master radioed the *Empress of the North* that it was clear to exit. The crew cast off lines and began to exit the lock. However, the vessel struck the gate over which it had been cleared to pass, sustaining damage to the forward ballast tank. No injuries or pollution resulted.

A month later, on November 22, 2003, the *Empress of the North* was bound down the Columbia River, carrying 68 passengers and 56 crewmembers. After leaving the lock at The Dalles, Oregon, the master turned the watch over to the second mate, and the helmsman requested permission to shift from autopilot to hand steering. During the shift, the vessel lost propulsion control and grounded on the Washington side of the river. The hull was damaged and required shipyard



**Figure 12.** Sites of previous accidents (Ice Harbor Lock and Dam on the Snake River; The Dalles, Oregon; Washougal, Washington) involving the *Empress of the North*. Also shown are locations mentioned in the report but not indicated on the accident location map (figure 2).

repair. Seven passengers and five crewmembers were injured, three of whom required medical attention beyond first aid.

On March 24, 2006, the *Empress of the North* grounded in the Columbia River near Washougal, Washington, while trying to avoid a towing vessel that was having difficulty maneuvering in the channel. On board were 178 passengers and 79 crewmembers. According to the senior vice president of operations at Majestic America Line,

... the vessel took avoidance action and strayed out of the channel because of a barge ... that had lost control. ... In order to avoid a worse situation, they went outside of the buoy markers and struck ground.

The *Empress of the North* sustained significant damage, but no pollution or injuries were reported. The Coast Guard investigated the incident and issued letters of warning to the *Empress of the North* second mate and to the towboat operator because they had failed to communicate clearly. The master at the time was also in command during the May 2007 grounding that is the subject of this report. As noted earlier, the Coast Guard did not fault the master in the 2006 grounding.

As a result of the 2006 grounding, Majestic America Line issued new policies for the *Empress of the North* in the form of supplementary bridge watch standing orders. In addition to policies specifically related to the grounding, such as establishing no-passing zones on the vessel's river routes, the supplementary orders included requirements for bridge watch officers to "have a thorough understanding of bridge equipment and electronics and their use" and to fully understand the route being followed before relieving the watch. Before the 2007 accident, the master and all watchstanders were required to sign a form attesting that they had read and understood the standing orders. The junior third mate had not signed the form when he assumed the watch during which the accident occurred.

## Additional Information

### *Majestic America Line Actions Since the Accident*

After the accident, Majestic America Line voluntarily redesigned its safety management system and completely rewrote its safety management manual. The new document, which sets out the definitions and procedures for implementing the company's safety management system, covers 834 pages, divided into five volumes:

- Vol. I     *Safety Management Manual* (25 pages).
- Vol. II    *Operations Manual* (319 pages, including company and vessel organization charts and job descriptions).
- Vol. III   *Operational Checklists and Forms* (109 pages).
- Vol. IV    *Preventive Maintenance Program* (183 pages).
- Vol. V     *Emergency Contingency Plan* (198 pages).

Listed in the margin of the text are relevant Coast Guard or International Maritime Organization regulations (such as parts of the ISM code) and cross-references to other sections of the safety manual. The contents pages of all five volumes are reproduced in appendix F.

Volume I gives general definitions related to the safety management system and defines company responsibilities and authority. Section 4.0, for example, defines the designated person ashore as responsible for maintaining the system, including matters related to the company's document of compliance and each vessel's safety management certificate.

Deck operations and technical operations (engineering) are covered in volume II, supplemented by an appendix giving detailed job descriptions for vessel officers, deckhands, engineers, and hotel employees. Section 4.2, "Deck

Watchkeeping,” subsection 4.2.1, lists vessel features that “each licensed, registered, or certificated individual must become familiar with . . . prior to assuming his or her duties,” such as maneuvering characteristics and operation of navigation equipment. Further, before they are “allowed to stand a navigational watch alone,” new deck officers are required to complete a bridge equipment checklist, and masters must “consider for a navigational officer” seven items related to pilotage, taken from the Coast Guard’s qualifying requirements for first-class pilots at 46 CFR 10.705.

Subsection 4.2.1 reminds employees: “[I]f a first-class pilot has not served over a particular route within the past 60 months, the pilot’s license or endorsement is invalid for that route.” An overlap period of between 1 and 4 days, or longer in special cases, is established for ensuring that an officer is qualified to stand watch alone. Further, “If deemed necessary by the Master or Chief Engineer, an experienced Officer will join the new Officer during the first watch or for a period of time, regardless of the overlap period with the off-signing Officer.” Two pages of the manual are devoted to discussing the responsibilities of the officer of the watch (section 4.2.6) and three pages to “Keeping Watch While Underway” (section 4.2.7).

Standing orders and night orders are dealt with in section 4.2.5 of the manual, which states, “The Master is to use a ‘Night Order Book’ for giving information and instructions to the [officer of the watch] regarding the navigation of the ship.” Standing orders are to be permanently attached to the night order book, which deck officers are required to sign and date.

Deck standard operating procedures are laid out in section 4.3 of the *Operations Manual*. The manual states, “A detailed voyage or passage plan should be prepared” and is to “be available at all times on the bridge.” The manual devotes 4 1/2 pages to analyzing the process of voyage planning and passage appraisal. The first step in developing a voyage plan is to be an appraisal of information relevant to the voyage, such as vessel condition, crew availability, certificates, weather, and pilotage. The manual lists 11 factors that should be included in the plan itself, such as plotting of intended route, safe speed, course alteration points, and position fixing. Decisions involved in executing the plan are also discussed, such as tide, weather, and traffic. The manual also contains over four pages of instructions for navigating in inland waters, including details about the effect of shallow water on a ship’s draft (“squat” effects) and specific examples and considerations for pilots to keep in mind.

Section 4.4 of the *Operations Manual* deals with documentation. The manual states, “The Master is responsible for tracking the expiration of all certificates issued to the vessel or maintained on the vessel.” They include the COI and SOLAS certificates. Other contents of the *Operations Manual* are listed in appendix F.

Operational checklists and forms are gathered in volume III of the safety management system documents. The operational checklist for passage appraisal

(OP 3.3) includes the task, “Make up trip voyage plan,” noting that an Excel template is located in the computer for that purpose. The master is required to prepare and review the passage appraisal checklist. The three-page checklist for bridge watch changes (OP 4.4) includes specific watch handover information that the officer on watch and his relief are responsible for (*Operations Manual*, section 4.1.10, “Change of Watch”).

Volume IV, the preventive maintenance program for the *Empress of the North*, gives inspection criteria references (ICRs) for 17 categories of shipboard items, including emergency equipment.<sup>63</sup> The appendix contains 30 detailed test procedures and checklists. The ICRs give authorization information (inspector, references, frequency) and list requirements for monthly, quarterly, and annual required checks. The criteria for inspecting the vessel’s inflatable liferafts (ICR B.05) give the following specific instructions for maintaining the remote-release units: “Hammar Manual Remote Release System Pneumatic Pump Units to be lubricated per instructions at least every two years. See USCG [Coast Guard] Marine Safety Alert 4-07” (the alert is described in the “Coast Guard Actions Since the Accident” section, below).<sup>64</sup> For the contents of volume V, the *Emergency Contingency Plan*, see appendix F.

Although the *Empress of the North* was the only ship in the Majestic America Line fleet that was required by international regulations to have a safety management system, the company informed the Safety Board that since the accident, it had voluntarily implemented the system fleetwide. Further, an implementation team was visiting all vessels to ensure that the safety management system was properly implemented, and the American Bureau of Shipping had approved the system. The company informed the Safety Board of numerous steps it had taken as of March 2008 to improve the safety of its operations, among them the following:

- Had all newly hired bridge watch officers evaluated at Pacific Maritime Institute (a vocational training center in Seattle for mariners) on a full bridge simulator.
- Contracted with Pacific Maritime Institute for a 2-year mates training program to provide trained officers to the company’s fleet.
- Contracted with a maritime risk consulting firm to examine company operations for risk and recommend changes to policies and procedures; implemented all recommendations.

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<sup>63</sup> The other categories are documents and paperwork; lifesaving equipment; fire protection equipment; structural fire protection; ventilation; navigation equipment; ground tackle; hull, decks; fittings, watertight integrity; accommodation/related spaces; emergency drills; forms, notices, publications, crew requirements; propulsion systems; diesel power systems, unfired pressure vessels; auxiliary machinery and equipment; electrical systems.

<sup>64</sup> Section 3.4.1 of the *Operations Manual* states that critical equipment, which includes lifesaving equipment, is to be inspected every year when the manufacturer has not defined the inspection interval.

The company stated that it had also become an active member of the Cruise Line Industry Association and the Passenger Vessel Association. The Cruise Line Industry Association is the official trade organization of the North American cruise industry, composed of 24 major cruise lines. The Passenger Vessel Association represents the interests of more than 350 vessel owners and operators in the U.S. passenger vessel industry.

### ***Safety Board Actions Since the Accident***

On July 5, 2007, after finding that the approved lifesaving equipment carried on the *Empress of the North* malfunctioned during the emergency response to the accident, the Safety Board issued two urgent safety recommendations to the Coast Guard. The first recommendation concerned the failure of half of the manual release mechanisms for the vessel's liferafts:

#### M-07-9

Verify the functionality of Hammar model H20 remote-release units for liferafts by inspecting or delegating the inspection of a sample of the models, requiring authorized facilities to demonstrate functionality, or other equally effective method. (Urgent)

On August 21, 2007, the Coast Guard responded that it concurred with the recommendation. The Coast Guard's letter stated that according to the company's port engineer, 20 of the 22 remote-release units had been on the *Empress of the North* for over 2 years and had not been properly lubricated since they were installed. The letter stated further that Majestic America Line had replaced those 20 units and was "taking steps to ensure" that the units would be lubricated as required (as described in the previous section, the company's revised preventive maintenance program contains specific requirements for the Hammar remote-release units).

The response letter continued that inspectors from Coast Guard Sector Portland had inspected more than half of the new units on June 30, 2007, and had "found them functioning satisfactorily." The letter stated that Coast Guard action on the recommendation was complete and requested that the recommendation be closed. On April 23, 2008, the Safety Board classified Safety Recommendation M-07-9 as "Closed – Acceptable Alternate Action."

The other urgent safety recommendation to the Coast Guard concerned the incorrect deployment of the inflatable evacuation slides on the *Empress of the North*:

#### M-07-10

Conduct a one-time inspection and correction of all deficiencies of evacuation slides last serviced by Marine Safety Services of Seattle, Washington. (Urgent)

On August 21, 2007, the Coast Guard responded that it concurred with Safety Recommendation M-07-10 and that inspectors from Coast Guard Sector Seattle who visited Marine Safety Services on July 6, 2007, had determined that

it would be extremely difficult to pack the slides incorrectly without making significant modifications to the valise. The pull cord especially must be oriented correctly inside the valise in order for it to be accessible at the flap. Any incorrect folding or orientation would likely make the slide impossible to deploy in any direction.

The Coast Guard concluded that

there were no deficiencies in the evacuation slide servicing by Marine Safety Services. It is likely that crewmembers, dealing with the stressful circumstances associated with the grounding, placed the valises upside down on the deck, leading to the slides deploying incorrectly.

