National Transportation Safety Board

Marine Accident Brief

Contact of the Cruise Ship *Nippon Maru* with Mooring Dolphins

Accident type	Contact	**No.** DCA19FM012
Vessel name	*Nippon Maru*	
Location	Apra Harbor, Guam 13°27.50' N, 144°39.91' E	
Date	December 30, 2018	
Time	2113 Chamorro standard time (coordinated universal time + 10 hours)	
Injuries	None	
Property damage	Ship: $456,080 est., mooring dolphins: in excess of $500,000	
Environmental damage	None reported	
Weather	Clear skies, winds northeast at 10 knots, seas calm, air temperature 80°F, water temperature 83°F	
Waterway information	Apra Harbor is an enclosed harbor. The Outer Harbor to the west contains anchorages; the Inner Harbor to the south is a naval base. To the northeast, within the Cabras Island Channel, is the commercial port. Water depths range from about 40 feet in Cabras Island Channel to over 150 feet in the Outer Harbor.	

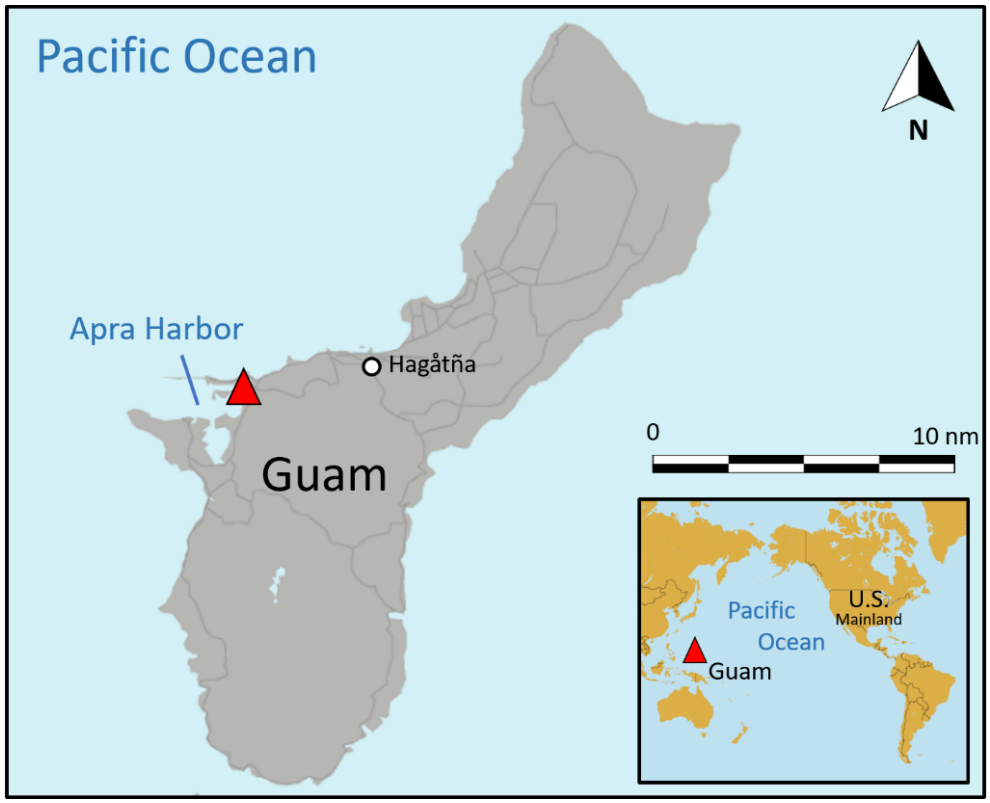
At 2113 local time on December 30, 2018, the stern of the passenger vessel *Nippon Maru* struck mooring dolphins at a US Navy fueling wharf in Apra Harbor, Guam, while the vessel was maneuvering in a turning basin after getting under way from the harbor's commercial port.[1] No pollution or injuries were reported. Damage to the vessel was estimated at $456,080; damage to the mooring dolphins was in excess of $500,000.

***Nippon Maru* in Apra Harbor postaccident. (Source: US Coast Guard)**

[1] A *mooring dolphin* is separate platform, column, or set of pilings that is installed forward or aft of a pier or wharf to provide additional mooring points for vessels at the berth.

Background

The 545-foot-long, Japanese-flagged cruise ship *Nippon Maru* was built in 1990 by Mitsubishi Heavy Industries in Kobe, Japan. The vessel had two controllable-pitch propellers (each driven by a 10,450 hp diesel engine), twin rudders, and a single 2,000 hp bow thruster. In addition to steering and propulsion controls on the bridge, each bridge wing had a maneuvering station with a single joystick that controlled the rudders, propeller pitch, and the propulsion engines, along with a separate lever to control the bow thruster. The vessel was normally employed on cruises around the Japanese island chain, with occasional longer voyages to the South Pacific Ocean and other locations.



Accident location, as marked by a red triangle. (Background source: Google Maps)

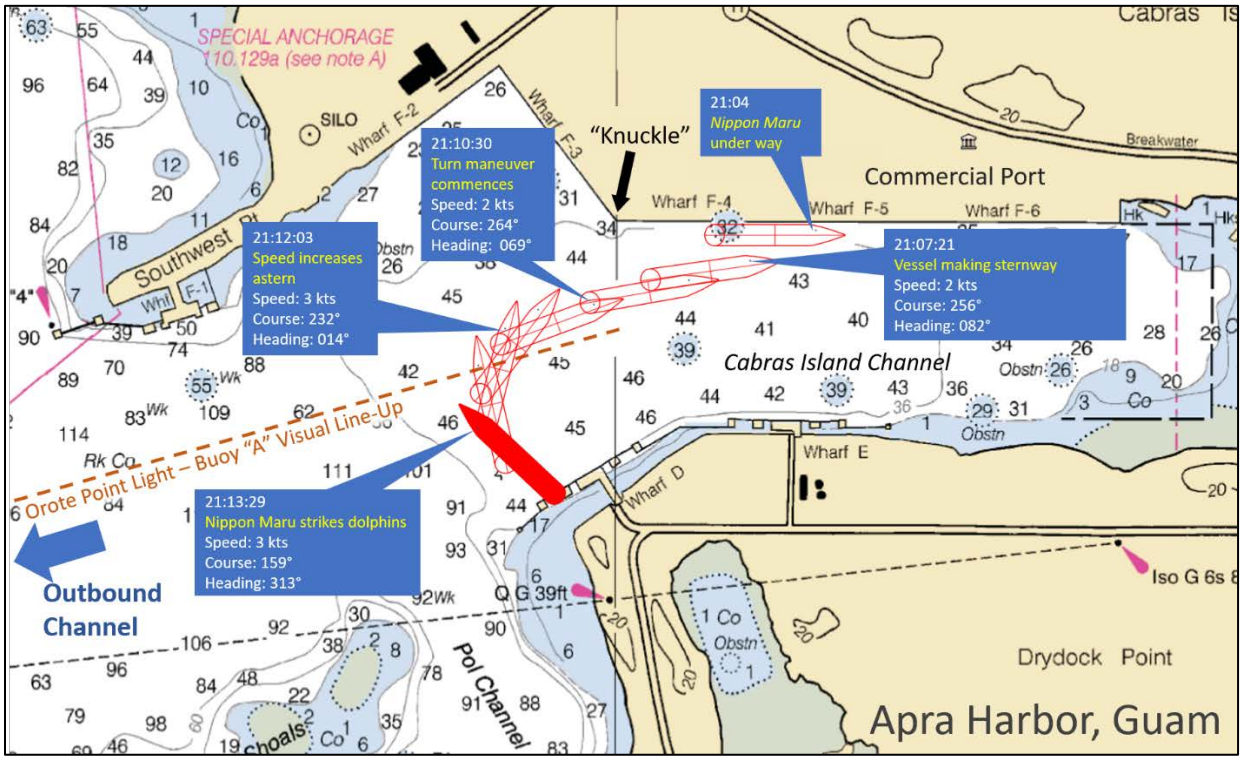
Accident Events

About 0645 on December 30, the *Nippon Maru* arrived in Apra Harbor for a daytime port call and was berthed port side to wharves F-4 and F-5 in the harbor's commercial port. The vessel was scheduled to get under way at 2100 that evening, bound for the island of Saipan. According to the crew and per the vessel owner's safety management system (SMS), for the departure, the third officer was assigned to the bridge, the chief officer was assigned to lead deck operations on the bow, and the second officer was assigned to lead operations on the stern. The third officer told investigators that his duties on the bridge included monitoring the vessel's electronic charting display and information system (ECDIS) and providing backup to the master, who would have the conn.

About 2050, a pilot boarded the *Nippon Maru* in preparation for the outbound transit. The pilot told investigators that when he arrived on the bridge, the master was not there, so he

proceeded to the port bridge wing to wait. The master arrived a few minutes later and, according to the pilot, stated, "We are ready to sail."