The Coast Guard stated that its action on Safety Recommendation M-07-10 was complete and requested that the recommendation be closed, noting that

at the time of the casualty, the valises were marked only with “inboard” and “outboard” markings to indicate the correct orientation. The manufacturer has since added additional markings to ensure that the “up” and “down” sides are clearly indicated.

The actions of the manufacturer, DBC Marine Safety Systems, are discussed below in “Other Actions Since the Accident.” After the Safety Board received the Coast Guard’s response, a Safety Board investigator and a Coast Guard investigator visited both Marine Safety Services and DBC Marine Safety Systems to test the evacuation slides, as described earlier in the “Tests and Research” section. On April 23, 2008, the Safety Board classified Safety Recommendation M-07-10 as “Open – Acceptable Response.”

### *Coast Guard Actions Since the Accident*

**Liferaft Release Units.** On September 26, 2007, the Coast Guard issued Marine Safety Alert 4-07 regarding the Hammar remote-release units, noting, without naming the *Empress of the North*, that “a recent passenger ship grounding revealed difficulties the crew had in manually deploying the vessel’s liferafts from their mounting cradles.” The safety alert “strongly” recommended that the Hammar pump units “be maintained in accordance with the manufacturer’s recommended maintenance schedules.” The alert featured a photo of a Hammar remote-release pump unit and stated that the units were clearly marked, “Lubricate piston every second year.”

**Document Inspection.** According to the Coast Guard chief of prevention for Sector Portland, after learning that the last annual inspection of the *Empress of the*

*North* had failed to identify problems with Majestic America Line's document of compliance, Sector Portland senior officers met with the inspector of the *Empress of the North* and then held a training session for all the Sector Portland vessel inspectors. The chief of prevention also listed other measures that Sector Portland had taken to prevent future oversights regarding vessel documentation:

- Inspection staff meets periodically to review shortcomings and identify ways to correct problems.
- Senior officers reevaluate inspection checklists.
- Inspection staff members review vessel certificates coming up for inspection in their sector.
- Inspectors participate in weekly training.

Coast Guard headquarters recently informed the Safety Board that the American Bureau of Shipping had agreed to notify the Coast Guard when an ISM document becomes invalid; headquarters staff will then notify the local OCMI for action. The Coast Guard also stated that it would seek similar agreements with the other two classification societies (Det Norske Veritas and Germanischer Lloyd) that issue ISM documents on U.S.-registered vessels.

**Pilotage.** The chief of vessel inspections for Coast Guard Sector Juneau informed the Safety Board that after the accident, Sector Juneau had checked 13 U.S. passenger vessels (subchapter T and subchapter K) for which pilotage requirements applied and was taking action to verify compliance. The chief estimated that it could take 30 to 60 days for a mariner to satisfy the "acting as" pilot requirements if he or she had no previous experience in southeast Alaskan waters.

The chief of vessel inspections said that Sector Juneau had explained the self-certification pilotage requirement to the managers of the companies that operate vessels in southeast Alaska. At the end of the 2007 season, Sector Juneau surveyed self-certified pilotage on 13 domestic cruise vessels that operate in southeast Alaskan waters. All masters and mates were found to be in compliance with the regulations, according to the assistant chief for inspections in Sector Juneau. At the beginning of the 2008 season, Sector Juneau again checked pilotage and found all vessels in compliance, though some had had to hire extra mates, adjust watch schedules, or temporarily hire Federal pilots.

### ***Other Actions Since the Accident***

On July 12, 2007, DBC Marine Safety Systems issued two service bulletins concerning the model SL32 slide carried on the *Empress of the North*. Bulletin DBC-07-04 instructed that at the next servicing, all slide valises should be marked with the labels THIS SIDE UP on the top and TURN OVER on the bottom. Bulletin

DBC-07-06 gave new instructions on the packing of the model SL32 slide, as follows:

This service bulletin outlines how the SL32 shall be packed. It differs slightly from the SL40 instructions because the cylinder is in a different position[;] this method allows for the cylinder to be packed at the back of the valise so that when it is carried the cylinder does not shift. The SL25 shall be packed similar to the SL40 because its cylinder is in a similar position to the SL40.

The company informed the Safety Board in May 2008 that it had prepared stencils for labeling the insides of the valises so that service technicians could readily determine into which side of the valises they should pack the slides.

### *U.S. Maritime Academies*

Six state maritime academies and the U.S. Merchant Marine Academy offer training to prospective merchant marine officers (table). Students are organized as military academy cadets and take examinations for Coast Guard licenses before their graduation date. The state academies operate with Federal aid. The U.S. Merchant Marine Academy is funded by the U.S. Department of Transportation's Maritime Administration and administered by the U.S. Maritime Service.

**Table.** Maritime academies in the United States.

Academy	Location	Founded	Enrollment	Degrees Awarded
California Maritime Academy	Vallejo, California	1929	650	BS marine transportation; BS marine engineering; Coast Guard license offered, deck and engine studies
Great Lakes Maritime Academy	Traverse City, Michigan	1969	80	BS business; associates degree, applied science, marine technology; Coast Guard license offered, deck and engine studies
Maine Maritime Academy	Castine, Maine	1941	720	BS marine transportation; BS marine engineering; Coast Guard license offered, deck and engine studies
Massachusetts Maritime Academy	Taylor Point, Buzzards Bay, Massachusetts	1891	900	BS marine transportation, marine engineering; Coast Guard license offered, deck and engine studies
State University of New York Maritime College	Throggs Neck, New York	1874	900	BS marine transportation; BS marine engineering; master's program, international transportation management; Coast Guard license offered, deck and engine studies
Texas Maritime Academy	Galveston, Texas	1962	260	BS marine transportation; BS marine engineering; Coast Guard license offered, deck and engine studies
U.S. Merchant Marine Academy	Kings Point, New York	1943	950	BS marine transportation; BS marine engineering; commissioned ensign, U.S. Naval Reserve; Coast Guard license offered, deck and engine studies

## ANALYSIS

### General

The analysis first identifies factors that can be eliminated as causal or contributory to the accident. It then discusses the safety issues identified in the accident investigation:

- Master's decision to put an inexperienced third mate on watch without supervision or guidance.
- Junior third mate's actions.
- Watchkeeping procedures.
- Documentation deficiencies.
- Malfunctioning lifesaving devices.

### Exclusions

The weather at the time of the accident was cloudy and drizzly, but the evidence indicates that visibility (7 to 10 miles) was not restricted, winds were mild (8 to 10 mph), and the sea was calm. The flashing green navigation light on Rocky Island was clearly visible to the watchstanders on the bridge about 4 minutes before the grounding, and the Coast Guard verified in a postaccident check of the aids to navigation in the area, including the light on Rocky Island, that all were functioning properly.

The evidence further indicates that the vessel's machinery was operating properly at the time of the accident, and that the vessel had experienced no propulsion, steering, or any other problems with the engineering plant before the grounding. (The vessel returned to Juneau under its own power after the accident, despite damage to its starboard propulsion drive sustained in the grounding.) Toxicological analysis of samples taken from the master, chief mate, helmsman, and junior third mate on watch were all negative for the presence of alcohol and illegal drugs. In addition, the chief mate, helmsman, and junior third mate had all had sufficient rest to perform effectively at the time of the accident. The Safety Board therefore concludes that the following were not causal to the accident: weather (including visibility, wind, sea, and current); aids to navigation; vessel propulsion and steering systems; use of alcohol or illegal drugs; watchstander fatigue.

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## Accident

Carrying 206 passengers and 75 crewmembers, the *Empress of the North* left Skagway the evening of May 13 and traveled south on Lynn Canal at about 12 knots. The trip was uneventful until about 8 hours later, when the vessel reached the intersection of Lynn Canal and Icy Strait. The bridge team consisted of the helmsman, who was an experienced AB, and the junior third mate, who was on his first ever underway watch as a licensed officer.

To make the westward turn into Icy Strait, the vessel could take either a route that ran between Rocky Island and the mainland at Point Couverden or one that went around Rocky Island to the south before turning west. The decision, according to the master and the chief mate, was left to the individual watch officer. Both routes were marked on the vessel's navigation charts. The second mate, who had the previous watch and who spent about 20 minutes with the junior third mate before the watch changed, recalled explaining the two possible routes but that the junior third mate did not indicate what his plans for the route were.

About 3 minutes before the accident, the helmsman initiated an 80° turn to the west, indicating that he intended to pass between Rocky Island and Point Couverden. Shortly thereafter, without informing the junior third mate, the helmsman altered his course to the left. He then told the junior third mate that he did not think the vessel was turning fast enough. The junior third mate observed the helmsman increase the rate of turn and looked for the flashing green light on Rocky Island but could not see it. When he saw rocks, he issued his first steering order, "Hard left," but it was too late to prevent the vessel from hitting the rocks. The Safety Board therefore concludes that the *Empress of the North* bridge team was attempting to negotiate an 80° turn at Rocky Island, a charted navigation hazard, but the vessel's rate of turn was insufficient to prevent it from grounding on the rocks.

## Master's Decision to Put Inexperienced Third Mate on Watch

The day before the accident, while the *Empress of the North* was in Skagway, the senior third mate was diagnosed with a gastrointestinal ailment and told to remain in isolation on the vessel. The master decided to replace the senior third mate on the midnight-to-0400 watch on May 14 with the newly arrived junior third mate. The junior third mate held an unlimited, any-ocean third officer's license but had never before stood an underway watch on the vessel or traveled the waters of Lynn Canal. Deck officers, or officers of the watch, were required by the vessel's COI to have either a pilotage endorsement or to have made four previous round-trips in those waters. The junior third mate met neither requirement. The implications of the vessel's pilotage requirements are discussed further in the "Documentation Deficiencies" section.

According to interviews, the master originally planned to have the junior third mate stand his first watch with the senior third mate, who, while having charge of the watch, could also have helped familiarize the new officer with the bridge equipment and routine. Once the senior third mate fell ill, the master altered his plan and decided to assign the junior third mate to the midnight-to-0400 watch in place of the ill crewmember. To compensate for the junior third mate's inexperience, the master decided to assign the most senior AB as helmsman on the same watch. The master stated that he discussed his plan with the chief mate, who did not disagree with it. The junior third mate, when informed by the master that he would be standing the watch, also expressed no disagreement with the plan. The master did not make the watchkeeping decision under duress, such as during an emergency. Rather, to solve the problem posed by the senior third mate's illness, the master had time to consider alternative actions. For example:

- He and the chief mate (although masters do not ordinarily stand watch) could have each stood 6 hours on watch and 6 hours off.
- He could have asked the company for an additional mate, one who met the pilotage requirements.
- He could have asked the company for authorization to hire a local pilot.

There is no evidence that the master considered any of these alternatives. Moreover, he did little to prepare the junior third mate for his first underway watch. Neither he nor the chief mate reviewed the route with the new officer, discussed the steering modes (manual or autopilot), or helped familiarize him with critical bridge components such as the radar. The standing orders for the *Empress of the North* required bridge watch officers to "have a thorough understanding of bridge equipment and electronics and their use." The junior third mate stated during interviews that he was unfamiliar with the bridge equipment and the bridge procedures. During the accident voyage, the helmsman attempted to familiarize the junior third mate with the equipment while engaged in steering the vessel, but it was the watch officer's responsibility to navigate, not the helmsman's.

The master told investigators that he considered the midnight-to-0400 watch an "easy" one. Nevertheless, the route contained at least one potential hazard (Rocky Island) and at least one critical decision for the watch officer (selecting the route from Lynn Canal into Icy Strait). A senior officer should have reviewed the merits and hazards of each with the junior third mate before he assumed his first watch. The junior third mate lacked any knowledge of the route and should not have been left to make this critical decision on his own. By assigning him to the watch, the master put the safety of the vessel and those on board at risk. The Safety Board therefore concludes that the master jeopardized the vessel's safety by allowing the junior third mate to stand a bridge watch before he was familiar with the route and the bridge equipment.

The junior third mate was unfamiliar with the route and during the accident voyage, relied on the helmsman for navigation and steering. The junior third mate told investigators that he understood that the helmsman “would be in control of the boat” and that he, the junior third mate, would be on the bridge because he was a licensed deck officer. Indeed, according to the VDR data, the helmsman steered without receiving commands from the junior third mate throughout the voyage. The helmsman did not inform the junior third mate of his intentions, and the officer did little to direct the helmsman until just before the accident. Thus, the junior third mate ceded his authority to make navigation decisions to the helmsman.

Breakdowns in team performance can occur when the superior member of a team is perceived to have less experience than the subordinate. The Safety Board has examined previous accidents in which the effectiveness of operator teams broke down because the gradient of authority degenerated. In 1990, for example, a runway collision occurred in Detroit when an aircraft entered an active runway during conditions of limited visibility.<sup>65</sup> The aircraft captain was on his first commercial flight in more than 6 years, after returning from medical leave and requalifying as captain. The first officer claimed to have greater knowledge of the area than the captain, and the captain deferred almost all navigation responsibilities to him. In its report on the accident, the Safety Board wrote:

The Safety Board believes that a nearly complete and unintentional reversal of command roles took place in the cockpit of the DC-9 shortly after taxiing began. The result was that the captain became overly reliant on the first officer. The captain essentially acquiesced to the first officer’s assumption of leadership. This role reversal contributed significantly to the eventual runway incursion.

Teams of operators are most effective when the lines of authority and responsibility are clear. The lines of authority on the *Empress of the North* were blurred because the experience of the two watchstanders was counter to that expected by their nominal roles in the team. The helmsman was superior to the officer on watch in knowledge, experience, and skill, and the junior third mate appeared to understand his role in relation to the helmsman, though it was contrary to the norm for bridge authority. The helmsman, probably in response to the junior third mate’s failure to exercise authority over the vessel’s navigation, exceeded his own authority by maneuvering the vessel in the absence of commands and, worse, failed to inform the officer of his intentions. In effect, the junior third mate and the helmsman switched roles during the accident voyage. Therefore, the Safety Board concludes that the master’s watch assignment created a poorly functioning bridge team in which an inexperienced officer in charge (the junior third mate) did not exercise authority and an experienced subordinate (the helmsman) exceeded his authority.

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<sup>65</sup> National Transportation Safety Board, *Northwest Airlines, Inc., Flights 1482 and 299, Runway Incursion and Collision, Detroit Metropolitan/Wayne County Airport, Romulus, Michigan, December 3, 1990*, Aviation Accident Report NTSB/AAR-91/05 (Washington, DC: NTSB, 1991).

The master's decision to assign an inexperienced deck officer to the watch created the situation that led to the accident. The Safety Board examined the master's decision to identify, if possible, the factors that influenced it. Two nights before the accident, the master received between 5 and 5 1/2 hours of sleep after a passenger fell ill and then died. The night before the accident, the master slept about 6 hours. Thus, on the two nights leading to the accident he received less than the 8 hours, plus or minus 1 hour, that researchers suggest most people require to function optimally.<sup>66</sup> However, while the master's accrued sleep deficit might have adversely affected his decision-making, other aspects of his decision do not suggest sleep deprivation. For example, the master told investigators that he decided to alter the watch schedule of the ABs so that an experienced AB would work with the junior third mate. He stated that the midnight-to-0400 watch was "an easy watch" and thus "a good place to start" for an inexperienced watchstander. He may also have considered other options, such as changing the schedules of the other licensed watchstanders to ensure that an experienced mate was on the bridge at that time, but he did not take them.

The Safety Board examined the company to determine what role, if any, it played in the master's errors. Despite the company's implementation of a required safety management system for the *Empress of the North*, and despite the requirement to adhere to Federal regulations, the master did not follow critical aspects of either and did not establish on his vessel an ethos of compliance with all policies, rules, and regulations. The company should have been more aware before the accident of the actions of the master and the type of safety atmosphere that he had established.

At the time of the accident, company personnel were involved in multiple, major corporate activities. A senior vice president of marine operations had joined the company about 2 months before the accident, but he told investigators that most of his time was spent integrating the operations of the two separate companies that had formed Majestic America Line. Just before the accident, the company acquired Windstar Cruises, and he was also responsible for overseeing their operations as well. The company official told Safety Board investigators that the safety management system under which the *Empress of the North* operated needed to be enhanced and that he intended to strengthen it. He had not been able to begin that activity before the accident. Therefore, the Safety Board concludes that Majestic America Line did not effectively monitor the master's compliance with its policies and procedures.

Company management accomplished several activities before the accident to enhance safety. The company, in assigning a person to the required position of designated safety official, hired a full-time employee dedicated exclusively to overseeing the safety of its operations. As many other companies have done, it could have assigned the duties of this position as collateral duties to another

<sup>66</sup> M. R. Rosekind, "Fatigue in Transportation: Physiological, Performance, and Safety Issues," in National Transportation Safety Board, *Evaluation of U.S. Department of Transportation Efforts in the 1990s to Address Operator Fatigue*, Safety Report SR-99/01 (Washington, DC: NTSB, 1999).

company official. Before the accident, the individual accepted the offer of the position, but he was not scheduled to join the company until after the accident. In addition, while not required, the company sent the junior third mate to the *Empress of the North* a full week before he was scheduled to report for duty, to enable him to become familiar with the vessel and its operations. That action should have communicated to the master the company's intent to have the mate serve in a training capacity and not as a watchstanding officer until he had spent time observing vessel operations.

The deficiencies in the master's decision-making appear to result not so much from impairment but rather from a failure to assess the skills and abilities of the mariners he assigned to the watch. The master failed to fully assess the junior third mate's lack of knowledge about the vessel, the route, and the navigation display believing, as he told investigators, that the junior third mate's license was sufficient to qualify him to stand the watch. This was a flawed assumption. The master was responsible for ascertaining the junior third mate's readiness to serve as officer of the watch, a task that he did not perform effectively. The master also failed to articulate his expectations about the duties and responsibilities of the watchstanders on the midnight-to-0400 watch, apparently assuming that the junior third mate and helmsman understood their roles, duties, and responsibilities. However, by not articulating his expectations, he created a situation, as described above, in which each watchstander took on elements of the role, duties, and responsibilities of the other and which increased the likelihood that the watchstanding team would commit errors. Thus, the master's original error in not fully assessing the skills and abilities of the junior third mate was compounded by further errors of judgment.

### **Junior Third Mate's Actions**

As the officer on watch, the junior third mate failed to avoid a navigation hazard that was clearly marked on the *Empress of the North's* navigation chart and whose flashing green light both he and the helmsman had seen from less than a mile away. The charted rock was clearly marked and conspicuous, and both men on watch were aware of its location. The grounding therefore was the result of a gross navigation error.

The junior third mate had no previous watch experience as a licensed officer before joining Majestic America Line, having graduated from California Maritime Academy less than 3 weeks before the accident. Lacking information from an employment record, the Safety Board assessed the junior third mate's navigational knowledge and experience by visiting the maritime academy and examining his record. Transcripts of his grades and interviews with some of his instructors indicate that he was an average student who performed successfully both on actual vessels and on simulated vessel bridges.

To graduate from the academy and qualify for a Coast Guard third mate's license, the junior third mate was required to demonstrate mastery of fundamental navigation skills. Because the accident occurred so soon after his graduation, he is unlikely to have forgotten the fundamentals of basic navigation by the time he began work on the *Empress of the North*. The Safety Board therefore concludes that the junior third mate's failure to navigate the *Empress of the North* past Rocky Island did not result from deficiencies in his maritime training.

The officer in charge of the navigational watch is responsible for the safe navigation of a ship. Although the junior third mate assumed the navigation watch for the first time without supervision and without being properly prepared, as a trained and licensed officer he was not without knowledge of ships or of how a navigation watch should be conducted. His statement that he understood that he was on the bridge because he had a license and that the helmsman "would be in control of the boat" did not free him from his responsibility to safely navigate the *Empress of the North*.

As a licensed officer, the junior third mate was duty-bound to make certain that he understood his watch duties. He had about 12 hours' notice before the watch began. On his own, he could have used some of that time to acquaint himself with the navigation equipment and become thoroughly familiar with the chart and the geographical area he would be transiting, including lights, prominent points, and currents. For example, he might have consulted the *Coast Pilot* and discovered its warning about the inadvisability of passing between Point Couverden and Rocky Island because of the erratic currents there.

Once he assumed the watch, the junior third mate had a duty to take charge of the bridge. Instead, he allowed the helmsman to maneuver the vessel as he saw fit. Three minutes before the accident, the junior third mate gave his first indication of a maneuvering intention when he stated, "We'll pass inside of that," referring to the flashing green light on Rocky Island that he had just seen. (By "pass inside" he presumably meant pass between Rocky Island and Point Couverden.) The junior third mate had no experience with the ship and was in no position to judge how it would handle during an 80° turn while traveling at 12 knots at night.

Newly licensed third officers will often find themselves on a ship they have never sailed on, in an unfamiliar waterway they have never transited before, and in the company of a master and crew they have never served with before. These circumstances do not, however, absolve them of their responsibility to take charge as the officer of the watch when so assigned. Junior officers are also responsible for speaking up to their supervisors about any apprehension or uneasiness they might feel regarding their assigned duties. The junior third officer told investigators that he felt "comfortable" about assuming the watch. His expressed confidence, despite his lack of knowledge about the route, the vessel, the bridge equipment, and the bridge routine, suggests that he did not fully appreciate his duties and responsibilities and what was required to fulfill them. The Safety Board

therefore concludes that the junior third mate failed to understand and fulfill his responsibilities as a licensed officer on an underway navigation watch.

The *Empress of the North* accident demonstrates that newly licensed third mates can be placed in situations for which they are unprepared. It is, however, incumbent on all licensed officers to thoroughly understand what is expected of them and to assess their ability to perform a task before they undertake it. The Safety Board therefore concludes that maritime academy cadets would benefit from learning about the circumstances of this accident, particularly their responsibility as newly licensed officers to prepare themselves for assigned duties and to express their concerns if placed in situations for which they are unprepared. Consequently, the Safety Board believes that the state and Federal maritime academies should teach their students the circumstances of this accident, including their responsibility as newly licensed officers to prepare themselves for assigned duties and to express their concerns if placed in situations for which they are unprepared.