The pilot's maneuvering plan for leaving port was for the ship to come off the wharf and back down past the "knuckle" between wharves F-4 and F-3, where the harbor opened to a wider turning basin. The master would then use the *Nippon Maru*'s bow thruster, and the pilot would use a tugboat made up to the stern to pivot the vessel around before heading outbound. The master told investigators that he originally intended to turn the vessel around to starboard, but the pilot recommended turning it to port, to which the master agreed. Other than this brief discussion, no other information was shared between the pilot and the master. According to the pilot, a formal master/pilot exchange, which was required by the *Nippon Maru*'s SMS, was not conducted.



Accident timeline reconstructed from automated identification system (AIS) data. (Background adapted from National Oceanic and Atmospheric Administration chart 81054)

At 2057, control of the *Nippon Maru*'s engines, rudders, and bow thruster was shifted to the port bridge wing, and the master took the conn. The tugboat *Talofofo* was made up to the vessel's starboard quarter, and, at 2104, the last mooring lines were taken in. The pilot ordered the tugboat to pull the stern away from the wharf and asked the master to use the bow thruster to match the stern movement with the bow. Once the *Nippon Maru* was about 60 feet from the wharf, the pilot ordered the tugboat to stop, and he instructed the master to stop the bow thruster and have the vessel go astern slowly. The pilot stated that the master did not verbally respond to his orders, but based on the movement of the vessel, he assessed that the master was complying. At 2106, the vessel began moving astern, making about 2 knots astern a minute later.

When the bow of the *Nippon Maru* was nearly clear of the knuckle between wharves F-4 and F-3, the pilot ordered the *Talofofo* to begin pulling on the stern, perpendicular to the starboard side, and directed the master to thrust the bow to port to turn the vessel around. At 2110, the chief

officer reported via handheld radio that the bow was clear of the knuckle, and the master responded that the ship was starting a "left turn."[2] All radio communications between the master and crewmembers were in Japanese (the pilot did not speak or understand Japanese). Twenty-five seconds after the radio exchange, automatic identification system (AIS) data showed the vessel beginning to turn to port. The pilot stated that his intention was for the ship to pivot until it was lined up on a range created by green buoy "A" in the Outer Harbor and Orote Point Light at the entrance to the harbor, which he said would position the vessel in the center of the channel for exiting the port.

The master stated that when the ship had turned 60 degrees, he intended to move the control joystick to starboard to assist with the turn, but because he had lost his "sense of orientation," he mistakenly moved the joystick aft, providing astern propulsion. The pilot stated that shortly thereafter, he noticed that the ship was still going astern and requested that the master put the engines at dead slow ahead and the rudders hard to port. At 2112:03, the *Nippon Maru*'s sternway increased to 3 knots. About the same time, the second officer on the stern reported to the bridge that mooring dolphins on the opposite side of the channel were 70 meters from the vessel "at the 5 o'clock position." The mooring dolphins were part of D wharf, a US Navy fueling dock.

Over the next minute and a half, the second officer on the stern made several reports to the master about the closing distance to the D wharf dolphins. At the same time, the captain of the *Talofofo* made similar reports to the pilot over VHF radio. The communications between the master and second officer were in Japanese, while the communications between the pilot and tugboat captain were in English.

Concerned about the *Nippon Maru*'s position, the pilot ordered successively more power from the tugboat to increase the ship's rate of turn. He also requested that the master increase the *Nippon Maru*'s engine speed to half ahead. The pilot stated that the master "seemed like he responded," but from where he was standing, he could not see the joystick controller that the master was operating. He also stated that he could not see bridge wing indicators for engine rpm or rudder angles. At 2112:59, the third officer was recorded on the vessel's voyage data recorder (VDR) telling the master in Japanese that the joystick was now full astern. According to AIS data, the *Nippon Maru*'s sternway remained at 3 knots while its bow continued to swing to port.

At 2113:17, the third officer again warned the master in Japanese that the joystick was at full astern. Two seconds later, the second officer reported that the *Nippon Maru* had hit an oil boom that surrounded the D wharf. Four seconds after that, the third officer yelled in English, "Ahead! Ahead!"

At 2113:29, the stern of the *Nippon Maru* struck two of the D wharf's mooring dolphins. About the same time, the third officer attempted to take control of the joystick by moving it to the ahead position, but the master immediately moved the joystick back to the astern position.