## Watchkeeping Procedures

Companies, masters, and crewmembers share a responsibility for assuring the safe operation of a ship. Specifically, the company is responsible for setting forth policies and procedures that provide safeguards against damage (to property and the environment), injury, and loss of life; and masters and crewmembers are responsible for following those policies and procedures. The master of a ship must make watchkeeping arrangements that are adequate for maintaining a safe navigation watch, and officers of the watch are responsible for safely navigating the ship while they are on duty. International standards, such as those of the STCW convention and the ISM code, were established to promote safe watchkeeping practices and safe ship management.

Majestic America Line was required to comply with international standards because one of its vessels, the *Empress of the North*, traveled in international waters. The company's safety management system had been audited and approved by an external auditor as containing all the elements required by the ISM code. The safety management system was documented in an office safety manual and a manual of fleet instructions. Investigators examined those documents and compared the documents' prescribed watchkeeping practices with actions taken, or not taken, before and during the accident voyage. Investigators found several deviations from sound watchkeeping practice, as described in the following paragraphs.

**Inadequate Voyage Plan.** The fleet instructions for the *Empress of the North* required the master to prepare an approved voyage plan. The voyage plan provided to the officers on watch for the night of the accident was basically an itinerary for the sightseeing cruise, with minimal indications of crew duties such as "test gear" and "security before underway." Other items consisted of locations on the route and activities such as whalewatching.

The first entry for the accident day is “Security call for rounding Rocky Is, west bound,” at Point Couverden. The word “rounding” is the only indication to the watch officer of how to approach Rocky Island. “Rounding” is ambiguous and requires interpretation. If the intended meaning was “go around, not through the passage between the mainland and Rocky Island,” it was not stated clearly enough for purposes of safe navigation.

For safety at sea, a voyage plan should lay out the entire route from dock to dock. Positions along the vessel’s track should be indicated, especially dangers or areas to be avoided. The appropriate navigation charts should be indicated and when to change from one chart to another. Call-in points should be indicated, along with the appropriate calling channel or frequency. Tides and currents specific to the track should be indicated, including speed and direction. Aids to navigation, such as the navigation light on Rocky Island, should be listed and described (color, light, frequency). Local information from the *Coast Pilot* should also be noted on the plan. If, for example, a voyage plan had been available that contained the information found in the *Coast Pilot* (“As currents are erratic in the channel between Rocky Island and Point Couverden, the slight saving in distance this channel offers does not warrant its use”), the junior third mate would have been warned not to attempt to pass north of Rocky Island.

**Lack of Night Orders.** The midnight-to-0400 watch is the most unsupervised watch of the day (because the master and all crewmembers but the watchstanders are asleep). The master wrote no night orders for the night of the accident. According to the company’s fleet instructions, night orders were optional. However, had the master issued them, the night orders could have given instructions on the course to follow until the next morning, when the master would have been available to supervise operations. Limits on speed, steering instructions, when to remain in autopilot and when to shift to manual steering, how to meet or overtake other vessels, and navigational hazards (such as Rocky Island) should have been part of the orders. Especially for a newly hired officer standing his first watch, providing specific, written information about the route and its hazards should not have been considered optional.

**Nonessential Persons on Navigation Bridge.** According to Coast Guard regulations at 46 CFR 78.10, persons who are not involved in navigation are not allowed on the bridge while a vessel is under way. The bridge watch standing orders for the *Empress of the North* reinforced that rule. Nevertheless, the VDR bridge recording shows that during the 20 minutes in which the bridge watch was changing from the second mate to the junior third mate, seven other crewmembers were either coming on or going off watch, including two crewmembers who had no duties on the bridge.

The two crewmembers not assigned to the bridge arrived there at 2334 and engaged in social conversation for 10 minutes, during which time the VDR recorded almost no interaction between the watch officers. Thus, of the 20 minutes available to exchange important information during the watch change, half was taken up

with extraneous conversation. The only exchange recorded by the VDR during the watch change was vessel position and track, when to take fixes, vessel speed, and at the end, the second mate's room number in case the junior third mate needed to call him. The presence on the bridge of crewmembers not engaged in vessel navigation was an unnecessary distraction to the officers engaged in the watch turnover and could easily have interfered with their exchange of information.

**Inappropriate Radar Setting.** According to VDR data, the 3-centimeter radar on the *Empress of the North* was set to the 6-mile scale during the entire voyage. The company's fleet instructions for using radar were to "select an appropriate range scale and ensure that plotting or systematic analysis is commenced in ample time." The navigable water between Rocky Island and Point Couverden is less than 0.5 mile wide. Though the rocks bounding the navigable water between Rocky Island and Point Couverden are visible in daylight because of the water washing against them, they might not be visible on radar at night, especially at the 6-mile scale. A lower setting on the range scale, such as 1 or 2 miles, would have shown more detail on and around Rocky Island and been more useful to the bridge team in assessing their progress through the turn.

In addition, the bridge team failed to use radar aids that might have prevented the accident. If, for example, they had used the ARPA to acquire Rocky Island, they could have obtained information about the nearness of the vessel to the rocks and therefore about the risk of collision. Further, a predesignated distance alarm set to a predetermined safety zone around Rocky Island could have warned the bridge team that the vessel was entering that zone and given the team time to take evasive action.

**Inadequate Lookout.** The watchstanding requirements in the *Empress of the North* fleet instructions state: "the Watch Officer should ensure . . . an alert all-round visual and aural lookout." The AB and deckhand who shared the lookout duty on the midnight-to-0400 watch had left the bridge at 0100 to conduct security rounds that lasted 30 to 40 minutes. Thus, no lookout was on the bridge while the junior third mate and helmsman were navigating the turn into Icy Strait. The helmsman was helping the junior third mate with his watch duties and explaining the steering system while adjusting the steering to come around to the vessel's course into Icy Strait. The STCW code states that the "duties of the lookout and helmsperson are separate and the helmsperson shall not be considered to be the lookout while steering" except on small ships and when there is "no impediment to the keeping of a proper lookout."

The watchstanders had to act as their own lookouts after the AB and deckhand went below. Shortly before the vessel struck the rocks, the junior third mate lost sight of the flashing green light on Rocky Island. If a lookout had been on the bridge, the lookout could have been monitoring the bearing of the light on Rocky Island as the *Empress of the North* approached. The light was flashing every 4 seconds. As the ship turned to starboard, its bearing to the light would have

changed. A lookout could have kept the light in sight and warned the bridge team that they were headed straight for Rocky Island.

**Conclusion.** In light of the inadequacies detailed above, the Safety Board concludes that the safety of the *Empress of the North* and all those on board was jeopardized by the failure of the master and watchstanders to follow sound watchkeeping practices, as contained in the STCW code and the company's safety management system. Since the accident, Majestic America Line has completely overhauled its safety management system and has provided the Safety Board with documentation of many improvements to its vessel operations, as described earlier in the "Majestic America Line Actions Since the Accident" section. The new guidelines require masters to prepare a voyage plan, for example, and provide extensive checklists to verify that required tasks are accomplished. The Safety Board considers that the company's actions have substantially improved the safety of its vessels, crews, and passengers and proposes no further action on this issue. The company discharged both the master and the junior third mate after the accident.

That the *Empress of the North* grounding caused no injuries was extremely fortunate, considering that the accident happened in the middle of the night in a remote area where the cold water would have posed a danger to persons entering it. As detailed above, the Safety Board's investigation identified numerous violations of sound seamanship during the accident voyage, such as failing to keep an adequate lookout and allowing unauthorized persons on the bridge. Although Majestic America Line took action after the accident to prevent such unsafe practices, it is possible that safety shortcomings might exist in the operations of other U.S. passenger vessel companies, particularly because not all passenger vessels are required to have safety management systems. Consequently, the Safety Board is concerned that, despite the obvious errors identified in this accident, experienced mariners employed by other passenger vessel companies might commit similar violations of good seamanship. The Board therefore concludes that other passenger vessel operators might benefit from learning about the circumstances of the *Empress of the North* accident, particularly the need for masters to verify that officers on watch are familiar with a vessel's route, handling characteristics, and bridge equipment. Consequently, the Board believes that the Passenger Vessel Association should, through its website, publications, and conferences, inform its members about the circumstances of this accident, including the need for masters to verify that officers of the navigation watch are familiar with a vessel's route, handling characteristics, and bridge equipment.

## Documentation Deficiencies

The Safety Board's investigation found deficiencies in the documentation of the *Empress of the North* and its crew with regard to both Federal and international regulations.

### *Crew Certification*

The vessel's COI, issued by the Coast Guard, required all deck officers to meet the requirements of first-class pilot on both designated and nondesignated pilotage waters. Coast Guard regulations allow crewmembers to serve as pilots if (1) they hold a Federal first-class pilot's license with endorsement for the route, in accordance with 46 CFR 15.812(b)(1), or (2) they qualify as an "acting as" pilot, that is, if they are licensed and are at least 21 years old, maintain a current knowledge of the waters to be navigated (one round trip within the past 60 months), and have four round trips on the route, with at least one round trip in darkness if the route is to be traversed at night.

The vessel's safety management documents stated that the master was responsible for ensuring that his vessel was manned in accordance with its COI. All the deck officers on the *Empress of the North* held valid Coast Guard licenses as masters or mates. However, none held a Federal first-class pilot's license valid for the accident route (the master and senior third mate held first-class pilot's licenses valid in Washington state). The senior third mate and the second mate had both joined the company recently and had not yet made their first round-trip on the accident route. The master and chief mate were therefore the only officers who had sufficient experience on the route to satisfy the vessel's pilotage requirement.

Although the junior third mate assigned to stand watch at the time of the accident was a licensed deck officer, he did not hold a Federal first-class pilot's license or meet the requirements of a self-certified pilot because he had no current knowledge of the waters and had not been on any round trips on the route, in daylight or in darkness. The Safety Board therefore concludes that the junior third mate was not qualified to stand watch on the accident route because he did not hold a Federal pilot's license or meet the requirements of a self-certified pilot. Further, the chief mate and the master were the only officers qualified to stand watch at the time of the accident.

### *Vessel Certification*

Majestic America Line was required to hold a valid document of compliance and a safety management certificate as evidence of compliance with the ISM code. At the *Empress of the North's* last annual inspection, the Coast Guard determined that the vessel's documentation was in order. The Coast Guard inspectors failed to notice, however, that the company's document of compliance was not valid (because it had not received the required annual verifications), which meant that the *Empress of the North's* safety management certificate was also out of compliance. Vessels that are required to comply with the ISM code may not sail if the company lacks a valid document of compliance. The Safety Board therefore concludes that the Coast Guard failed to identify critical deficiencies in the *Empress of the North's* documentation during the vessel's 2007 annual inspection.

After the accident, the company received a valid interim document of compliance (May 30, 2007) and a valid interim safety management certificate (June 30, 2007) from the American Bureau of Shipping, for use during its 2007 season. In March 2008, the company obtained another valid interim document of compliance and another valid interim safety management certificate from the American Bureau of Shipping. As noted in the "Coast Guard Actions Since the Accident" section, officials from Sector Portland have taken a number of measures, such as increasing inspector training, reevaluating inspection checklists, and instituting advance preparation for inspections, designed to prevent vessel inspectors from overlooking vessel documentation deficiencies in the future. In addition, Coast Guard headquarters has arranged for the American Bureau of Shipping to inform it when an ISM document becomes invalid, after which the appropriate OCMI will be notified for action. The Coast Guard is also seeking similar agreements with the other classification societies that issue ISM documents to U.S. vessels. The Safety Board considers that those measures have addressed the identified safety issue and proposes no further action.