[2] Voice and radio communications between the master and crewmembers were recorded on the *Nippon Maru*'s voyage data recorder (VDR). During a playback of the VDR while on board the vessel following the accident, investigators transcribed the audio recording, translating Japanese language communications with the assistance of the vessel's second and third officers. Electronic VDR data later retrieved from the vessel was corrupted and unusable, and thus only the original transcription was available to investigators.

The second officer reported the contact with the dolphins to the bridge, and, at 2114, the third officer notified the engine room and directed the engineers to check for flooding. No flooding was reported, and the *Nippon Maru* moved under its own power back to wharves F-4 and F-5 with assistance from the *Talofofo*.

Damage to the *Nippon Maru*'s starboard stern. (Source: Coast Guard)

The strike opened a large hole in the starboard side of the *Nippon Maru*'s stern and a gash in the port side stern. Both of the concrete dolphins at the D wharf were damaged in the accident, and a catwalk that spanned the gap between the dolphins was destroyed.

Damage to Navy D Wharf dolphins. (Source: Coast Guard)

Additional Information

The master of the *Nippon Maru* stated that he had 28 years' experience at sea, with 6 years as master, all with the *Nippon Maru*. He held a valid certificate of competency, issued by the government of Japan, for "First Grade Maritime Officer (Navigation)," which licensed him to serve as a master of vessels in oceans and coastal areas. He said that he had made port calls in Apra Harbor at least 10 times and had worked with the same pilot during previous calls.

The third officer told investigators that he had 1 year and 4 months experience as a third officer. The *Nippon Maru* was the only ship he had served on, and he had only worked for this master. The third officer told investigators that his relationship with the master was "not good." He said, "[The master] doesn't like my briefings. He seems annoyed with me, and [on the accident date] he said, 'no brief; don't report to me.'"

The pilot said that he had been a pilot in Apra Harbor since 1992. He piloted most of the US Navy vessels that called on the port, but he also handled commercial vessels, including passenger vessels, tankers, and cargo ships. He held a valid US Coast Guard merchant mariner credential as a "Deck Officer – First Class Pilot of Vessels of Any Gross Tons Upon Apra Inner and Outer Harbor, Guam, and Tanapag Harbor, Saipan." Coast Guard records showed that he had first completed bridge resource management (BRM) training in 2001, and he told investigators that he had completed a BRM-for-pilots training course 5–6 years before the accident. He stated that he had piloted the *Nippon Maru* four times previous to the accident voyage and that the ship called on the port about once a year. He had worked with the current master of the *Nippon Maru* before, but a different master had been aboard when he last piloted the vessel.

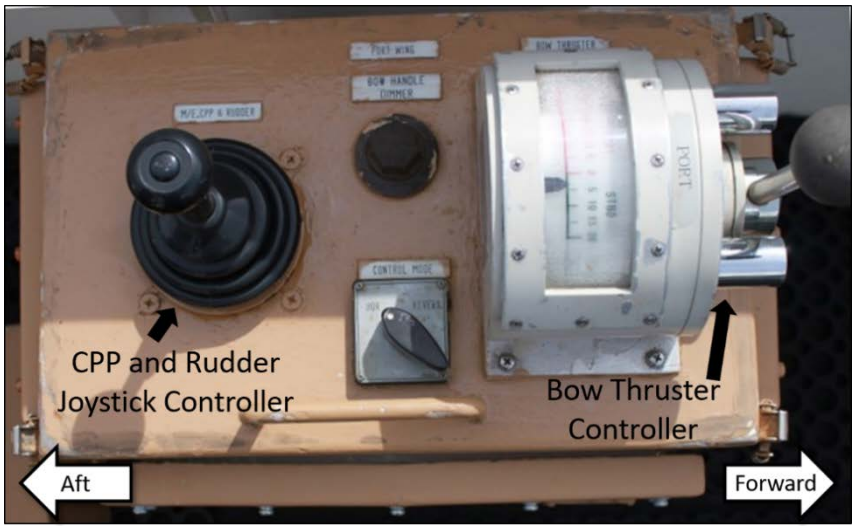
The pilot stated that, as he prepared to leave the ship after the accident, he smelled alcohol on the breath of the master. He said that prior to this time he had not been close enough to the master to detect the odor. During postaccident interviews, the master told investigators that he drank one can of beer about 1300 on the day of the accident and had no other alcoholic beverages before getting under way. In a statement made to the Japanese Ministry of Land, Infrastructure, Transport and Tourism about 2 weeks after the accident, the master reported that, between 1700 and 1800 on the accident date, he drank one and a half cans of premixed whisky with soda. He also stated in the Report of Marine Casualty submitted to the US Coast Guard that he drank a can of beer after the accident, between about 2300 and 2400, to "calm my mind."