A manufacturer's representative was inspecting the *Empress of the North's* VDR on the same day (February 17) that the Coast Guard conducted its 2007 annual inspection. Although the VDR inspection report noted deficiencies, a certificate of compliance for the VDR was signed the next day. The Coast Guard would not have had either the VDR inspection report or the certificate of compliance to inspect on February 17, and therefore cannot be said to have overlooked the noncompliant VDR (which would not in any case have prevented the vessel from sailing).

## Survival Factors

### *Emergency Response*

Immediately after the *Empress of the North* struck Rocky Island, the master went to the bridge and took control, waking the crew, alerting the Coast Guard to the emergency, and waking the passengers and instructing them to dress and go with their lifejackets to their muster stations. Crewmembers checked all cabins to make sure that no passengers remained inside, and passengers were accounted for when they arrived at their muster stations. The master deployed the vessel's liferafts when he learned that the belowdecks spaces were flooding, an appropriate precaution (even though the liferafts were not used in the emergency) in case it had become necessary to abandon ship, particularly if other vessels had not been in the area to assist. The engineering crew monitored the vessel for flooding, pumped out flooded spaces, and periodically updated the bridge on the status of their efforts.

The master contacted other vessels in the vicinity of the accident, and those masters agreed to help evacuate passengers from the cruise ship. The good Samaritan vessels included two fishing vessels, a small passenger vessel, and

a towing vessel. Although the master had ordered the liferafts to be launched, he told investigators that he wanted to avoid using them because of the elderly people on board. Even though the *Empress of the North* was flooding, it was a safer platform than the liferafts, especially in a remote area where the water temperature was 40° F or less and where anyone who entered the water would have suffered cold water immersion injuries, loss of breath control, and possibly death.<sup>67</sup> Using the liferafts would have required passengers to slide down the evacuation slides (which in any case did not deploy properly) and climb into the liferafts, a hazardous activity for anyone, but especially for the elderly or incapacitated (four passengers were wheelchair-bound and five needed help walking).

All the responding vessels interrupted their normal work to assist the vessel in need. The first responding vessel, one of the fishing boats, arrived on scene within an hour of the grounding, and the second arrived about a half-hour after that. The calm seas and winds were ideal for an evacuation. The good Samaritan vessels provided a stable platform for the evacuees, who either walked directly onto the vessels or used the *Empress of the North's* gangways. All passengers and nonessential crewmembers were safely evacuated within 4 hours of the grounding.

The Coast Guard began coordinating the emergency response immediately after receiving word of the accident. Within 5 minutes, the Coast Guard had alerted helicopters in Sitka and issued an urgent marine information broadcast. Within 10 minutes, the Coast Guard cutter *Liberty* was tasked with responding to the accident and was under way within the hour. The Coast Guard eventually determined to transfer all evacuated passengers and crewmembers to an Alaska Marine Highway System ferry that had diverted to the scene after hearing the urgent marine information broadcast.

The Coast Guard organized its response according to the incident command system, working closely with the city of Juneau. The area's emergency response plan had identified a cruise ship disaster as a worst-case scenario and had laid out specific steps, including checklists. The Coast Guard oversaw the transporting of passengers back to Juneau, while the city prepared for their arrival, arranging for medical personnel to meet the passengers when they docked at Auke Bay and organizing shelter. The Coast Guard relayed the names of passengers to the command center as they were evacuated and checked the names against the passenger manifest at several stages.

In the end, all 206 passengers and 46 nonessential crewmembers were safely evacuated from the *Empress of the North* and transported back to port, and no one was injured. The Safety Board therefore concludes that the response to the

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<sup>67</sup> Research into survivability in cold water has found that the critical water temperature in incidents of cold water immersion is 59° F and that entry into water below that temperature "should be avoided" (Transport Canada, *Survival in Cold Waters: Staying Alive*, report TP13822E, Ottawa, Ontario: 2003). As described in the study, cold shock (a large gasp followed by hyperventilation and greatly increased heart rate and blood pressure) occurs during the first 2 to 3 minutes of immersion in water below 59° F; death from hypothermia can occur after 30 minutes of immersion.

emergency by all those involved – the vessel’s crew, the master, the good Samaritan vessels, the Coast Guard, and the city of Juneau – was timely and effective.

### *Lifesaving Equipment*

**Liferafts.** When crewmembers attempted to launch the vessel’s 12 inflatable liferafts, half the hydrostatic release units malfunctioned, forcing the crew to cut the lines with knives to launch the rafts. The investigation revealed that the pistons on the pumps that were connected to the hydrostatic release units had not been lubricated every other year, as directed by the manufacturer. The company’s port engineer told the Coast Guard that 20 of the 22 manual release units had been on board the *Empress of the North* for over 2 years but had never been lubricated. The Safety Board therefore concludes that the company’s failure to properly maintain the vessel’s liferafts caused some of the remote-release units for the rafts to malfunction.

The preventive maintenance documents the company prepared after the accident contain specific criteria for lubricating the Hammar remote-release pump units at least every 2 years. In September 2007, the Coast Guard issued Marine Safety Alert 4-07 regarding the Hammar remote-release pump units and stressing their maintenance schedule. The Safety Board considers that these measures should remedy the identified safety issue and plans no further action.

**Evacuation Slides.** The chief mate told investigators that the evacuation slides carried on the *Empress of the North* did not inflate properly when they were deployed after the accident. He described the inflated slides as inverted and folded against the side of the ship. On July 5, 2007, the Safety Board issued an urgent safety recommendation to the Coast Guard concerning the incorrect deployment of the evacuation slides:

M-07-10

Conduct a one-time inspection and correction of all deficiencies of evacuation slides last serviced by Marine Safety Services of Seattle, Washington. (Urgent)

In its response to Safety Recommendation M-07-10, the Coast Guard stated that inspectors who visited the service company, Marine Safety Services, after the accident had determined that “it would be extremely difficult to pack the slides incorrectly” without modifying the valises and that “[a]ny incorrect folding or orientation would likely make the slide impossible to deploy in any direction.” The Coast Guard concluded that Marine Safety Services had serviced the slides correctly and that crewmembers had most likely “placed the valises upside down on the deck,” causing them to deploy incorrectly.

As described in the “Tests and Research” section, after receiving the Coast Guard’s response, investigators visited both Marine Safety Services and DBC

Marine Safety Systems, the manufacturer of the equipment, to test the evacuation slides. The investigators simulated the scenario the Coast Guard had posited as most likely, that is, that the valises holding the slides had been placed upside-down on the deck. In that position, the stenciled instructions for positioning and inflating the slide, as well as the inflation cord, would have been on the bottom of the valise and therefore not visible to crewmembers. The chief mate told investigators that he could see the stenciled instructions on the valises when the crewmembers installed them on the deck. Further, inflating the slides would have been difficult if the valises were upside-down, because crewmembers would have had to lift the 60-pound gas cylinder to reach the inflation cord. It is thus unlikely that the crew placed the valises upside-down on the deck of the *Empress of the North*.

On July 12, 2007, DBC Marine Safety Systems issued a service bulletin that instructed servicing facilities to mark the tops of the valises containing the evacuation slides THIS SIDE UP and the bottoms TURN OVER. The company also prepared stencils to label the insides of the valises so that technicians could readily determine the correct orientation of the valises when packing the evacuation slides. The Safety Board judges that the company's actions should eliminate any confusion about packing the valises or positioning them on deck and proposes no further action on this issue.

Investigators also examined the two other possible ways the valises containing the evacuation slides could have been placed on deck. In tests with the valise placed right side up but backward (with the outboard arrow pointing inboard), the slide inflated upward and folded back against the test platform. On a vessel, the inflated slide would have blocked the exit. The chief mate identified a diagram, created by DBC Marine Safety Systems during the postaccident tests, in which a slide was inverted and folded back against the outside of the ship, thereby blocking the embarkation area, as matching the way the slides malfunctioned on the *Empress of the North*.

Although it is possible that in the excitement after the accident the crew might have secured the valises backward on the deck, it is unlikely that after the first slide inflated upside-down the crew would have repeated the mistake. The chief mate told investigators that after the first slide inflated incorrectly, he examined the second slide's position and had crewmembers check the position of the arrows. The chief mate also said that this was not the first time he had used the slides and that the valises were installed on deck as a part of regular crew training. The instructions on the valises were clear and concise: one arrow pointed outboard, the other pointed inboard, making it unlikely that the crew placed the valises backward on the deck.

If the valises had been positioned correctly on deck, the slides could have inflated incorrectly only if the valises were mislabeled or the slides were packed incorrectly into the valises. Investigators examined a valise from the *Empress of the North* taken after the accident and determined that it was properly labeled.

Investigators discussed the possibility of a packing error with the manufacturer and determined that the most likely error would have been to fold the slide correctly but place it in the top half of the valise instead of the bottom. Investigators determined that a slide packed upside-down would inflate upside-down, and that there would be no visible indications that the slide had been packed incorrectly. The Safety Board therefore concludes that the most likely reason the vessel's evacuation slides did not inflate properly was that the service company had packed them into the wrong side of their valises.

The Coast Guard concluded after its inspectors visited Marine Safety Services that the valises had probably been placed upside-down on the deck of the *Empress of the North*. Although the Safety Board's analysis disagrees with the Coast Guard's conclusion, DBC Marine Safety Systems's subsequent service bulletin should prevent any misunderstandings about the correct positioning of the valises on deck, and the instructions stenciled on the inside of the valises should prevent misunderstandings about how to pack the evacuation slides into them. The Board therefore classifies Safety Recommendation M-07-10 as "Closed – Acceptable Alternate Action."

Fortunately, because other vessels were nearby to assist, neither the malfunctioning liferafts nor the malfunctioning evacuation slides were needed to evacuate passengers and crewmembers from the damaged *Empress of the North*. However, if the vessel had been in danger of sinking or if it had been necessary for another reason to abandon ship, the malfunctioning equipment could have endangered all those on board. In an emergency, time is critical. In the aftermath of the *Empress of the North* grounding, crewmembers lost valuable time in attempting to operate the liferaft releases and then in cutting the liferafts loose. Furthermore, the deckhands spent about 30 minutes trying to deploy the evacuation slides. If the ship had been sinking, that time could have meant the difference between life and death for those on board. The Safety Board therefore concludes that the malfunctioning liferaft release units and evacuation slides on the *Empress of the North* could have endangered the lives of those on board if other vessels had not been in the vicinity to help evacuate the damaged ship.

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## CONCLUSIONS

### Findings

1. The following were not causal to the accident: weather (including visibility, wind, sea, and current); aids to navigation; vessel propulsion and steering systems; use of alcohol or illegal drugs; watchstander fatigue.
2. The *Empress of the North* bridge team was attempting to negotiate an 80° turn at Rocky Island, a charted navigation hazard, but the vessel's rate of turn was insufficient to prevent it from grounding on the rocks.
3. The master jeopardized the vessel's safety by allowing the junior third mate to stand a bridge watch before he was familiar with the route and the bridge equipment.
4. The master's watch assignment created a poorly functioning bridge team in which an inexperienced officer in charge (the junior third mate) did not exercise authority and an experienced subordinate (the helmsman) exceeded his authority.
5. Majestic America Line did not effectively monitor the master's compliance with its policies and procedures.
6. The junior third mate's failure to navigate the *Empress of the North* past Rocky Island did not result from deficiencies in his maritime training.
7. The junior third mate failed to understand and fulfill his responsibilities as a licensed officer on an underway navigation watch.
8. Maritime academy cadets would benefit from learning about the circumstances of this accident, particularly their responsibility as newly licensed officers to prepare themselves for assigned duties and to express their concerns if placed in situations for which they are unprepared.
9. The safety of the *Empress of the North* and all those on board was jeopardized by the failure of the master and watchstanders to follow sound watchkeeping practices, as contained in the Seafarer's Training, Certification, and Watchkeeping code and the company's safety management system.
10. Other passenger vessel operators might benefit from learning about the circumstances of the *Empress of the North* accident, particularly the need for

masters to verify that officers on watch are familiar with a vessel's route, handling characteristics, and bridge equipment.

11. The junior third mate was not qualified to stand watch on the accident route because he did not hold a Federal pilot's license or meet the requirements of a self-certified pilot. Further, the chief mate and the master were the only officers qualified to stand watch at the time of the accident.
12. The Coast Guard failed to identify critical deficiencies in the *Empress of the North's* documentation during the vessel's 2007 annual inspection.
13. The response to the emergency by all those involved – the vessel's crew, the master, the good Samaritan vessels, the Coast Guard, and the city of Juneau – was timely and effective.
14. The company's failure to properly maintain the vessel's liferafts caused some of the remote-release units for the rafts to malfunction.
15. The most likely reason the vessel's evacuation slides did not inflate properly was that the service company had packed them into the wrong side of their valises.
16. The malfunctioning liferaft release units and evacuation slides on the *Empress of the North* could have endangered the lives of those on board if other vessels had not been in the vicinity to help evacuate the damaged ship.

## Probable Cause

The National Transportation Safety Board determines that the probable cause of the grounding of the *Empress of the North* was the failure of the officer of the watch and the helmsman to navigate the turn at Rocky Island, which resulted from the master's decision to assign to the midnight-to-0400 watch an inexperienced, newly licensed deck officer who was not familiar with the route, the vessel's handling characteristics, or the equipment on the vessel's bridge.

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## RECOMMENDATIONS

### New Recommendations

As a result of its investigation of the *Empress of the North* accident, the National Transportation Safety Board makes the following safety recommendations.

#### To the State and Federal Maritime Academies:

Teach your students the circumstances of this accident, including their responsibility as newly licensed officers to prepare themselves for assigned duties and to express their concerns if placed in situations for which they are unprepared. (M-08-6)

#### To the Passenger Vessel Association:

Through your website, publications, and conferences, inform your members about the circumstances of this accident, including the need for masters to verify that officers of the navigation watch are familiar with a vessel's route, handling characteristics, and bridge equipment. (M-08-7)

### Previously Issued Recommendation Resulting From This Accident Investigation

#### To the U.S. Coast Guard:

##### M-07-9

Verify the functionality of Hammar model H20 remote-release units for liferafts by inspecting or delegating the inspection of a sample of the models, requiring authorized facilities to demonstrate functionality, or other equally effective method. (Urgent)

Safety Recommendation M-07-9 was classified as "Closed—Acceptable Alternate Action" on April 23, 2008.

## Previously Issued Recommendation Classified in This Report

To the U.S. Coast Guard:

M-07-10

Conduct a one-time inspection and correction of all deficiencies of evacuation slides last serviced by Marine Safety Services of Seattle, Washington. (Urgent)

Safety Recommendation M-07-10 (previously classified as “Open—Acceptable Response”) is classified as “Closed—Acceptable Alternate Action” in the “Survival Factors” section of this report’s analysis.

## BY THE NATIONAL TRANSPORTATION SAFETY BOARD

**MARK V. ROSENKER**  
Acting Chairman

**DEBORAH A. P. HERSMAN**  
Member

**ROBERT L. SUMWALT**  
Member

**KATHRYN O’LEARY HIGGINS**  
Member

**STEVEN R. CHEALANDER**  
Member

**Adopted: November 4, 2008**

Member Sumwalt filed the following concurring statement on July 29, 2008, and was joined by Member Hersman.

**Member Sumwalt, Concurring:**

The written report of this accident does a fine job of describing the crew errors that led to the accident. However, as Dr. James Reason<sup>68</sup> has established, an examination of human error should assess the actions and decisions of the managers and designers at least as much, if not more, than the actions of the system operators.

As I read the errors of those on board the ship, I could not help wondering how (or if) their inappropriate actions may have been influenced by organizational factors. I believe the draft report, even as revised by staff, did not fully address these issues.

As discussed during the board meeting, Majestic America Line did not have in place several components associated with a healthy safety culture. For example, the company did not employ adequate controls to ensure that the *Empress of the North* was seaworthy when it sailed. This lack of oversight enabled the *Empress of the North* to be out of compliance with its annual verification for almost an entire year. As a result, the vessel's document of compliance was invalid, along with its safety management certificate and thus, its Safety Management System (SMS). The company also failed to ensure that the vessel received internal and external audits and did not adequately perform risk assessments, which are all requirements of SMS.

During the board meeting, a member of staff acknowledged that the company did have shortcomings in its safety processes, but staff was unable to establish a definitive link between the company's poor safety performance and the crew's performance. I accept their findings but wish to comment on the direction of the investigation and reporting process. Although the linkage between the company's and the crew's performance could not be determined in this accident, I believe the quality of the report could have been strengthened by documenting these factors as part of our investigation. The Safety Board has the reputation for doing thorough investigations. In order to maintain that reputation we must not only consider and investigate these factors; we must document our work as well.

My hope is that this important part of the investigation be fully discussed in future reports brought to the board and that documentation of organizational factors will become the norm. Such discussions should not be delayed until a board meeting. It is critical that we investigate these factors, even if we end up ruling them out.

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<sup>68</sup> Reason, James (1997). *Managing the Risks of Organizational Accidents*. Burlington: Ashgate Publishing Company.

Most accidents have organizational roots; if we don't at least look for these underlying causes, it is likely we will not find them. As stated in the Columbia Space Shuttle Accident Investigation Report<sup>69</sup>:

Many accident investigations make the same mistake in defining causes. They identify the widget that broke or malfunctioned, then locate the person most closely connected with the technical failure: the engineer who miscalculated an analysis, the operator who missed signals or pulled the wrong switches, the supervisor who failed to listen, or the manager who made bad decisions. When causal chains are limited to technical flaws and individual failures, the ensuing responses aimed at preventing a similar event in the future are equally limited: they aim to fix the technical problem and replace or retrain the individual responsible. Such corrections lead to a misguided and potentially disastrous belief that the underlying problem has been solved.

In other words, if we focus our investigation on those individuals who committed the active error that led to the accident, we may be overlooking other systemic factors that caused the accident. In doing so, we miss valuable prevention opportunities which directly impacts our mission – preventing accidents.

Robert L. Sumwalt, III  
July 29, 2008

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<sup>69</sup> National Aeronautics and Space Administration (2003). Columbia Accident Investigation Board (CAIB) Report. vol. 1, Washington, DC.



## APPENDIX A

### Investigation

The National Transportation Safety Board was notified of the accident by U.S. Coast Guard headquarters at 0730 eastern daylight time on May 14, 2007 (2 hours after the accident). A four-member go-team launched at 1530 eastern daylight time on May 14 and arrived on scene in Juneau at 1800 Alaska daylight time the same day. The launch team consisted of specialists in engineering, deck operations, survival factors, and human performance. Board Member Kathryn O’Leary Higgins and her assistant traveled to the scene, as well as the acting deputy director of the Office of Marine Safety and a representative from the Board’s Office of Public Affairs. Also joining the team was an investigator from the Office of Investigations and Analysis at Coast Guard headquarters.

The investigators began their work on May 15. They interviewed crewmembers, company managers, and other personnel and obtained supporting documentation. On May 21, the investigator-in-charge and one other member of the investigative team traveled to Ketchikan, Alaska, where the *Empress of the North* was in drydock. After documenting the vessel’s underwater damage and obtaining more documents, the investigators concluded the on-scene investigation on May 24.

The Safety Board investigated the accident under the authority of the Independent Safety Board Act of 1974, according to the Board’s rules. The parties to the investigation were the Coast Guard and Majestic America Line.

## APPENDIX B

### Voyage Plan

#### EMPRESS OF THE NORTH

*2007 Alaska Itinerary*

**Day 3 – Monday**

**Glacier Bay/Pt Adolphus**

Time	Location/Comments
0330	<i>Security call for rounding Rocky Is, west bound Pt Couverden</i>
0545	Bartlett Cove. Pick up Rangers
0600- ?	Glacier Bay
1730	<i>Security call for east bound Icy Straits Underway, 144 NM to Sitka, 73 NM to Morris Reef, 112 to Sergius Narrows GPS Route: AK GBNP 2 Peril</i>
1900	Pt Adolphus <i>Whale Watching</i>
2030	Underway for Sitka <i>Max speed to Morris Reef then adjust for current at Sergius Narrows</i>
	<i>Security call for rounding Pt Augusta, east bound</i>
2200	The Sister
2300	Point Augusta

2007 Alaska Itinerary

Revised: 5/12/2007 C:\Documents and Settings\Owner\My Documents\2nd Mate\Voyage  
Planning\Itineraries\_Columbia River\_Alaska\2007\2007 Alaska.doc

## APPENDIX C

### Standing Orders

MAJESTIC AMERICA LINE -----FLEET INSTRUCTIONS		
Empress of the North		
Date Issued: 06/03/04	Date Revised: 06/03/04	Approved By: Randy Burns