According to the Coast Guard report of mandatory chemical testing following a serious marine incident form, the master had a positive alcohol screen at 0215 on December 31, about 5 hours after the accident, with a confirmatory positive breath alcohol test of 0.071 g/dL (grams per deciliter) at 0230. Alcohol screening results for all other critical *Nippon Maru* crewmembers and the pilot were negative; screening results of crewmembers, including the master, and the pilot for all other drugs were negative. Per the Title 33 *Code of Federal Regulations* Part 95, an individual is under the influence of alcohol when operating a vessel other than a recreational vessel with a blood alcohol concentration of 0.04 percent by weight (equivalent to 0.04 g/dL) or more. Company policy for the *Nippon Maru* stated that the crew was required to abstain from drinking 4 hours before performing scheduled duties and keep alcohol levels at less than 0.03 g/dL while on duty.

Analysis

The master stated that while he and the pilot attempted to pivot the vessel in the turning basin, he had mistakenly moved the joystick that controlled the *Nippon Maru*'s engines and rudder

to the astern position. Statements from the third officer and bridge wing VDR audio recorded during the accident sequence confirm that the master moved the joystick astern, eventually moving it to full astern, and kept it there until after the vessel struck the mooring dolphins.



Port bridge wing control station. (Source: Coast Guard)

To stop the sternway of the *Nippon Maru* as it began its turn, the pilot requested dead slow ahead and then half ahead on the vessel's engines. As the vessel continued to close on the mooring dolphins, more drastic engine orders, such as engines full ahead, would have been expected to avoid contact. However, given that the master had mistakenly moved the engines to astern while intending to go ahead and ignored warnings from the third officer, it is unlikely that requests from the pilot to further increase ahead propulsion would have changed the outcome of the accident. The pilot's orders to the tugboat *Talofofo* to increase astern propulsion, which were intended to increase the swing of the ship, were insufficient to counteract the sternway generated from the errant engine and rudder input from the master.

The master reported that he drank one and a half cans of whisky and soda 3–4 hours before the accident. The metabolism of alcohol is well understood and has been shown to decrease at a rate ranging from 0.010 to 0.035 g/dL per hour.[3] Using the master's stated consumption and assuming a slower rate of metabolism for what is typical of a moderate drinker, the alcohol level of the master at the time of the accident would have been at most 0.02 g/dL and would have been fully metabolized at the time of the breathalyzer test. The one can of beer that he reported that he consumed 2–3 hours after the accident would also have been fully metabolized. The master was documented as having a blood alcohol concentration (BAC) of 0.071 g/dL approximately 5 hours after the accident, and therefore it is likely that the master consumed more alcoholic beverages than he reported.

Because the breathalyzer test was conducted 5 hours after the *Nippon Maru* struck the D wharf, it is possible that the master's BAC was the result of additional alcohol consumed after the accident. However, the master's errors in maneuvering the vessel were not consistent with his level of skill and experience—in particular his experience with this vessel in this harbor—and

[3] Jones, AW, Evidence-based survey of the elimination rates of ethanol from blood with applications in forensic casework, *Forensic Science International,* 200 (2010): 1-20.

suggest that he was impaired during the vessel's voyage. Also, the pilot noted that the master smelled of alcohol just after the accident. Using the same metabolism rate as above, a retrograde extrapolation of a BAC of 0.071 g/dL at the time of the breathalyzer test indicates that, even taking into account the reported consumption of a beer after the accident, the master likely had a BAC of 0.14 g/dL at the time of the accident. The extrapolated BAC exceeded the Coast Guard maximum allowable BAC of 0.04 g/dL and the company policy of less than 0.03 g/dL while on duty. Moreover, a BAC between 0.06 and 0.15 g/dL is associated with memory, attention, coordination, and balance impairments, with impairments increasing with BAC.[4] Given the evidence, it is likely that impairment from alcohol contributed to the accident.

Bridge resource management (BRM) is the effective use of all available resources—information, equipment, and personnel—by a vessel's bridge team (masters, pilots, officers, and crew) to safely operate the vessel. One of the key elements in establishing effective BRM is the master/pilot exchange, which is conducted at the start of pilot transits and includes discussion of the vessel's navigational equipment, any limitations of maneuverability, undocking maneuvers, intended courses and speeds through the waterway, anticipated hazards along the route, and weather conditions. The exchange ensures that the pilot, master, and other bridge watchstanders have a shared mental model of the intended transit. The SMS for the *Nippon Maru* required that a master/pilot exchange be conducted and provided a checklist and pilot card to be used "to ensure the exchange of information and safe pilotage."