#### STANDING ORDERS M/V EMPRESS of the NORTH

☞ OBSERVE THE RULES OF THE ROAD ☞

1. The orders below must be read by each watch officer before taking their first watch on the bridge. He/she must sign on the appropriate line indicating that he/she understands these orders.
2. When alone on the bridge you should keep in mind that the time to take action for the vessel's safety is while there is still time.
3. An officer should be on the bridge at all times when the vessel is underway.
4. Before relieving the watch, the relieving officer will sign the night orders, acquaint themselves with the vessel's position, course and speed, weather conditions, and any contacts visual or by radar and obtain any pertinent information the officer to be relieved may have to pass on.
5. As watch officer of this vessel you are, when on duty, expected to keep a good watch and see to it that your lookout does the same.
6. When visibility becomes poor or if you anticipate that visibility may become poor because of fog, mist, rain, snow, or any other reason, call me. In the meantime post lookouts, start Fog Signals, reduce speed to safe speed. If necessary, post one lookout on the bow with a radio for deck to bridge communication.
7. Be sure your lookout is thoroughly familiar with his/her duties, that they keep alert and that they listen as well as look out for other vessels and possible hazards. He/she is not to be assigned other duties. When your personnel are on lookout, they should be properly dressed for the weather. If the weather is inclement, keep the lookout on the bridge. A lookout protected from the weather will keep a better watch.
8. **CALL THE CAPTAIN ANY TIME WHEN IN DOUBT**, but do so in ample time - better too soon than too late. Make sure the vessel is safe. Call me if the weather starts to make up or you think it might be necessary to change course or slow down. Do not allow the vessel to pound the seas.
9. Give passing vessels a good berth in ample time. DO NOT try to bluff the other vessel out of their right of way. Let the other vessel know in plenty of time what you intend to do.
10. Whenever underway, the radar must be turned on. Do not wait till fog or any other cause to shut around you. If using the short range, be sure to switch to the long range and intermediate ranges periodically.
11. Whenever underway, take a fix at a minimum of once every hour (radar, gps, visual bearing) and log it in the underway deck logbook. Always verify a fix taken with one type of gear, with information from another source and confirm sounding on the chart with the ship's depth sounder. If there is discrepancy with regards to the ship's position or the observed depth, call me.
12. Check the course on the chart every time there is a change of course on your watch. Call the Captain immediately if there is an error or the course will lead the vessel into danger.
13. This vessel is to be put into hand steering at all times a Pilot has the con, when maneuvering through a bridge and it's supports, approaching or maneuvering in locks, when within 0.5 NM of another vessel in any situation, and when you, as the officer on watch, think it necessary.
14. Call the Captain if you experience an unexpected power, steering, or other equipment failure, or

MAJESTIC AMERICA LINE -----FLEET INSTRUCTIONS		
Empress of the North		
Date Issued: 06/03/04	Date Revised: 06/03/04	Approved By: Randy Burns

if the ship begins to drag anchor, or you see or hear any type of distress signal.

15. Give engineers a minimum of 15 minutes notice prior to maneuvering alongside if the bowthruster is required.
16. Always check steering and engine controls prior to getting underway and maintain an active watch on VHF radio channels 16,13 and any other locally applied traffic channels (as in 14 for locks).
17. Call the Captain when anchoring at night or in limited visibility. (ie. fog, rain snow).
18. If it becomes necessary to take the vessel outside the buoyed or charted channel due to ship traffic, call the Captain immediately. Other than to let large ship traffic pass, stay in the channel.
19. Keep all log books up to date while on watch. Entries in the radio log should be made by the operator in regards to a listening watch. Log all significant communications made on either VHF or SSB radios. This includes VTS check-in and out, Distress calls and all communications with any government agency.
20. Any significant change to the ship's itinerary ( ie. Change in the ship's destination or a significant change to the ship's departure or arrival time) must be approved by the Captain prior to any implementation of said plans.
21. A proper anchor watch is maintained by taking hourly observations of ranges prominent to landmarks, water depth and wind speed. Periodic observations should be taken in excess of hourly notations.
22. The officer of the watch is the Master's representative and as that representative, the safe navigation of the ship is his/her primary responsibility. He/she should at all times comply with applicable regulations for preventing a collision at sea. It is essential that the officer of the watch appreciate that the efficient performance of their duties is necessary in the interest of safety and life and property at sea and the prevention of pollution of the marine environment.
23. Please sign below indicating that you understand these standing orders, which will be supplemented by night orders each evening when the vessel is underway or at anchor when required. In signing you are also acknowledging that you have read and will comply with these guidelines. A copy of these Standing Orders is to be kept in the front cover of the logbook for reference.

_____	_____
MASTER	DATE
_____	_____
CHIEF MATE	DATE
_____	_____
SECOND MATE	DATE
_____	_____
THIRD MATE	DATE

FLEET INSTRUCTIONS OAS 12

## APPENDIX D

### Excerpt from Bridge Audio Recording

The reader is cautioned that the transcription of a voyage data recorder audio recording is not a precise science but is the best product possible from a Safety Board group investigative effort. The transcript or parts of it, if taken out of context, could be misleading. The transcript should be viewed as an accident investigation tool to be used in conjunction with other evidence gathered during the investigation. Conclusions or interpretations should not be made using the transcript as the sole source of information.

<b>2M</b>	Voice identified as second mate
<b>3M-1</b>	Voice identified as junior third mate
<b>3M-2</b>	Voice identified as senior third mate
<b>AB-1</b>	Voice identified as first AB (helmsman)
<b>AB-2</b>	Voice identified as second AB
<b>CPT</b>	Voice identified as captain (master)
<b>OS</b>	Voice identified as ordinary seaman
<b>CM</b>	Voice identified as chief mate
<b>CE</b>	Voice identified as chief engineer
<b>OIL</b>	Voice identified as oiler
<b>USCG</b>	Transmission from U. S. Coast Guard Sector Juneau
<b>ES</b>	Transmission from <i>Evening Star</i>
<b>PA</b>	Transmission made over vessel's public address system
<b>VHF</b>	Transmission made or received over VHF radio
<b>UHF</b>	Transmission made or received over crew's handheld emergency radios
<b>?</b>	Unidentified voice
<b>*</b>	Unintelligible word
<b>#</b>	Expletive
<b>@</b>	Nonpertinent word
<b>[ ]</b>	Editorial insertion

NOTE: Times are Alaska daylight saving time.

Generally, only radio transmissions to and from the accident vessel were transcribed.

Words shown with excess vowels, letters, or drawn-out syllables are a phonetic representation of the words as spoken. A nonpertinent word, where noted, refers to a word not directly related to the operation, control, or condition of the vessel.

**Bridge Audio Recording from 4 Minutes Before Accident Until 30 Minutes Afterward**

0126:24 AB-1	yeah. I'm kind of comin' on the inside of our turn here comin' around.
0126:27 3M-1	okay. **. flashing green ** yup there it is.
0126:43 AB-1	that is our flashing green isn't it?
0126:43 3M-1	yup.
0126:44 AB-1	way up there.
0126:48 3M-1	yeah broad on the starboard bow.
0126:52 3M-1	we'll pass inside of that.
0126:53 AB-1	yup.
0127:12 3M-1	are these depths? on there are those in feet or they in uh fathoms?
0127:19 AB-1	fathoms.
0127:20 3M-1	oh # got plenty of water.
0128:53 AB-1	comin' around fast enough you think?
0128:55 3M-1	yeah.
0129:06 3M-1	turn it down *.
0129:27 AB-1	I don't think so.
0129:28 3M-1	you don't think so?
0129:30 AB-1	no.
0129:44 AB-1	we should go on that side. whaddyou think?
0129:52 3M-1	yeah let's just steady up on this until we clear that light.
0129:58 3M-1	oh come left.
0129:59 AB-1	comin' left.

0130:02 3M-1	hard left.
0130:03 AB-1	hard left.
0130:07 3M-1	yeah we're real close. we better call the captain. we better call the captain.
0130:10 AB-1	oh #.
0130:11 3M-1	call the captain.
0130:13	[sound of impact]
0130:16	[sound similar multiple warning alarms from GE console]
0130:21 ?	want your radio.
0130:23 3M-1	oh God.
0130:25 ?	* captain *.
0130:29 ?	captain.
0130:29 ab-1	oh he knows he's comin'.
0130:30 CPT	what was that? what was that?
0130:30 ?	that was the rocks sir.
0130:32 CPT	the rocks.
0130:36 3M-1	** rocks.
0130:37 CPT	stop.
0130:38 AB-1	stop stop stop.
0130:45 CPT	we got to call the Coast Guard...hold it hold it here.
0130:46 ?	okay.
0130:47 CPT	hold it.
0130:56 UHF-?	report.
0130:59 ?	we just came inside the rocks.

0130:59 ?	*.
0131:00 ?	what do we do now?
0131:03 3M-1	did you take the thrust off?
0131:04 AB-1	yes the thrust is off.
0131:05 3M-1	okay.
0131:09 ?	station bill.
0131:10 ?	'kay.
0131:13 OS	you wanna like get some of these alarms?
0131:14 3M-1	no don't don't don't touch anything.
0131:18 OS	all right.
0131:23 ?	**.
0131:25 CPT	augh get my radio.
0131:30	[sound similar to bridge phone]
0131:31 ?	I don't like *.
0131:31 CPT	get my radio from the office.
0131:34 AB-1	got it.
0131:39 CPT	water in bilge void number one okay. we need to take uh take down a uh someone needs to start writing this down.
0131:50 ?	okay.
0131:52 CPT	what? can you start sounding tanks please right away. sound tanks right away.
0132:04 Crew PA- CPT	yeah crew all crew all crew this is an emergency this is an emergency I repeat this is an emergency. all crew members wake up get dressed wake up and get dressed...
0132:19 UHF-?	bridge deck bridge deck.
0132:24 UHF-CM	go from the bridge.

UHF-?	yeah we've got a breach in room nineteen.
0132:29 UHF-CM	roger that.
0132:29 Crew PA- CPT	...wake up get dressed and get your life jackets and come up to port side. wake up.
0132:30 CM	breach water's comin' in room nineteen.
0132:33 OS	cap I can't find the radio.
0132:35 CPT	its on my vest which could be in the uh thing.
0132:38 OS	all right.
0132:51 UHF-?	**.
0132:52 ?	**
0132:54 UHF-OIL	** I'm opening watertight number one.
0132:55 UHF-CE	negative.
0132:57 UHF-OIL	I'm opening watertight number one.
0133:02 UHF-?	Matt don't open it.
0133:08 VHF-CPT	pan pan pan pan pan.
0133:15 CPT	turn that down please.
0133:18 VHF-CPT	this is the Empress of the North. Empress of the North. we have an emergency aboard. an emergency aboard. we are— .
0133:26 ?	*.
0133:34 CPT	what's the name of this rock and where?
0133:35 ?	Coouverdeeran.
0133:37 CPT	its what?
0133:39 VHF- USCG	Empress of the North United States Coast Guard Sector Juneau what's your emergency over?

0133:43 VHF-CPT	Coast Guard Sector Juneau Empress of the North we have uh hit some rocks. we have uh holed our vessel. we have holed our vessel...our our position is fifty eight degrees one zero point four north one three five zero three point five minutes west.
0133:44 ?	[sound of unintelligible conversation]
0133:53 UHF-?	sounding deep * right now.
0134:14 VHF- USCG	Empress of the North Sector Juneau roger how many souls on board over?
0134:15 CPT	people on board?
0134:21 3M-1	uh two hundred eighty four uh two hundred eighty one.
0134:24 VHF-CPT	uh we have two hundred eighty one persons on board at this time two hundred eighty one persons on board. we are— we have holed our vessel we are taking on water.
0134:36 CPT	what's the name of this rock here?
0134:39 3M-1	Cour—.
0134:41 CPT	what?
0134:45 3M-1	Courvedeer— Cour— Courvedon Rock.
0134:45 CPT	Courvedon?
0134:46 3M-1	C-O-U—.
0134:49 VHF- USCG	Empress of the North Sector Juneau can I get description of your vessel over?
0134:53 ?	hundred miles *.
0134:51 VHF-CPT	description of the vessel is a three hundred sixty foot three hundred and sixty foot paddle-wheel vessel and uh we're white hull white hull with three decks over.
0135:00 UHF-?	chief mate.
0135:04 UHF-CM	go.
0135:15 3M-1	actually I think this might be Han— Hanus.
0135:18 UHF-CPT	'kay uh engineering bridge uh please continue sounding all tanks.

0135:24 VHF- USCG	Empress of the North Sector Juneau roger what's on scene weather over?
0135:29 CPT	on scene weather.
0135:37 CPT	is it raining is it what's going on?
0135:39	[bridge alarms are silenced]
0135:44 3M-2	little bit of rain. overcast.
0135:44 CPT	what's the wind and uhh?
0135:47	[sound similar to bridge phone]
0135:50 VHF-CPT	Sector Juneau we have zero wind we have uh drizzle and uh its calm outside. we have uh drizzle at this time. seas and swells are slight calm and a uh slight chop.
0136:03	[background music is silenced]
0136:18 CPT	okay so we have uh awww we got the crew up.
0136:26 ?	passengers are up too captain.
0136:27 VHF- USCG	Empress of the North Sector Juneau do you have any idea * or how much longer you'll have until you have to abandon over?
0136:35 VHF-CPT	negative we don't know at this time. we are showing an alarm in one bilge void in one bilge void. that's all we got so far. we are not listing we are cur— currently sounding tanks.
0136:21 UHF-CM	bridge chief mate.
0136:50 UHF-3M-2	chief mate bridge. chief mate bridge.
0137:01	[sound similar to fire system alarm lasting 10 seconds]
0137:01 UHF-CPT	chief mate go ahead.
0137:05 UHF-CM	yes captain chief mate here room one nineteen oh excuse me one nine uh there's air *. ** top side starboard side that area **.
0137:13 VHF- USCG	Empress of the North Sector Juneau roger ** stand by over.
0137:22 VHF-CPT	yeah roger we're standing by.

0137:22 CPT	yeah what room was he in?
0137:26 VHF-ES	Empress of the North Evening Star on sixteen do you copy?
0137:26 VHF-CPT	Evening Star Empress of the North.
0137:30 VHF-ES	roger I'm only five miles from your position. I see you * we are fifty-six foot fishing vessel would you like me to come by and stand by for an assist possibly.
0137:37 VHF-CPT	Evening Star Empress of the North roger please come by and stand by.
0137:44 VHF-ES	roger we're en route to your position should be about twenty-five minutes we'll be there.
1037:48 CPT	let's flip out er uh someone go up there on the deck and flip out all our lights our emergency lights.
0137:55 3M-2	* over here.
0137:59 CPT	yeah these.
0138:05 3M-2	captain.
0138:22 PA-CPT	ladies and gentlemen ladies and gentlemen. this is the captain we are on the bridge there has been an emergency on board at this time. please do not panic everything is okay ladies and gentlemen. we wanted to inform you that uh we have uh run aground and uh folks that uh we are sounding our tanks and doing everything we can *. please stand by for further instructions at this time please just stand by for further instructions.
0138:47 VHF-ES	Empress of the North Evening Star can I get your position one more time please?
0138:59 VHF-CPT	yeah Evening Star Empress of the North we are fif— five eight degrees one zero point two minutes north one three five three zero three one three five degrees zero three point zero six minutes west.
0139:24 CPT	what is the name of that rock? * the name of the rock.
0139:25 VHF-ES	roger that bottom number was one three five point zero three point one five correct?
0139:32 VHF-CPT	that is one three five degrees zero three point six minutes west.
0139:36 VHF-ES	roger we're en route.
0139:41 CPT	um the name of the rock on the bottom.
0139:44 3M-1	isn't it uhh Hanus Reef?

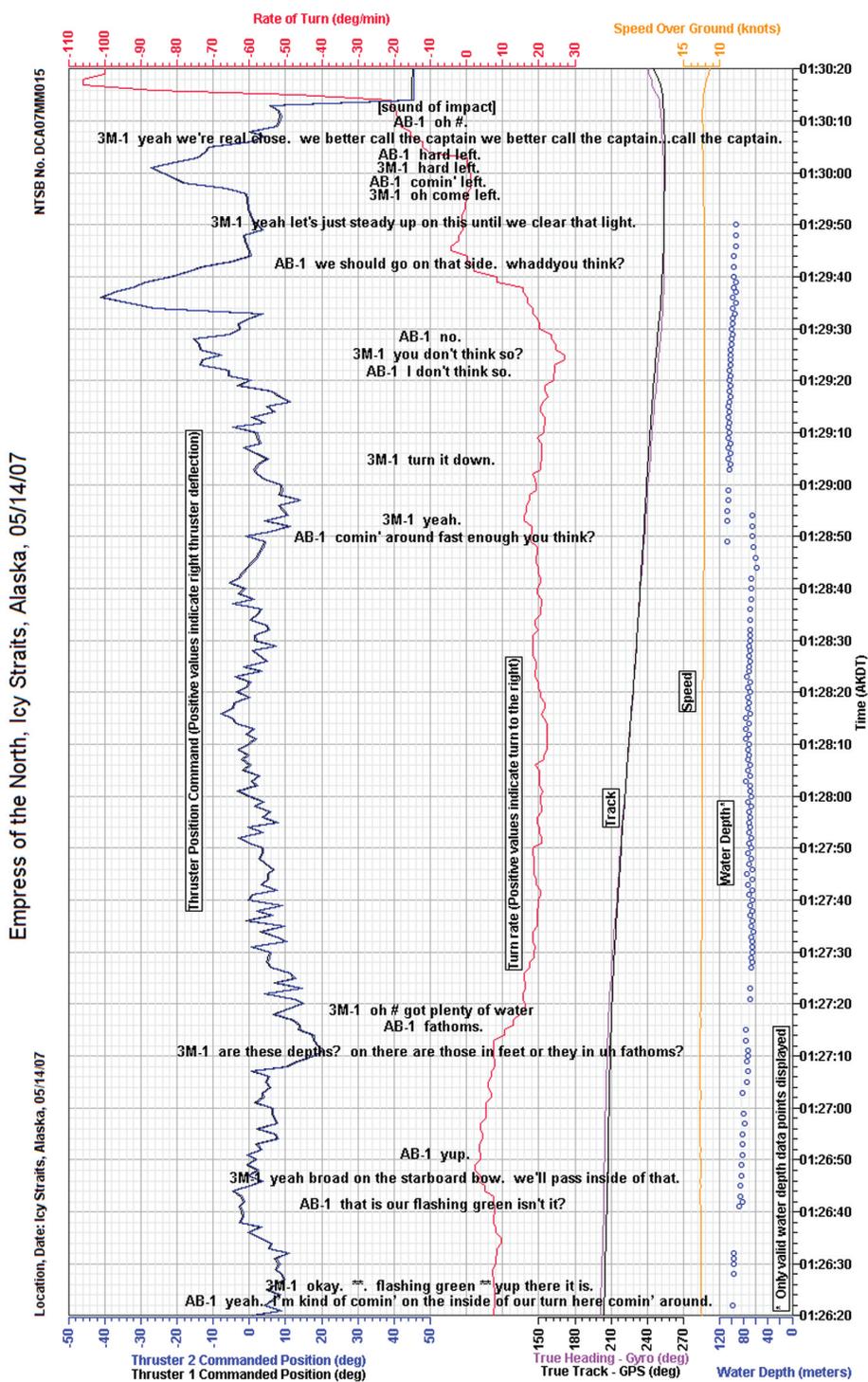
0139:45 CPT	Hanus?
0139:45 VHF- USCG	Empress of the North Sector Juneau can I get your geographical position over?
0139:47 3M-1	H-A-N-U-S reef.
0139:52 CPT	Hanus.
0139:59 VHF-CPT	Sector Juneau Empress of the North say again.
0140:02 VHF- USCG	Empress of the North Sector Juneau can I get your geographical position over?
0140:09 VHF-CPT	roger we're just south of Hanus Hanus Rock just south of Hanus Rock. that is what we uh came against over.
0140:22 CPT	man we are #.
0140:26 VHF- USCG	Empress of the North Sector Juneau uh can you spell that for me over?
0140:30 CPT	spell that for me.
0140:34 3M-1	H-A-N-U-S.
0140:39 VHF-CPT	roger that's H-A-N-U-S.
0140:41 CPT	its the bottom end of what's the island or that peninsula at the bottom down there? we're just—.
0140:48 VHF- USCG	Empress of the North Sector Juneau roger stand by.
0140:59 CPT	** Icy Straits at the bottom *.
0141:03 VHF- USCG	[sound of VHF-USCG pan pan announcement]
0141:08 CPT	okay so...we're gonna go for an evacuation *.
0141:13 ?	do you want the rafts launched?
0141:20 CPT	no nope not at this time. okay we're gonna go for an evacuation. I mean we muster the people into the—.

0141:27 2M	evacuation stations.
0141:30 CPT	we need to get ready to uh get ready to uh evacuate.
0141:35 3M-2	okay why don't we uh we need to pass the word captain. have them get dressed and get their life jackets.
0141:44 CPT	yeah.
0141:49 PA-CPT	attention on board the Empress of the North this is the captain on the bridge. I'd like to ask that all passengers all passengers will please get dressed at this time. I'd like to ask and this is a precaution at this point because we haven't uh done a full— haven't don't a full damage control on exactly what is going on. we are have Coast Guard and other rescue personnel en en route to assist us. I would like to ask you all to please put on your clothing and if you would to to collect your life jackets located inside your armoire and slowly and uh if you would please quietly work our way down to our muster stations. that there we're gonna make sure everyone is down there. please do this orderly and uh calmly work your way down to all those forward of the main stair tower go forward down the forward ladder outside ladder and into the showroom. all those aft of the main stair tower please move forward and down the uh stair tower and go in to the showroom er into the dining room. there you will be accounted for. ladies and gentlemen please help us do this safely and calmly we have plenty plenty of time ladies and gentlemen this is just a precaution.
0143:34 UHF-CPT	okay crew uh we're going to uh yeah.
0143:39 UHF-?	what was that?
0143:40 UHF-CPT	we're going to move into an evacuation. I want you all to start calmly helping people to the evacuation stations.
0143:51 3M-2	we're taking—.
0143:53 CPT	we're starting to list can we note that we're starting to list?
0144:05 VHF-CPT	yeah this is the Empress of the North back roger I turned the radio down I was making a making a uh announcements to our passengers. we have had all passengers all passengers have are getting dressed and are getting their life jackets and we are proceeding to our muster stations where we will account for all passengers over. Sector Juneau Empress of the North please be advised we are we are uh sounding tanks at this time. we are hearing we have definitely breached the hull we have water in some void areas. we are slowly starting to list.
0144:56 CPT	okay so uh ** okay so uh we need um we need ** emergency evacuation procedures * they're in our SMS. [stepped on by VHF communication] ...um we need to make sure—.
0145:45 ?	captain do you mind if we—.
0145:47 CPT	what's that? * all the deck lights on all the outside lights on there.

0152:00	[captain orders IBA and slide launched]
0157:03	[chief mate reports port side IBA launched]
0159:12	[captain orders rafts to be launched]
0201:16	[crew reports first raft in the water]

# APPENDIX E

## Vessel Data Recorded Immediately Before Accident



National Transportation Safety Board

Revised: 22 May 2008

## APPENDIX F

### Contents Pages from Company's New Safety Management Manual

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