According to the pilot, a master/pilot exchange was normal practice on the ships that he piloted, but an exchange was not conducted on the *Nippon Maru* prior to getting under way for the accident voyage. The master arrived on the bridge minutes before the ship began singling up lines in preparation for getting under way, and no information was discussed, other than which direction the vessel would turn. A proper master/pilot exchange would have allowed the pilot and master to talk through the expected actions of the master and the operation of the joystick controller. Furthermore, interaction with the master during a master/pilot exchange would have given the pilot an opportunity to discover that the master had been drinking, and, if he believed it necessary, an alternate arrangement could have been made to ensure that the *Nippon Maru* was operated safely.

Another critical element of BRM is effective communication between the bridge watchstanders, the master, and the pilot. According to the *Nippon Maru*'s deck log, the working languages of the vessel were Japanese and English, and throughout the accident sequence, the master and pilot communicated in English, while nearly all other shipboard communications were conducted in Japanese. Thus, the pilot was not aware of the distances to the mooring dolphins being reported by the second officer on the stern. Although the pilot received distance reports from the tugboat *Talofofo* captain, he was not able to understand the additional distance information being provided by the crew, which would have corroborated the information provided by the tugboat. Furthermore, the pilot was not able to understand the third officer's first two warnings that the master had the joystick controller in the full astern position. It was only the final warning, 5 seconds before impact, that was spoken in English. Additionally, the pilot reported that during the accident sequence, the master did not acknowledge his engine orders verbally, and thus he

[4] "Understanding the Dangers of Alcohol Overdose," *National Institute on Alcohol Abuse and Alcoholism*, last modified October 2018, https://pubs.niaaa.nih.gov/publications/AlcoholOverdoseFactsheet/Overdosefact.htm.

could only assume that the master was complying. These factors suggest that communication between the pilot and crew was ineffective during the accident voyage.

The ability to effectively challenge the actions of another bridge watchstander when an unsafe condition exists—also an essential element of BRM—is more difficult when there is a large gap between levels of authority in bridge watch team members. This gap, known as "power distance," can lead senior personnel to disregard valid challenges by junior personnel. Prior to the *Nippon Maru* striking the mooring dolphins, the third officer warned the master three times that he had the joystick in the wrong position, yet the master ignored each of these warnings and kept the joystick astern. When the third officer attempted to take physical control of the joystick and moved it ahead, the master rebuffed him and moved the joystick back astern. The third officer was the most junior deck officer on the ship, with only a fraction of the master's seagoing experience. Additionally, he stated that his relationship with the master was poor, and the master refused to be briefed by the third officer prior to getting under way. It is possible that a large power distance between the master and the third officer, exacerbated by the master's alcohol-impaired state, contributed to the master's failure to heed the third officer's warnings.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the passenger vessel *Nippon Maru*'s contact with the mooring dolphins at the US Navy wharf D in Apra Harbor, Guam, was alcohol impairment of the master while he conned the vessel, resulting in an errant astern engine input.

Master/Pilot Exchange

The master/pilot exchange is a critical component of bridge resource management, and is more than a simple exchange of vessel particulars. The master/pilot exchange is an opportunity to ensure the pilot and bridge team can clearly communicate and have a shared mental model of the task ahead. A formal master/pilot exchange should be conducted whenever a pilot comes aboard a vessel, regardless of the level of familiarity with the pilot, the master, and the vessel.

Vessel Particulars

Vessel	*Nippon Maru*
Owner/operator	Mitsui O.S.K. Passenger Line, Ltd.
Port of Registry	Tokyo
Flag	Japan
Type	Passenger vessel
Year built	1990
IMO number	8817631
Classification society	Nippon Kaiji Kyokai (ClassNK)
Construction	Steel
Length	547.9 ft (167 m)
Depth	21 ft (6.4 m)
Beam/width	78.7 ft (24 m)
Gross/net tonnage	22,472 gross tons
Engine power; manufacturer	2 X 10,450 hp (7,793 kW) Mitsubishi 8UEC52LA diesel engines
Persons on board	624

NTSB investigators worked closely with our counterparts from Coast Guard Sector Guam throughout this investigation.

For more details about this accident, visit www.ntsb.gov and search for NTSB accident ID DCA19FM012.

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